STATE OF MICHIGAN

IN THE COURT OF APPEALS

FAZLUL SARKAR,

Plaintiff–Appellant,

vs.

JOHN and/or JANE DOE(S),

Defendants,

THE PUBPEER FOUNDATION,

Appellee.
_____/

COA Case No. 326667

Wayne County Circuit Court
Case No. 14-013099-CZ (Gibson, J.)

FAZLUL SARKAR,

Plaintiff–Appellee,

vs.

JOHN and/or JANE DOE(S),

Defendants,

THE PUBPEER FOUNDATION,

Appellant.
_____/

COA Case No. 326691

Wayne County Circuit Court
Case No. 14-013099-CZ (Gibson, J.)

PUBPEER'S MOTION TO SUPPLEMENT THE RECORD

Pursuant to MCR 7.216(A)(4), The PubPeer Foundation seeks to supplement the record with the Final Report of the Investigation Committee of Wayne State University regarding 263

allegations of research misconduct made against Plaintiff Fazlul Sarkar ("Final Report"), attached as Exhibit A.[1]

On October 20, 2016, PubPeer filed a motion for leave to file a supplemental brief that quoted portions of the Final Report as described in a news article. PubPeer noted in its brief that, if the full report became public, PubPeer would likely seek the Court's leave to file the full report. On October 28, the Court granted PubPeer's motion. Since that time, Wayne State University has released the Final Report to PubPeer's counsel pursuant to a Michigan Freedom of Information Act ("FOIA") request, see MCL 15.231 *et seq*. Accordingly, PubPeer now seeks to bring to the Court's attention the conclusions of the investigation, which were not previously available and which go directly to the core of Dr. Sarkar's defamation claim.

It is within this Court's discretion to allow a party to supplement the record on appeal. The "Court of Appeals may, at any time . . . in its discretion, and on the terms it deems just . . . permit amendments, corrections, or additions to the transcript or record." MCR 7.216(A)(4). See, e.g., *People v Lee*, 314 Mich App 266, at *1 n 3 (2016) (considering new evidence on appeal because it related to an issue that had been raised in the lower court and the parties did not dispute its authenticity); *People v Nash*, 244 Mich App 93, 100 (2000) (considering new affidavit on appeal because it clarified the existing record).

Here, the Court should allow PubPeer to supplement the record because the Final Report is critical to understanding the importance of requiring defamation plaintiffs to proffer some evidence of the merit of their claims before stripping speakers of their right to remain anonymous. As PubPeer has explained in the principal briefs, none of Dr. Sarkar's claims

[1] PubPeer's counsel requested only those portions of the Final Report that concern Dr. Sarkar. Wayne State University granted the request in full, but did not provide pages 340–413 of the Report as they do not involve Dr. Sarkar.

satisfies the standard articulated in *Ghanam v Does*, 303 Mich App 522 (2014) for unmasking anonymous speakers. But should the Court disagree, Wayne State's findings concerning Dr. Sarkar highlight the importance of testing the factual merit of defamation claims before permitting unmasking. See *Dendrite Int'l, Inc v Doe No 3*, 342 NJ Super 134, 142 (NJ App, 2005). In addition to the findings highlighted by The Scientist—the University's recommendation that Dr. Sarkar retract 42 publications and its conclusion that "Dr. Sarkar engaged in and permitted (and tacitly encouraged) intentional and knowing fabrication, falsification, and/or plagiarism of data, and its publication in journals, and its use to support his federal grant applications"—the Final Report describes 263 individual allegations of research misconduct received by Wayne State University against Dr. Sarkar and concludes that 204 of them constituted substantiated misconduct. See Ex. A at 2, 415–22. The Final Report also makes clear that, of the articles discussed in the PubPeer comments that Dr. Sarkar challenges as defamatory, seven have been retracted, recommended for retraction, or recommended for correction.[2]

These findings underscore the danger of allowing unmasking on the basis of legally sufficient but factually untested claims. None of PubPeer's commenters have stated any fact about Dr. Sarkar that is capable of being defamatory. But even if they had, as Dr. Sarkar alleges they have done through innuendo, Wayne State's findings support the *truth* of that alleged innuendo. Anonymous true speech is protected by the First Amendment even if the same speech,

[2] See, e.g., JOURNAL OF CELLULAR PHYSIOLOGY, *Retraction* (17 June 2016), http://onlinelibrary.wiley.com/doi/10.1002/jcp.25417/full (retracting article referenced in Compl. ¶¶ 43, 37); JOURNAL OF CELLULAR BIOCHEMISTRY, *Retraction* (15 June 2016) http://onlinelibrary.wiley.com/doi/10.1002/jcb.25586/full (retracting article referenced in Compl. ¶ 52); Final Report at 416–18, 420–21 (recommending retraction of Paper 59, referenced in Compl. ¶ 40, Paper 68, referenced in Compl. ¶ 48, and Paper 40, referenced in Compl. ¶ 54c; and submission of erratum for Paper 20, referenced in Compl. ¶¶ 42, 46, and Paper 26, referenced in Compl. ¶ 54a).

when false, would be defamatory. The Final Report also severely undercuts Dr. Sarkar's apparent theory of harm causation. According to the Report, the University's investigation began in 2012, long before any of the challenged comments were published. See Ex. A at 1–2.

For these reasons, PubPeer requests that the Court grant this motion and accept the attached Exhibit as filed.

Respectfully submitted,

November 16, 2016

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EXHIBIT A

WAYNE STATE UNIVERSITY

Final Report of the Investigation Committee
Wayne State University

DATE: Monday August 31, 2015
RE: Investigation of research misconduct allegations—DIO 4915
Complainant(s): Anonymous
Respondent: Dr. Fazlul H. Sarkar

I. BACKGROUND

On August 31, 2012, Dr. Philip R. Cunningham, Research Integrity Officer (RIO) for WSU, received a letter from the Office of Research Integrity requesting that WSU initiate an inquiry into 24 allegations of research misconduct against Dr. Fazlul H. Sarkar by an anonymous complainant. An Inquiry Committee was appointed and met several times beginning on September 24, 2012 and issued its final report on October 29, 2012. The Inquiry Committee concluded that there was sufficient and credible supporting evidence of research misconduct as described in 42 CFR Part 93 and Wayne State University Policy 2010-01 to warrant a full investigation into the 24 allegations.

An Investigation Committee was appointed and met initially on December 6, 2012. Each member confirmed s/he had no conflicts of interest with the complainant or the respondent, or the Wayne State University Department of Pathology, Wayne State University Department of Oncology, or the Karmanos Cancer Institute. The RIO reminded each member that confidentiality was of the utmost importance.

The committee members were provided with the following information:

- The Inquiry Report
- The letter containing allegation(s) from the complainant
- Responses to the initial 24 allegations from Dr. Sarkar in a letter dated November 27, 2012
- The 24 publications provided as supporting evidence by the complainant
- Access to the materials sequestered from Dr. Sarkar's laboratory
- Copies of WSU's Policy and Procedure Regarding Research Misconduct (2010-01)

The RIO charged the committee with conducting the investigation as prescribed in Section 7.5 of WSU's Policy 2010-01. They were directed to use diligent efforts to ensure a thorough investigation, sufficiently documented, and examining all research records and evidence relevant to reaching a determination on each allegation. They were also directed to pursue diligently any evidence of any additional instances of possible research misconduct or any additional respondents.

The Investigation Committee initially pursued evidence of the 24 allegations described in the Report of the Inquiry Committee. Consistent with their obligations under 42 CFR sec. 93.105 and University Policy 2010-01 sec. 4.7, the Investigation Committee examined all publications, NIH grant applications and progress reports, presentations, and patents published or submitted by Dr. Sarkar, and the members of his research group during the 6-years prior to the date of the initial allegations of research misconduct (the "period under investigation"). The Committee identified multiple instances of possible fabrication, falsification, and/or plagiarism within these sources from Dr. Sarkar's laboratory. Periodically during the course of the investigation, the Investigation Committee received additional allegations from anonymous or pseudonymous complainants. Additionally, the Investigation Committee identified other instances of fabrication and/or falsification in errata submitted by the Respondent to journals purported to correct mistakes in publications under investigation, and in responses submitted to the Investigation Committee by the Respondent purported to explain or correct data or images subject to these allegations. Overall, the Investigation Committee identified multiple additional allegations, for which it provided supporting documentation, and bringing the total to 263 individual allegations against Dr. Sarkar. All of these additional allegations were communicated to Dr. Sarkar. All the allegations involved manipulations of images in figures (e.g., Western blots, EMSA assays, cell cultures, etc.) suspected of being falsifications and/or fabrications in the publications, NIH grant applications and progress reports, a patent application, and a dissertation. The specific allegations are listed below in Section III.

The Investigation Committee named additional respondents, each of whom are members of Dr. Sarkar's laboratory, are paid by him, and are co-authors on his publications. Dr. Sarkar was the sole common author on all materials examined. The other Respondents were named regarding specific allegations related to publications on which they were the first author and/or the corresponding author. It had been determined by the Committee, based on consistent testimony from Dr. Sarkar and witnesses, that the first authors had primary responsibility for the research and the content of the publications under investigation for research misconduct, and that Dr. Sarkar had final responsibility for publications where he is senior or corresponding author or which were supported by his NIH grants. Dr. Sarkar was responsible for all grant applications and progress reports.

II.

Summary of Research Records and Evidence

Reviewed & Not Reviewed

II. SUMMARY OF RESEARCH RECORDS AND EVIDENCE REVIEWED AND NOT REVIEWED

All of the materials listed in this section were reviewed by the Investigation Committee.

The RIO sequestered the following materials before the Inquiry Committee met, and these materials were provided to the Investigation Committee:

- The hard drives from 18 computers found in the laboratory rooms/offices of Dr. Sarkar were sequestered and copied by the IT Department of the Office of the Vice President for Research
- Three flash drives (thumb drives)
- Dozens of laboratory notebooks, pads, and other written lab records
- Copies of all publications, NIH grant proposals and progress reports, and patents by Dr. Sarkar from the period under investigation

During the course of the investigation, the Investigation Committee received and reviewed the following additional materials:

- Two external drives from Karmanos Cancer Institute containing additional computer files from Dr. Sarkar's laboratory contained on 3 shared drives ("P_homes", "Y_shares" & "Z_research") at Karmanos Cancer Institute sequestered and copied by the WSU IT Department of the Office of the Vice President for Research
- Several additional laboratory notebooks and other written lab records that should have been sequestered during the initial phase of the Inquiry but were instead received later from the members of Dr. Sarkar's lab.
- Hundreds of films, many of them not marked or organized in any identifiable way
- Responses to subsequent allegations from Dr. Sarkar and members of his lab, typically with cover letters and supporting materials, received periodically during 2014 (i.e., in February, July, September, and November)

The Investigation Committee conducted 24 interviews of the following 15 individuals:

Ahmad, Aamir	12/16/2013
Ali, Shadan	12/11/2013
	12/18/2013
	07/17/2014
Azmi, Asfar	12/11/2013
Banerjee, Sanjeev	02/06/2014
	03/12/2014
	07/17/2014
Bao, Bin	12/11/2013
Hencsie, Jacqui	12/18/2013
Hillman, Gilda	02/13/2014
	05/01/2014
Kong, Dejuan	12/16/2013
	07/17/2014

Li, Yiwei	12/12/2013
	12/20/2013
Majumdar, Adhip	12/12/2013
Mohammad, Ramzi	12/18/2013
Philip, Philip	12/12/2013
Sarkar, Fazlul	12/19/2013
	02/13/2014
Singh-Gupta, V	03/07/2014
Wang, Zhiwei	01/28/2014
	10/22/2014

Over 80 hours of interviews were conducted. Relevant information from these interviews is described in the analysis section below. The full transcripts of the interviews used in the preparation of this report are included.

Investigation Committee members worked individually on evaluations and the Committee met as a group almost every week for 3 to 5 hours between February 2013 and February 2015 in approximately 90 sessions. At every meeting, the members signed a form re-confirming they had no conflict of interest with any Respondent or their department(s). The Investigation Committee deliberated by consensus and all of the determinations included in this report are the unanimous conclusions of the Investigation Committee members following the guidelines and definitions specified in the WSU Policy and Procedures Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. There are no dissenting opinions.

Throughout this 26+ month process, the Investigation Committee sought out original data, notes, and testimony that would authenticate the published findings and explain the figures that give rise to the allegations. The Committee searched and found data that the members of the Sarkar lab did not or could not provide. Despite extensive and diligent efforts to locate and evaluate all relevant information related to each figure in each publication under investigation, the Investigation Committee was unable to find original data for many of the experiments addressed in the allegations.

The following is a list of all materials:

Publications

1: Sethi S, Li Y, Sarkar FH. **Regulating MiRNA by Natural Agents as a New Strategy For Cancer Treatment. Curr Drug Targets**. 2013 Jul 4. [Epub ahead of print] PubMed PMID: 23834152.

2: Ma J, Cheng L, Liu H, Zhang J, Shi Y, Zeng F, Miele L, Sarkar FH, Xia J, Wang Z. **Genistein down-regulates miR-223 expression in pancreatic cancer cells. Curr Drug Targets**. 2013 Jul 4.
[Epub ahead of print] PubMed PMID: 23834147.

3: Wang R, Ma J, Wu Q, Xia J, Miele L, Sarkar FH, Wang Z. **Functional Role of MiR-34 Family in Human Cancer**. Curr Drug Targets. 2013 Jul 4. [Epub ahead of print] PubMed PMID: 23834144.

4: Ahmad A, Biersack B, Li Y, Bao B, Kong D, Ali S, Banerjee S, Sarkar FH. **Perspectives on the Role of Isoflavones in Prostate Cancer.** AAPS J. 2013 Jul 4. [Epub ahead of print] PubMed PMID: 23824838.

5: Bao B, Ahmad A, Azmi AS, Ali S, Sarkar FH. **Overview of Cancer Stem Cells (CSCs) and Mechanisms of Their Regulation: Implications for Cancer Therapy**. Curr Protoc Pharmacol. 2013 Jun;Chapter 14:Unit14.25. DOI:10.1002/0471141755.ph1425s61. PubMed PMID: 23744710.

6: Zubair H, Khan HY, Sohail A, Azim S, Ullah MF, Ahmad A, Sarkar FH, Hadi SM. **Redox cycling of endogenous copper by thymoquinone leads to ROS-mediated DNA breakage and consequent cell death: putative anticancer mechanism of antioxidants**. Cell Death Dis. 2013 Jun 6;4:e660. DOI: 10.1038/cddis.2013.172. PubMed PMID: 23744360; PubMed Central PMCID: PMC3698541.

7: Azmi AS, Bao B, Sarkar FH. **Exosomes in cancer development, metastasis, and drug resistance: a comprehensive review**. Cancer Metastasis Rev. 2013 May 25.
[Epub ahead of print] PubMed PMID: 23709120.

8: Osman MA, Sarkar FH, Rodriguez-Boulan E. **A molecular rheostat at the interface of cancer and diabetes**. Biochim Biophys Acta. 2013 Aug;1836(1):166-76. DOI:10.1016/j.bbcan.2013.04.005. Epub 2013 Apr 29. PubMed PMID: 23639840; PubMed Central PMCID: PMC3667713.

9: Sethi S, Kong D, Land S, Dyson G, Sakr WA, Sarkar FH. **Comprehensive molecular oncogenomic profiling and miRNA analysis of prostate cancer**. Am J Transl Res. 2013;5(2):200-11. Epub 2013 Mar 28. PubMed PMID: 23573364; PubMed Central PMCID: PMC3612515.

10: Yusufi M, Banerjee S, Mohammad M, Khatal S, Venkateswara Swamy K, Khan EM, Aboukameel A, Sarkar FH, Padhye S. **Synthesis, Characterization and anti-tumor activity of novel thymoquinone analogs against pancreatic cancer**. Bioorg Med Chem Lett. 2013 May 15;23(10):3101-4. DOI: 10.1016/j.bmcl.2013.03.003. Epub 2013 Mar 14. PubMed PMID: 23562242.

11: Wang S, Wu Y, Hou Y, Guan X, Castelvetere MP, Oblak JJ, Banerjee S, Filtz TM, Sarkar FH, Chen X, Jena BP, Li C. **CXCR2 macromolecular complex in pancreatic cancer: a potential therapeutic target in tumor growth**. Transl Oncol. 2013 Apr;6(2):216-25. Epub 2013 Apr 1. PubMed PMID: 23544174; PubMed Central PMCID: PMC3610555.

12: Yu Y, Sarkar FH, Majumdar AP. **Down-regulation of miR-21 Induces Differentiation of Chemoresistant Colon Cancer Cells and Enhances Susceptibility to Therapeutic Regimens.** Transl Oncol. 2013 Apr;6(2):180-6. Epub 2013 Apr 1. PubMed PMID: 23544170; PubMed Central PMCID: PMC3610548.

13: Alian OM, Philip PA, Sarkar FH, Azmi AS. **Systems Biology Approaches to Pancreatic Cancer Detection, Prevention and Treatment.** Curr Pharm Des. 2013 Mar 19. [Epub ahead of print] PubMed PMID: 23530496.

14: Zhang G, Yang P, Guo P, Miele L, Sarkar FH, Wang Z, Zhou Q. **Unraveling the mystery of cancer metabolism in the genesis of tumor-initiating cells and development of cancer.** Biochim Biophys Acta. 2013 Aug;1836(1):49-59. DOI:10.1016/j.bbcan.2013.03.001. Epub 2013 Mar 21. PubMed PMID: 23523716.

15: Yin S, Xu L, Bonfil RD, Banerjee S, Sarkar FH, Sethi S, Reddy KB. **Tumor-initiating cells and FZD8 play a major role in drug resistance in triple-negative breast cancer.** Mol Cancer Ther. 2013 Apr;12(4):491-8. DOI:10.1158/1535-7163.MCT-12-1090. Epub 2013 Feb 27. PubMed PMID: 23445611; PubMed Central PMCID: PMC3624033.

16: Tang J, Salama R, Gadgeel SM, Sarkar FH, Ahmad A. **Erlotinib resistance in lung cancer: current progress and future perspectives.** Front Pharmacol. 2013;4:15. DOI: 10.3389/fphar.2013.00015. Epub 2013 Feb 13. PubMed PMID:23407898; PubMed Central PMCID: PMC3570789.

17: Thakur A, Schalk D, Tomaszewski E, Kondadasula SV, Yano H, Sarkar FH, Lum LG. **Microenvironment generated during EGFR targeted killing of pancreatic tumor cells by ATC inhibits myeloid-derived suppressor cells through COX2 and PGE2 dependent pathway.** J Transl Med. 2013 Feb 9;11:35. DOI: 10.1186/1479-5876-11-35. PubMed PMID: 23394575; PubMed Central PMCID: PMC3608954.

18: Li Y, Kong D, Ahmad A, Bao B, Sarkar FH. **Antioxidant function of isoflavone and 3,3'-diindolylmethane: are they important for cancer prevention and therapy?** Antioxid Redox Signal. 2013 Jul 10;19(2):139-50. DOI: 10.1089/ars.2013.5233. Epub 2013 Mar 14. PubMed PMID: 23391445; PubMed Central PMCID: PMC3689155.

19: Tan Y, Miele L, Sarkar FH, Wang Z. **Identifying Biomarkers and Drug Targets Using Systems Biology Approaches for Pancreatic Cancer.** Pancreat Disord Ther. 2012 Dec 6;2(4):1000e128. PubMed PMID: 23378937; PubMed Central PMCID:PMC3559026.

20: Raffoul JJ, Kucuk O, Sarkar FH, Hillman GG. **Dietary agents in cancer chemoprevention and treatment.** J Oncol. 2012;2012:749310. DOI:10.1155/2012/749310. Epub 2012 Dec 18. PubMed PMID: 23316231; PubMed Central PMCID: PMC3536068.

21: Parasramka MA, Ali S, Banerjee S, Deryavoush T, Sarkar FH, Gupta S. **Garcinol sensitizes human pancreatic adenocarcinoma cells to gemcitabine in association with microRNA signatures.** Mol Nutr Food Res. 2013 Feb;57(2):235-48. DOI:10.1002/mnfr.201200297. Epub 2013 Jan 7. PubMed PMID: 23293055.

22: Ahmad A, Biersack B, Li Y, Bao B, Kong D, Schobert R, Padhye SB, Sarkar FH. **Deregulation of PI3K/Akt/mTOR Signaling Pathways by Isoflavones and its Implication in Cancer Treatment.** Anticancer Agents Med Chem. 2012 Dec 11. [Epub ahead of print] PubMed PMID: 23272911.

23: Ahmad A, Biersack B, Li Y, Kong D, Bao B, Schobert R, Padhye SB, Sarkar FH. **Targeted Regulation of PI3K/Akt/mTOR/NF-κB Signaling by Indole Compounds and their Derivatives: Mechanistic Details and Biological Implications for Cancer Therapy.** Anticancer Agents Med Chem. 2012 Dec 11. [Epub ahead of print] PubMed PMID: 23272910.

24: Bao B, Ali S, Ahmad A, Azmi AS, Li Y, Banerjee S, Kong D, Sethi S, Aboukameel A, Padhye SB, Sarkar FH. **Hypoxia-induced ggressiveness of pancreatic cancer cells is due to increased expression of VEGF, IL-6 and miR-21, which can be attenuated by CDF treatment**. PLoS One. 2012;7(12):e50165. DOI:10.1371/journal.pone.0050165. Epub 2012 Dec 13. PMID: 23272057; PMCID: PMC3521759.

25: Wu Q, Hou X, Xia J, Qian X, Miele L, Sarkar FH, Wang Z. **Emerging roles of PDGF-D in EMT progression during tumorigenesis**. Cancer Treat Rev. 2013 Oct;39(6):640-6. DOI: 10.1016/j.ctrv.2012.11.006. Epub 2012 Dec 20. PubMed PMID: 23261166; PubMed Central PMCID: PMC3619006.

26: Patzkó A, Bai Y, Saporta MA, Katona I, Wu X, Vizzuso D, Feltri ML, Wang S, Dillon LM, Kamholz J, Kirschner D, Sarkar FH, Wrabetz L, Shy ME. **Curcumin derivatives promote Schwann cell differentiation and improve neuropathy in R98C CMT1B mice**. Brain. 2012 Dec;135(Pt 12):3551-66. DOI: 10.1093/brain/aws299. PubMed PMID: 23250879; PubMed Central PMCID: PMC3577101.

27: Azmi AS, Bao GW, Gao J, Mohammad RM, Sarkar FH. **Network insights into the genes regulated by hepatocyte nuclear factor 4 in response to drug induced perturbations: a review.** Curr Drug Discov Technol. 2013 Jun;10(2):147-54. PubMed PMID: 23237677.

28: Tan Y, Wu Q, Xia J, Miele L, Sarkar FH, Wang Z. **Systems biology approaches in identifying the targets of natural compounds for cancer therapy**. Curr Drug Discov Technol. 2013 Jun;10(2):139-46. PubMed PMID: 23237676.

29: Wang Z, Inuzuka H, Zhong J, Liu P, Sarkar FH, Sun Y, Wei W. **Identification of acetylation-dependent regulatory mechanisms that govern the oncogenic functions of Skp2.** Oncotarget. 2012 Nov;3(11):1294-300. PubMed PMID: 23230084.

30: Tang J, Ahmad A, Sarkar FH. **The Role of MicroRNAs in Breast Cancer Migration, Invasion and Metastasis**. Int J Mol Sci. 2012 Oct 18;13(10):13414-37. DOI:10.3390/ijms131013414. PubMed PMID: 23202960; PubMed Central PMCID: PMC3497334.

31: Haq S, Ali S, Mohammad R, Sarkar FH. **The complexities of epidemiology and prevention of gastrointestinal cancers**. Int J Mol Sci. 2012 Oct 1;13(10):12556-72. DOI: 10.3390/ijms131012556. PubMed PMID: 23202913; PubMed Central PMCID: PMC3497287.

32: Thakur A, Lum LG, Schalk D, Azmi A, Banerjee S, Sarkar FH, Mohommad R. **Pan-Bcl-2 inhibitor AT-101 enhances tumor cell killing by EGFR targeted T cells**. PLoS One. 2012;7(11):e47520. DOI: 10.1371/journal.pone.0047520. Epub 2012 Nov 19. PubMed PMID: 23185240; PubMed Central PMCID: PMC3501501.

33: Wang Z, Wan L, Zhong J, Inuzuka H, Liu P, Sarkar FH, Wei W. **Cdc20: a potential novel therapeutic target for cancer treatment**. Curr Pharm Des. 2013;19(18):3210-4. PubMed PMID: 23151139.

34: Wu Q, Miele L, Sarkar FH, Wang Z. **The Role of EMT in Pancreatic Cancer Progression**. Pancreat Disord Ther. 2012 Sep 29;2(3). DOI:pii: e121. PubMed PMID: 23145368; PubMed Central PMCID: PMC3491903.

35: Kashat M, Azzouz L, Sarkar SH, Kong D, Li Y, Sarkar FH. **Inactivation of AR and Notch-1 signaling by miR-34a attenuates prostate cancer aggressiveness**. Am J Transl Res. 2012;4(4):432-42. Epub 2012 Oct 10. PubMed PMID: 23145211; PubMedCentral PMCID: PMC3493023.

36: Bao B, Li Y, Ahmad A, Azmi AS, Bao G, Ali S, Banerjee S, Kong D, Sarkar FH. **Targeting CSC-related miRNAs for cancer therapy by natural agents.** Curr Drug Targets. 2012 Dec;13(14):1858-68. PubMed PMID: 23140295.

37: Pradhan R, Dandawate P, Vyas A, Padhye S, Biersack B, Schobert R, Ahmad A, Sarkar FH. **From body art to anticancer activities: perspectives on medicinal properties of henna.** Curr Drug Targets. 2012 Dec;13(14):1777-98. PubMed PMID: 23140289.

38: Xia J, Duan Q, Ahmad A, Bao B, Banerjee S, Shi Y, Ma J, Geng J, Chen Z, Rahman KM, Miele L, Sarkar FH, Wang Z. **Genistein inhibits cell growth and induces apoptosis through up-regulation of miR-34a in pancreatic cancer cells.** Curr Drug Targets. 2012 Dec;13(14):1750-6. PubMed PMID: 23140286.

39: Azmi AS, Aboukameel A, Bao B, Sarkar FH, Philip PA, Kauffman M, Shacham S, Mohammad RM. **Selective inhibitors of nuclear export block pancreatic cancer cell proliferation and reduce tumor growth in mice.** Gastroenterology. 2013 Feb;144(2):447-56. DOI: 10.1053/j.gastro.2012.10.036. Epub 2012 Oct 23. PubMed PMID: 23089203; PubMed Central PMCID: PMC3594519.

40: Padhye S, Dandawate P, Yusufi M, Ahmad A, Sarkar FH. **Perspectives on medicinal properties of plumbagin and its analogs.** Med Res Rev. 2012 Nov;32(6):1131-58. DOI: 10.1002/med.20235. Epub 2010 Nov 9. PubMed PMID:23059762.

41: Chen D, Banerjee S, Cui QC, Kong D, Sarkar FH, Dou QP. **Activation of AMP-activated protein kinase by 3,3'-Diindolylmethane (DIM) is associated with human prostate cancer cell death in vitro and in vivo.** PLoS One. 2012;7(10):e47186. DOI: 10.1371/journal.pone.0047186. Epub 2012 Oct 9. PubMed PMID: 23056607; PubMed Central PMCID: PMC3467201.

42: Kong D, Ahmad A, Bao B, Li Y, Banerjee S, Sarkar FH. **Histone deacetylase inhibitors induce epithelial-to-mesenchymal transition in prostate cancer cells.** PLoS One. 2012;7(9):e45045. Epub 2012 Sep 14. PubMed PMID: 23024790; PubMed Central PMCID: PMC3443231.

43: Roy S, Levi E, Majumdar AP, Sarkar FH. **Expression of miR-34 is lost in colon cancer which can be re-expressed by a novel agent CDF.** J Hematol Oncol. 2012 Sep 19;5:58. DOI: 10.1186/1756-8722-5-58. PubMed PMID: 22992310; PubMed Central PMCID: PMC3464169.

44: Ahmad A, Sarkar SH, Aboukameel A, Ali S, Biersack B, Seibt S, Li Y, Bao B, Kong D, Banerjee S, Schobert R, Padhye SB, Sarkar FH. **Anticancer action of garcinol in vitro and in vivo is in part mediated through inhibition of STAT-3 signaling.** Carcinogenesis. 2012 Dec;33(12):2450-6. DOI: 10.1093/carcin/bgs290. Epub 2012 Sep 12. PubMed PMID: 22971573.

45: Bao B, Ahmad A, Kong D, Ali S, Azmi AS, Li Y, Banerjee S, Padhye S, Sarkar FH. **Hypoxia induced aggressiveness of prostate cancer cells is linked with deregulated expression of VEGF, IL-6 and miRNAs that are attenuated by CDF. PLoS One.** 2012;7(8):e43726. DOI: 10.1371/journal.pone.0043726. Epub 2012 Aug 27. PubMed PMID: 22952749; PubMed Central PMCID: PMC3428287.

46: Xia J, Li Y, Yang Q, Mei C, Chen Z, Bao B, Ahmad A, Miele L, Sarkar FH, Wang Z. **Arsenic Trioxide Inhibits Cell Growth and Induces Apoptosis through Inactivation of Notch Signaling Pathway in Breast Cancer.** Int J Mol Sci. 2012;13(8):9627-41. DOI: 10.3390/ijms13089627. Epub 2012 Aug 2. PubMed PMID:22949821; PubMed Central PMCID: PMC3431819.

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Lab Books / Note Books / Legal Pads

- 75 lab books / note books / legal pads

Grant Proposals / Progress Reviews

YEAR	TYPE	INSTITUTE	GRANT #	FILE NAME	TITLE
2005	R01	CA	119972-01	2005, 05 06 - Sarkar Proposal 05073153	Targeting Androgen Receptor for Prostate Cancer Therapy
	R01	CA	120008-01	2005, 05 20 - Sarkar Proposal 05083189	Targeting Notch Signaling for Pancreatic Cancer Therapy
	R01	CA	108535-2	2005, 06 06 - Sarkar Proposal 05083211	Novel Targets of Indoles in Prostate Cancer
	R01	CA	101870-3	2005, 06 14 - Sarkar Proposal 05083322	Targeting Akt/NF-kappa beta for Pancreatic Cancer Therapy
	R01	CA	122732-0	2005, 10 01 - Sarkar Proposal 05124008	Discovery of Novel Anti-Cancer Agents
	R01	CA	113379	2005, 10 28 - Sarkar Proposal 06010044	Molecular Mechanism of Genistein in Breast Cancer
2006	R01	CA	124512	2006, 01 26 - Sarkar Proposal 06040451	Notch-1 in Tumor Cell Invasion and Metastasis
	R01	CA	124744-01	2006, 01 31 - Sarkar Proposal 06040449	Androgen Receptor: A Molecular Target of DIM in Prostate Cancer
	R01	CA	120008-01 A1	2006, 02 27 - Sarkar Proposal 06050791	Notch-1 in Tumor Cell Invasion and Metastasis
	R01	CA	083695-05	2006, 03 01 - Sarkar Proposal 06050719	Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer
	R01	CA	121092-01 A1	2006, 03 01 - Sarkar Proposal 06050814	Molecular Targets for Pancreas Cancer Prevention and Therapy
	R01	CA	101870-4	2006, 04 14 - Sarkar Proposal 06071101	Targeting Akt/NF-kappa beta for Pancreatic Cancer Therapy
	R01	CA	121092	2006, 06 01 - Sarkar Proposal 05083241	Molecular Targets for Pancreas Cancer Prevention and Therapy
	R01	CA	128987	2006, 09 28 - Sarkar Proposal 06122146	Regulatory Role of NF-kB in Pancreatic Cancer Invasion
	R01	CA	124744	2006, 10 26 - Sarkar Proposal 07010061	Androgen Receptor: A Molecular Target of DIM in Prostate Cancer
	R01	CA	083695-05	2006, 10 26 - Sarkar Proposal 07010062	Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer
	R01	CA	108535-3	2006, 04 14 – Sarkar Proposal 06071099	Novel Targets of Indoles in Prostate Cancer
2007	R01	CA	131151-01	2007, 02 01 - Sarkar Proposal 14114-001	A novel and targeted approach to inhibit invasion and angiogenesis
	R01	CA	131151-01	2007, 02 01 - Sarkar Proposal 07040510	A novel and targeted approach to inhibit invasion and angiogenesis

	R01	CA	131456-01	2007, 02 05 - Sarkar Proposal 07050620	Chemoprevention of pancreatic tumor progression
	5R01	CA	108535-4	2007, 03 22 - Sarkar Proposal 07060892-1	Novel Targets of Indoles in Prostate Cancer
	5R01	CA	101870-5	2007, 03 22 - Sarkar Proposal 07060904	Targeting Akt/NF-kappa beta for Pancreatic Cancer Therapy
	R01	CA	132794-01	2007, 05 29 - Sarkar Proposal 07081203	FoxM1: A molecular target in pancreatic cancer
	R21	CA	133558-01	2007, 06 08 - Sarkar Proposal 07081147	Molecular targeting of FoxM1 by a nutritional agent for the prevention of pancreatic cancer
	R01	CA	131151-01A1	2007, 10 31 - Sarkar Proposal 8010127	A novel and targeted approach to inhibit invasion and angiogenesis
	R01	CA	124744-01A2	2007, 10 31 – Sarkar Proposal 08010113	Androgen Receptor: A Molecular Target of DIM in Prostate Cancer
2008	R01	CA	132794-01A1	2008, 02 26 - Sarkar Proposal 08050727	FoxM1: A molecular target in pancreatic cancer
	5R01	CA	083695-6	2008, 04 07 - Sarkar Proposal 08060947	Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer
	R01	CA	138507-01	2008, 06 03 - Sarkar Proposal 08081215	PDGF-D signaling in epithelial-mesenchymal transition (EMT)
	2R01	CA	108535-05	2008, 07 03 - Sarkar Proposal 08091398	Novel Targets of Indoles in Prostate Cancer
	2R01	CA	101870-06	2008, 10 30 - Sarkar Proposal 09010137	Targeting NF-kappa beta for Pancreatic Cancer Therapy
2009	1 R03	TW	008419-01	2009, 01 28 - Sarkar Proposal 09040556	Novel Analogs of Curcumin as anti-cancer agents
	1 R01	OD	006146-01	2009, 01 30 - Sarkar Proposal 09040548	Novel approach for targeted treatment of gastrointestinal malignancies
				2009, 02 20 - Sarkar Proposal 09050718	
				2009, 04 10 - Sarkar Proposal 09071199	
	1 RC1	CA	144449-01	2009, 04 16 - Sarkar Proposal 09071027	Mechanistic targeting of drug resistant cells
	1 RC1	CA	144726-01	2009, 04 20 - Sarkar Proposal 09071043	Molecular characterization of pancreatic cancer stem cells
	1 RC1	CA	144926-01	2009, 04 21 - Sarkar Proposal 09071063	Mechanistic role of PDGF-D in epithelial-mesenchymal transition (EMT)
	1 R01	CA	138507-01 A1	2009, 06 29 - Sarkar Proposal 09091675	PDGF-D signaling in epithelial-mesenchymal transition (EMT)
	2 R01	CA	101870-06A2	2009, 11 03 - Sarkar Proposal 09081480	Targeting HF-Kappa beta for Pancreatic Cancer Therapy
	5 R01	CA	132794-2	2009, 12 09 - Sarkar Proposal 10030359	FoxM1: A molecular target in pancreatic cancer
2010	1 R01	CA	154321-01	2010, 01 21 - Sarkar Proposal 10040486	Prevention of Tumor Progression by a Novel Approach

	1 R01	CA	154430-01	2010, 02 01 - Sarkar Proposal 10050592	A novel and targeted approach for the management of castrate resistant prostate cancer
	5 R01	CA	131151-3	2010, 04 13 - Sarkar Proposal 10070978	R01: A novel and targeted approach to inhibit invasion and angiogenesis
	5 R01	CA	83695-8	2010, 04 13 - Sarkar Proposal 10070979	Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer
	1 R01	CA	157608-01	2010, 06 03 - Sarkar Proposal 10091299	A novel targeting of breast cancer bone metastasis through AMF and miRNA signaling
	1 R01	CA	160211-01	2010, 09 28 - Sarkar Proposal 10121919	Mechanistic Role of Lin28B Mediated Signaling in Prostate Cancer Aggressiveness
	1 R01	CA	154321-01A1	2010, 10 22 - Sarkar Proposal 11010149	Prevention of Tumor Progression by a Novel Approach
2011	1 R01	CA	164318-01	2011, 02 15 - Sarkar Proposal 11050732	Mechanistic role of miRNAs and their targets in prostate cancer aggressiveness
	1 R01	CA	154430-01A1	2011, 03 01 - Sarkar Proposal 11050799	Targeted approach for management of castrate resistant prostate cancer
	1 R01	CA	157608-01 A1	2011, 03 08 - Sarkar Proposal 11060858	Novel targeting of breast cancer bone metastasis through AMF and miRNA signaling
	5 R01	CA	131151-4	2011, 04 08 - Sarkar Proposal 11071040	R01: A novel and targeted approach to inhibit invasion and angiogenesis
	5 R01	CA	83695-9	2011, 04 08 - Sarkar Proposal 11071041	Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer
	1 P01	CA	168525-01	2011, 09 26 - Sarkar Proposal 11121789	Novel Strategies for Overcoming Therapeutic Resistance of GI Cancers
	1 R01	CA	164318-01A1	2011, 11 02 - Sarkar Proposal 12010208	Mechanistic role of miRNAs and their targets in prostate cancer aggressiveness
2012	1 R01	CA	174704-01	2012, 05 23 - Sarkar Proposal 12081120	Deregulation of miRNAs and their targets by BR-DIM in prostate cancer
	1 R21	CA	175049-01	2012, 06 08 - Sarkar Proposal 12091211	Molecular evidence of racial disparity in prostate cancer
2013	1R01	CA	174704-01A1	Proposal - Sarkar 1	Deregulation of miRNAs and their targets by BR-DIM in prostate cancer
	1 R01	CA	187469-01	Proposal - Sarkar 2	Network Pharmacology approaches to overcome Chemo-Resistance of GI Cancer by Natural Agents
		CA	164318	Proposal - Sarkar 3	Biological activity of novel rhenium compounds in prostate cancer
	1 R01	CA	190330-01	Proposal - Sarkar 4	Network Pharmacology approaches to overcome Chemo-Resistance of GI Cancer
	1 R01	CA	186876-01	Proposal - Sarkar 5	Targeting epigenetically deregulated miRNAs by natural agents in prostate cancer

DOD		LC	130851	Sarkar 13101372	Role of CLCA2 in erlotinib resistance of NSCLC cells
		LC	130852	Sarkar 13101373	Delineating the role of Autocrine Motility Factor signaling in metastasis of non-small cell lung cancer cells
		PC	131877	Sarkar 131121534	Study of the efficacy of novel thenium compounds on prostate cancer and its tumor microenvironment - a joint effort between KCI and three HBCUs
		PC	130347	Sarkar 13121533	Inhibition of hypoxia-induced CSC/EMT through deregulation of miRNAs by a novel approach

Patents

Novel Analogs of Curcumin and Methods of Use
WO 2011/142795 A1

Thymoquinone Analogs for the Treatment of Pancreatic Cancer
WO 2011/126544 A2

Isoflavonoid Analogs and their Metal Conjugates as Anti-Cancer Agents
US 2010/0160268 A1

Patent Application

Co-administration of BR-DIM and Enzalutamide for the Treatment of Prostate Cancer

Dissertation

Wang, Zhiwei (2006) Notch Signaling: A Potential Therapeutic Target for Pancreatic Cancer.
Wayne State University. UMI Number: 3243059

Computer Hard Drives – obtained during sequestration on 9/13/12

No.	Make	Computer Model	Original Room Number	Tag	Hard drive Make	HD Model	HD Serial No.
1	Apple	Power Mac M5183	740.2	11703	Seagate	ST380011A	3jv54f77
2	Dell	Optiplex GX620	740.2	006335	Seagate	ST3250824AS	5nd2ys9z
3	Dell	Dimension 2350	715	993038	Western Digital	WD600	wma8f3328854
4	Gateway	700S	715	0027033238	Western Digital	WD1200	wma8c1809566
5	Dell	Optiplex GX620	715, inner	G626NB1	Seagate	ST3250824AS	5nd4yrnf

6	Dell	Optiplex GX270	715, inner	G8B2541	Western Digital	WD1200	wma8c3766092
7	Dell	Dimension 8300	715	BXWBW21	Western Digital	WD600	wma8f3263353
8	Gateway	510CXL	715	991663	Maxtor	DiamondMax+9	y42e9v7e
9	Dell	Optiplex GX270	707	FS1FX41	Western Digital	WD400	wcajc1488431
10	Dell	Optiplex GX270	707	J00FX41	Western Digital	WD400	wcaja1511860
11	Dell	Optiplex GX270	707	G51FX41	Western Digital	WD400	wcajc1469935
12	Dell	Optiplex 745	703	6HVBPD1	Western Digital	WD800JD	wd-wmam9uu13037
13	Dell	Optiplex 745	703	830XXC1	Western Digital	WD800JD	wmam9ln56663
14	Dell	Optiplex GX280	715	4NX4J71	Western Digital	WD400	wmama3651379
15	Dell	Optiplex 760	708	1DQD9K1	Samsung	HD083GJ	s1vbj90s548492
16	Dell	Optiplex GX260	708	FNM0321	Seagate	ST380215A	9qz2vj47
17	Dell	Optiplex GX280	708	4HMQS71	Maxtor	DiamondMax+9	y24d95nc
18	Apple	Power PC 8500/150	715	991662	Seagate	ST32151N	JBN42448

Additionally, the following was received:

- Data Stick Pro – Sanjeev Banerjee (9/13/12)
- Relay Micro USB "thumb drive" (in 50 ml tube) (10/4/12)
- HP 4GB USB jump drive (in box from Zhiwei "Jerry" Wang) (10/9/12)
- Zip 100 "MAHBUB 2" Mac formatted 100MB Disk S. McCarter with Karmanos Cancer Institute
- External Hard Drive from S. McCarter with Karmanos Cancer Institute data (2/3/14)

III.

Allegations

III. ALLEGATIONS:

Allegation 1: Ahmad, A., *et al., Breast Cancer Res Treat* **122**, 337-346, (2010) Figure 5C (**Paper 1**): *"The circled images are identical but are indicated as results for two different cell lines."*

Allegation 2: Ahmad, A., *et al., Breast Cancer Res Treat* **122**, 337-346, (2010) Figure 6 (**Paper 1**): *"The circled images are identical but are indicated as results for different experimental conditions."*

Allegation 3: Kong, D., *et al., Cancer Res* **67**, 3310-3319, (2007) Figure 6 (**Paper 2**):
"... the circled images are identical but are indicated as presenting results for different experimental conditions, a patently impossible situation."
*NOTE: In Allegation **97** these duplicated images are used in an NIH grant application.*

Allegation 4: Kong, D., *et al., Cancer Res* **67**, 3310-3319, (2007) Figures 4C & 4D (**Paper 2**): *"Figure 4C and Figure 4D Western blots for MMP-9 which appear the same despite being labelled differently for different cells, LNCaP (Figure 4C) and C4-2B (Figure 4D). It appears from the spacing between the β-actin bands that those bands do not correspond to the same gel as the MMP-9 bands. MMP-9 bands for cell C4-2B may have been pasted. These indicate fabrication or falsification."*
NOTE: The same figure used in grant proposal 1 R01 CA131151-01
(File: 2007, 02 01 – Sarkar Proposal 14114-001.pdf)

Allegation 5: Wang, Z., *et al., Cancer Res*, **66**, 7653-7660, (2006) Figure 2C (**Paper 3**):
"Identical bands have been used to indicate results from different experimental conditions ... a heavy band appears to have been overlaid/pasted onto the central portion of the image."

Allegation 5a: Wang, Z., *et al., Cancer Res*, **66**, 7653-7660, (2006) Figures 2C & 2D (**Paper 3**) *"In the Figure 2C, Hes-1 panel lanes 3 and 5 are duplicates flipped vertical. Figure 2D is cut and pasted in all columns for the middle row Notch-1 bands (i.e., per caption, those treated with HB-EGF). Lanes 1 to 3 of the top Notch-1 band in Figure 2D is the same image (manipulated) as lanes 2 to 4 in the Hes-1 band in Figure 2C. Lanes 4 & 5 of the top Notch-1 band in Figure 2D are constructed from images in lanes 5 & 6 in the Hes-1 band in Figure 2C. Finally, the Hes-1 and Cyclin-D1 bands in Figure 2C are duplicated to **Reference #277** and re- labeled as Cyclin-D1 and Bcl-X_L, respectively. These manipulations indicate fabrication or falsification"*
NOTE: There is suspected duplicate use of Rb and/or β-actin in this paper.
NOTE: See also Allegations **74** & **38a**.

Allegation 5b: Wang, Z., *et al., Cancer Res*, **66**, 7653-7660, (2006) Figure 6 (**Paper 3**) *"In the MMP-9 panel, lanes 3 and 4 are identical images indicating fabrication."*

Allegation 6: Wang, Z., *et al., Cancer Res*, **66**, 7653-7660, (2006) Figure 4 (**Paper 3**):
"... the circled images are identical but are presented as showing results for different experimental conditions."

Allegation 7: Wang, Z., *et al., Cancer Res*, **66**, 7653-7660, (2006) Figures 5C & 6 (**Paper 3**): *"... Notch 1 (Figure 5C) and MMP-9 (Figure 6) bands are identical ... the MMP-9 image was flipped horizontally and the contrast altered ..."*
NOTE: See also Allegation **79** regarding re-use of Figure 5A from **Paper 3**.

Allegation 8: Bhuiyan, M., *et al., Cancer Res*, **66**, 10064-10072, (2006) Figure 2B (**Paper 4**): *"The β-Actin load control image (first six lanes in B) was used in representing two different experiments. The image was compressed in one case ..."*

Allegation 9: Bhuiyan, M., *et al., Cancer Res*, **66**, 10064-10072, (2006) Figures 2A & 2B (**Paper 4**): *"Figures 2A, 2B & 3A. In Figure 2A, top panels, the PSA band @ 72 hours appears to be covered over with a white box. Figure 2B, bottom panels, where the PSA band for the B-DIM=10 M/DHT=0 cell (4th column) also appears to be covered over with a white box. In the middle panels of Figure 2A and 2B, the 5 left lanes for PSA in Figure 2B (doses 0 to 25 μM of B-DIM) appear to be the same images as in PSA lanes 2 through 6 in Figure 2A (doses of 0.1 to 50 μM B-DIM). Also in Figure 2A, the 24 hours β-actin is the same as Figure 2B 24 hours β-actin: lanes 1 & 2 of Figure 2A are the same images as in lanes 3 & 4 of Figure 2B (flipped horizontal). Lanes 3 & 4 of Figure 2A are the same as lanes 1 & 2 of Figure 2B."*
NOTE: Also see Allegation **87** regarding β-actin bands.

Allegation 10: Bhuiyan, M., *et al., Cancer Res*, **66**, 10064-10072, (2006) Figure 3A (**Paper 4**): *"For AR in both right and left bands, the 7th lane (PC-3) seems to have been removed and 'smudged,' overlayed or masked indicating fabrication of data."*

Allegation 11: Bhuiyan, M., *et al., Cancer Res*, **66**, 10064-10072, (2006) Figure 4 (**Paper 4**): *"... identical PSA Lanes appear as representing data for two different cell lines. Further, there is evidence that data was overlaid/pasted in the Nuclear AR set for this Figure."*

Allegation 12: Banerjee, S., *et al., Int. J. Cancer*, **120**, 906-917, (2006) Figures 2 & 3 (**Paper 5**): *"... the same Actin load controls were used to represent data from different experiments. The reuse was disguised by means of horizontal and/or vertical rotation."*

Allegation 12a: Banerjee, S., *et al., Int. J. Cancer*, **120**, 906-917, (2006) Figures 2C and 3A (**Paper 5**): *"All BCl-xL bands in Figure 2C are either altered (copied and flipped) and/or labeled for other proteins. The top β-actin for Figure 3A with COLO 357 cells is the same image manipulated (flipped and squeezed) and re-used as the β-actin for L36.pl cells in Figure 2C (blue arrow). These duplications and manipulations indicate fabrication or falsification of data."*

Allegation 13: Banerjee, S., *et al., Int. J. Cancer*, **120**, 906-917, (2006) Figures 5 & 6 (**Paper 5**): *"...another reuse of material to represent different experiments, ie, here the Actin and AKT bands are identical. Similarly the Rb control was recycled to represent results in different experiments."*

Allegation 13a: Banerjee, S., *et al., Int. J. Cancer*, **120**, 906-917, (2006) Figures 1C & 5A (**Paper 5**): *"The 3 lanes for β-actin for 3 different cell types (Colo-357, L3.6pl & BxCP-3 cells) in Figure 1C is the same image re-used and manipulated as lanes 1-3 of the β-actin band for PARP in Figure 5A (width*

changed) where the image is labeled for different combinations of Genistein and CDDP in Colo 357 cells. This duplication, manipulation and re-labelling is falsification or fabrication."

Allegation 14: Wang, Z., *et al., J Cell Physiol,* **228**(3), 556-562 (2013) Figure 4 (**Paper 6**):
"... identical band set was rotated horizontally to represent results for two different proteins (EZH2 and E-Cadherin)."

Allegation 15: Soubani, O., *et al., Carcinogenesis*, **33**(8):1563-1771 (2012) Figure 4 (**Paper 7**): PTEN
"...bands appear to have been overlaid/pasted into the far right gel lanes."

Allegation 15a: Soubani, O., *et al., Carcinogenesis*, **33**(8):1563-1771 (2012) Figure 4A (**Paper 7**)
"...middle panels (MIAPaCa-2), both PTEN for B-DIM and CDF show signs of cut and paste. The CDF lane for MT1-MMP is highly cut and pasted. These manipulations suggest fabrication."

Allegation 16: Soubani, O., et al., Carcinogenesis, 33(8):1563-1771 (2012) Figures 5D & 6D (**Paper 7**)
""Figure 5D is composed of multiple cut and pasted squares, and the left-hand band for PTEN appears to be the same as the left-hand band for PTEN in Figure 6D. Fabrication or falsification is indicated."."

Allegation 17: Li, Y., *et al., J Biol Chem*, **282**, 21542-21550, (2007) Figure 3C (**Paper 8**):
"In this case, the four bands shown to represent data obtained from the two distinct cellular fractions (cytoplasmic and nuclear) are obviously identical."

Allegation 18: Ali, S., *et al., Cancer Lett*, **319**, 173-181, (2012) Figures 1 & 3 (**Paper 9**):
"...various bands have been utilized multiply between/among different figures and panels within the Figures."

Allegation 19: Ali, S., *et al., Cancer Lett*, **319**, 173-181, (2012) Figure 5 (**Paper 9**):
"... right-most band representing Ras GTPase activity appears to have been overlaid/pasted to represent data in two different experimental conditions."

Allegation 20: Ali, S., *et al., Cancer Lett*, **319**, 173-181, (2012) Figure 6B (**Paper 9**):
"The cut and pasting of the 'RAS GTPase Activity' band in the right column ("Pre-let-7i + CDF" condition) similar to the original allegation for Figure 5B in this paper."

Allegation 20a: Ali, S., *et al., Cancer Lett*, **319**, 173-181, (2012) Figure 4B **(Paper 9).**
The Inquiry Committee was not convinced there was manipulation in Figure 4B. However, in his November, 2012 response Dr. Sarkar volunteered that the far right blot in the top "RAS GTPase Activity" row was pasted in, similar to Figures 5B and 6B.

Allegation 21: Ali, S., *et al., J Cell Physiol*, **227**, 3373-3380, (2012) Figure 5A (**Paper 10**):
"... bands ... appear to have been overlaid/pasted into the EGFR and K-Ras data sections."

Allegation 21a : Ali, S., *et al., J Cell Physiol*, **227**, 3373-3380, (2012) Figure 5A (**Paper 10**): *"In addition to the cutting and pasting identified in the original allegations, this figure shows evidence of cut and pasted blots in several other rows and columns. Overall, the right and left halves are from different*

gels. Further, these do not appear to be matched in the β-actin band. These all indicate fabrication or falsification."

Allegation 22: Ali, S., *et al., J Cell Physiol*, **227**, 3373-3380, (2012) Figure 6B (**Paper 10**): *"The β-actin appears to be duplicated and manipulated to blur or eliminate edges, indicating falsification."*

Allegation 22a: *"The β-actin band from Figure 6B in **Paper 10** appears to have been duplicated in Figure 6A in Bao, B., et al., Cancer Prev Res **5**:355-364.* (2012) (**Paper 22**):

Allegation 22b: *"The β-actin band from Figure 6B in **Paper 10** appears to have been duplicated in Figure* 5A in Bao, B., *et al., Cancer Res* **72**:335-345 (2012) (**Paper 23**):

Allegation 22c : Prasad, A., *et al., Free Rad Biol Med*, **37**, 1182-1190, (2004) Figure 3 (**Paper 11**): *"... the same two Actin panels obviously were used to represent load controls for different experimental conditions."*
NOTE: This paper may have been published outside the period of investigation.

Allegation 23: Ali, S., *et al., Cancer Res*, **70**, 3606-3617, (2010) Figure 3A (**Paper 12**):
"The apparently blank panels indicated in the rectangular outlines are the same but utilized in four different places to indicate results for quite different protein expression patterns. The putative tropomyosin control bands shown do not match the lane size for the pAkt and other experimental lanes above. Some evidence is noted also suggesting multiple instances of overlaying/pasting of bands into various images of results in several parts of the Figure."

Allegation 23a: Ali, S., *et al., Cancer Res*, **70**, 3606-3617, (2010) Figure 3D (**Paper 12**):
"Indication of cutting and pasting in the middle of the PTEN band suggesting fabrication.

Allegation 24: Ahmad, A., *et al., Breast Cancer Res Treat,* **126**, 15-25, (2011) Figure 3C (**Paper 13**):
"...overlaying/pasting of bands into the Notch-1 and Jagged-1 data lanes..."

Allegation 24a: Ahmad, A., et al., *Breast Cancer Res Treat*, **126**, 15-25, (2011) Figure 3C (**Paper 13**):
"... cutting and pasting which is more extensive than in the original allegation. Most bands in both the Notch-1 and Jagged-1 rows appear to be cut and pasted in. The β-actin band shows only a single cut between the 4th and 5th lanes so does not appear to be from the same gel as Notch-1 or Jagged-1."

Allegation 24b: Ahmad, A., et al., *Breast Cancer Res Treat*, **126**, 15-25, (2011) Figures 3C and 5A (**Paper 13**): *"The β-actin band is cut between lanes 4 & 5, and the 4 right lanes (lanes 5-8) are duplicated and manipulated in Figure 5A. In Figure 3C, the conditions for these 4 lanes are labeled "MDA-MB-468" and "MCF-7" cells, and alternately "V" and "P," whereas in Figure 5A, the 4 lanes are labeled alternately "NS" and "PS" for "MDA-MB-231" and "SUM149" cells (which are the labels on the left side of Figure 3C with different β-actin). This re-labeling is fabrication."*

Allegation 25: Ahmad, A., et al., Breast Cancer Res Treat, **126,** 15-25, (2011) Figures 4A & 4B (**Paper 13**): *"... the center two EMS columns appear to be the same as the left columns in Figure 4B, indicating falsification."*

Allegation 26: Ali, S., *et al., Am J Trans Res*, **3**, 28-47, (2011) Figure 5C (**Paper 14**): *"... bands have been overlaid/pasted into the E-Cadherin, Vimentin, FEN-1, and PTEN results panels."*

Allegation 26a: Ali, S., *et al., Am J Trans Res*, **3**, 28-47, (2011) Figure 5C (**Paper 14**): *"Additional cut and pasting of images in seen in many lanes of most proteins; specifically, Vimentin lanes 4, 5 & 6, FEN-1 lane1 & 5, PTEN lane 6, PDCD4 lane 4, and Maspin lanes 1 to 6. Also, E-Cadherin lanes 4-7, Vimentin lanes 1-3, as well as lane 7 for PTEN, PDCD4, Maspin & TMP-1, all appear to have been blurred out/masked. The β-actin band which is not cut and pasted, therefore, cannot be correct because of all the cut and pasting for other proteins, and also because there are 8 lanes, not 7 as in all other bands. This figure appears fabricated."*

Allegation 27: Kong, D., *et al., Am J Trans Res*, **4**, 14-23, (2012) Figure 4B (**Paper 15**): *"...bands in PSA (center panel) and in GAPDH (two left lanes in lower panel) were overlaid/pasted ..."*

Allegation 28a: Banerjee, S., *et al., Int. J. Cancer*, **128**, 1240-1250, (2010) Figure 2B (**Paper 16**): *"This Allegation indicates that one of the panels in the "b" segment has been altered to include an empty space between the upper and lower bands. Further, in the panel indicated by the complainant as number 3, the width of the lower band is not consistent with the width of the upper band in the same lane, suggesting manipulation of the Figure."*

Allegation 28b: Banerjee, S., *et al., Int. J. Cancer*, **128**, 1240-1250, (2010) (**Paper 16**) Figure 2B – PARP cleaved and Bcl-2 bands under the MiaPaCa-2 panel on the left appear to be pasted in; edges of another background are visible.

Allegation 28c: Banerjee, S., *et al., Int. J. Cancer*, **128**, 1240-1250, (2010) (**Paper 16**) Figure 2B – The image used for the ABC-G2 row of bands under the MiaCaPa-2 cells panel on the left is the same image as the Bcl-xL bands under Panc-1 cells panel on the right, but stretched horizontally, squeezed vertically, and labeled differently (i.e., both different cells and different protein).

Allegation 28d: Banerjee, S., et al., Int. J. Cancer, 128, 1240-1250, (2010) (**Paper 16**) Figure 2B and Figure 5D – The images labeled Survivin bands under MiaPaCa-2 cells in Figure 2B appear to be the same images used in lanes 1-4 of Survivin in Figure 5D (squeezed horizontally) with different labels. The bands in Figure 2B are labeled as being from the "MiaCaPa-2" cell line, while what appears to be those same images duplicated in Figure 5D are labeled as from "Pancreatic tumors at autopsy."

Allegation 28e: Banerjee, S., et al., Int. J. Cancer, 128, 1240-1250, (2010) (**Paper 16**) Figure 2B –The labels for the c-IAP (pan), XIAP, Survivin and β-actin bands under Panc-1 cells panel on the right may not match the labels in original images. This is based on comparisons to labels on what appear to be matching images for these bands on original films of Western blots found on Dr. Sarkar's computers. That is, the XIAP image appears to be the same as a blot labeled "Survivin;" the Survivin blot image appears to be the same as a band labeled "Anti-Puma;" the c-IAP (pan) row appears to be the same

as an image labeled β-actin in one place and "NOXA" in another. Also, lane 1 in the row labeled "Survivin" in the publication has been cut and rotated, and in the β-actin band under Panc-1 cells, lane 5 appears to be pasted in.

Allegation 29: Banerjee, S., *et al., Int. J. Cancer*, **128**, 1240-1250, (2010) Figure 3A (**Paper 16**): *"Additionally, it is alleged that the same Rb image has been used as control in two different experimental contexts."*

Allegation 30: Ali, S., *et al., J Cellul Biochem*, **110**, 171-181, (2010) Figure 2 (**Paper 17**): *"... bands .. appear to have been overlaid/pasted onto the data set for COX-2 and EGFR."*

Allegation 31: Ali, S., *et al., J Cellul Biochem*, **110**, 171-181, (2010) Figure 6A (**Paper 17**): *"...the same data* [images] *has been used to represent results from different experimental conditions." (Specifically lanes 3 and 9 are identical.)*

Allegation 32 : Ali, S., *et al., J Cellul Biochem*, **110**, 171-181, (2010) Figure 6C (**Paper 17**): *"...bands have been overlaid/pasted into the data sets for EGFR and pEGFR. Further, the band width in some instances is not congruent among the data panels ..."*

Allegation 33: Ali, S., *et al., J Cellul Biochem*, **110**, 171-181, (2010) Figure 4 (**Paper 17**): *"cutting and pasting and blurring out of images throughout all rows in all 3 panels in Figure 4, but most obviously in the 4 right lanes, and in the COX-2 and NF-κB rows, suggesting data manipulation that is falsification and/or fabrication."*

Allegation 34: Banerjee, S., *et al., Cancer Res*, **69**, 5592-5600, (2009) Figure 2B (**Paper 18**): *"...the same image obviously has been used to represent the results of two different drug treatments."*

Allegation 34a: Banerjee, S., *et al., Cancer Res*, **69**, 5592-5600, (2009) Figure 4C (**Paper 18**): *"Made to appear as one gel but cells are spliced together."*
NOTE: This figure also used in **PROGRESS REPORT: 5R01CA131151-2** (File: 2009, 04 10 - Sarkar Proposal 09071199.pdf): see Allegation **106**, Figure 10C.

Allegation 35: Wang, Z., *et al., Cancer Res*, **67**, 8293-8300, (2007a) Figures 1D and 4C (**Paper 19**): *"This Allegation indicates the possibility of multiple alterations to the Figure. In several areas of the Figure, the complainant indicates bands that appear to have been overlaid/pasted onto the various data sets."*

Allegation 35a: Wang, Z., *et al., Cancer Res*, **67**, 8293-8300, (2007a) Figure 4C (**Paper 19**): *"... blots are cut and pasted for the cell types for most rows, and do not match up with the β-actin band which is not cut/pasted. The CDK2 blots are cut and pasted for the cell types for most rows. All this indicates falsification and/or fabrication."*

Allegation 36: Wang, Z., *et al., Cancer Res*, **67**, 8293-8300, (2007a) Figure 6C (**Paper 19**): *"Again, identical images have been used to represent experimental results given by different cell types."*

Allegation 37: Wang, Z., *et al., Cancer Res*, **67**, 8293-8300, (2007a) Figure 1D (**Paper 19**): *"For BxPC-3/HPAC/PANC-1, lanes 2, 4 & 6 from the left (FoxM1), labeled "FS", are blurred out, indicating falsification, and PANC-1 CP in FoxM1 is pasted in, indicating falsification and/or fabrication."*
NOTE: β-actin for the lower panel in Figure 1D is the same image (stretched) labeled as "Rb" in Figure 3A (**Paper 3**); compare Allegation **82b** below. There is also evidence of duplicate use of Rb and/or β-actin in this paper (**Paper 19**; see below).

Allegation 38: Wang, Z., *et al., Cancer Res*, **67**, 8293-8300, (2007a) Figure 5B (**Paper 19**): *"... 'FS' columns appear blurred out or pasted over for the MMP-9 and uPAR rows. Again, matching cuts/pastes are not seen in β-actin bands ... for all figures, the 'cuts' are not seen in the β-actin bands indicating that they are not the loading controls for these proteins."*

Allegation 38a: Wang, Z., *et al., Cancer Res*, **67**, 8293-8300, (2007a) Figure 5B (**Paper 19**): *"The image in the uPAR row, with column headings "CS" and "FS", is duplicated in Wang, Z., et al., Mol Cancer Ther 5(3):483–93 (2006) Figure 5 (**Reference #277**) but labeled Cyclin-D1 with different column headings ("CS" and "NS"). This duplication and different re-labeling is fabrication of data."*

Allegation 39: Li, Y., *et al., Cancer Prev Res*, **4**, 1495-1506, (2011) Figures 3A & 3C (**Paper 20**): *"... the indicated images are identical but are used to represent different experimental conditions."*

Allegation 40: Bao, B., *et al., J Cellul Biochem*, **112**, 2296-2306 (2011) Figure 1C (**Paper 21**): *"... the Vimentin band has been overlaid/pasted into the Figure."*

Allegation 41: Bao, B., *et al., J Cellul Biochem*, **112**, 2296-2306 (2011) Figures 1C & 4C (**Paper 21**): *"Most of the bands in Figure 4C with lanes 4-6 labeled "Fox-M1" are duplicated as Figure 3C in **Reference #107** but with columns 4-6 labeled "Notch-1". Only the top half of the CD44 band in Figure 4C is copied to Figure 3C in **Reference #107**. Several bands appear to be cut and pasted from different lanes but the bands for β-actins in Figure 4C do not show cuts. These duplications and relabeling indicate falsification and/or fabrication of data."*

Allegation 42: Bao, B., *et al., J Cellul Biochem*, **112**, 2296-2306 (2011) Figure 4C (**Paper 21**): *"... several bands from the right portion of the Cyclin D1 and P65 panels are identical, and that all EpCAM bands are identical to those in the P65 panel but with lighter exposure."*

Allegation 43: Bao, B., *et al., Cancer Prev Res*, **5**, 355-364, (2012) Figure 6A (**Paper 22**): Bao, B., *et al., Cancer Res*, **72**, 335-345, (2012) Figure 5A (originally misstated as "4A") (**Paper 23**): *"...the same data has been utilized in two different papers, suggesting recycling of data. The β-actin load control data has been rotated horizontally between the two figures."*

Allegation 44: Ahmad, A., *et al., J Cell Biochem*, **108**, 916-925 (2009) Figures 5A & 5C (**Paper 24**): *"...the same image was used to represent experimental results in two different papers for two different cell lines."*

Allegation 45: Xia, J., *et al., Intern. J., Molecular Sci*, **13**, 9627-9641 (2012) Figure 5D (**Paper 25**) *"In Figure 5D, lanes 1 - 4 for the Notch1 and NFkB lanes are the same image duplicated, perhaps with*

slightly different exposures, but labeled for the different proteins. The 3 left lanes for the Notch1 and NFkb bands (labeled as Control, siRNA Control & Notch1 siRNA) are duplicated and shifted to be the 3 right lanes for the Bcl-2 band, and labeled "siRNA Control, Notch1 siRNA, and siRNA+As2O3", respectively. This duplication and re-labelling constitute fabrication and/or falsification of data."

Allegation 46: Singh-Gupta, V., *et al., Cancer Letters*, **318**, 86-92 (2012) Figure 3B (**Paper 26**) *"The Allegation indicates that the B-DIM and B-BIM+Rad panels are the same. The Investigation Committee determined that there is sufficient evidence that parts of the panels for the B-DIM and B-BIM+Rad condition appear to be from the same photomicrographic image and just cropped differently.*
NOTE: It is not clear if this research was conducted at WSU or not.

Allegation 47: Bao, B., *et al.,* Cancer Letters **307(1)**: 26–36 (2011) Figures 1B & 3C (**Reference #107**): *In Figures 1B and 3C the β-actin bands are clearly not from the same gel since they do not have the cuts and spacing as the other proteins, suggesting fabrication."*

Allegation 48: Bao, B., *et al., Cancer Letters **307(1)**: 26–36* (2011) Figures 2B (**Reference #107**): *"The β-actin band appear to be not from the same gel as the other bands, and the ZEB1 band looks cut and pasted, suggesting fabrication."*

Allegation 49: Maitah, et al., PLoS ONE **6 (1):** e16068 (2011) Figures 1C, 3D & 5D (**Reference #118**): *"There is cutting and pasting in these figures and an apparent mis-match between β-actin loading control lanes and the protein bands. β-actin does not appear to be from the same gels."*

Allegation 50: Kanwar et al., Pharm Res **28**:827-838 (2011) Figure 6A (**Reference #120**) *"The far right lane of the top bands is pasted in suggesting fabrication"*

Allegation 51: Banerjee, S., et al., Pharm Res **27:** 1146–1158 (2010) Figure 5A (**Reference #149**) *"There is reason to believe that that image is manipulated by stretching, rotating, flipping and/or pasting in of images, that alter presentation of Western blot data for Caspace-3, PARP and Bcl-2 bands."*
NOTE: This altered image was also included in Patent Application WO 2011/126544 A2 (see **Allegation 108**).

Allegation 52: Majunder, et al., Nutrition and Cancer, **61**(4), 544–553 (2009) Figure 3 (**Reference #177**) *"There are many rows and/or cells that were all cut and pasted and/or cropped (esp., β-actin). This manipulation indicates fabrication and/or falsification.""*

Allegation 53: Majunder, et al., Nutrition and Cancer, **61**(4), 544–553 (2009) Figures 4A & 4B (**Reference #177**) *"The bands are highly pixilated and suggested substantial manipulation by being enlarged, stretched and cropped, and thereby suggesting falsification."*

Allegation 54: Ali, S., et al., Life Sciences **84** 766–771 (2009) Figures 1 & 3 (**Reference #193**) *"Figures 1 and 3 both appear to be cut and pasted throughout, and/or manipulated in some bands. The cytosol PKC-ε band in Figure 1 appears stretched out vertically. Lanes 3 and 5 in the cytosol PKC-ε*

band in Figure 1 are duplicated (and squeezed vertically) in lanes 2 and 3 in the cytosol PKC-ε band of Figure 3. Those duplications are not seen in the β-actin bands. These duplications and manipulations indicate fabrication and/or falsification."

There is no Allegation 55.

Allegation 56: Gadgeel, S.M., et al., Cancer **115:**2165–76 (2009) Figures 4A, 4B & 4C **(Reference #196)** *"In Figure 4A, the Gef+Gen cell for Cox-2 appears to be pasted in and in Figure 4B, the right 2 lanes (Gen 25uM & Erl+Gen conditions) for COX-2 and EGFR appear to be pasted in. In Figure 4C, the whole pAkt row appears to be uniformly blurred out or masked, and when enlarged the β-actin row has white "halos" in blots in all lanes that suggest manipulation. These manipulations indicate fabrication of data."*

Allegation 57: Li, Y., et al., J Biological Chem **283(41)** 27707–27716 (2008) Figure 1 **(Reference #213)** *"There are multiple panels in Figure 1 (A, B, C [bottom part], D & F). Each appears to have multiple instances of cutting and pasting throughout, especially "Isoflavone" columns in 1A, 1B, 1F, as well as cropping (β-actin bands), blurring out/masking of specific blots, especially in Figure 1B, certain "Nuclear" pFOXO3a(Ser253) & AR bands. These manipulations raise concerns of fabrication or falsification."*

Allegation 58 : Li, Y., et al., J Biological Chem **283(41)** 27707–27716 (2008) Figure 2B **(Reference #213)** *"There are multiple instances of what appear to be pasting over or blocking out/masking of images, especially in the "No / Isoflavone +" column for the Akt and p-Akt(Ser473) rows, the "Emp Vector / Isoflavone +" "column for the p-Akt(Ser473) row, and all 4 "Isoflavone +" columns in the p-AR(Ser213) row.*

Allegation 59: Ali, S., et al., Mol Cancer Ther **7**, 1708-1719 (2008) Figure 3 **(Reference #217)** *"There are cuts and pastes throughout; blurring/masking of some cells, especially across most or all columns for EGFR, pEGFR and cleaved PARP proteins under the MiAPaCa cells, and the first column of PARP and last column of EGFR for BxPC-3 cells, all that indicate fabrication and/or falsification."*
NOTE: The left part of Figure 3 (BxPC-3 cells) in **Reference #217** is also used as Figure 18 in **APPLICATION: 1 R01 CA131151-01** (File: 2007, 02 01 – Sarkar Proposal 14114-001.pdf.

Allegation 60: Ali, S., et al., Mol Cancer Ther **7**, 1708-1719 (2008) Figure 5A **(Reference #217)** *"There is cutting and pasting in every other column (e.g., control, B-DIM, Er, celocoxib, ...) in the BxPC-3 cell blots for the N NFκB and cyto NFκB lanes, suggesting fabrication."*

Allegation 61: Wang, Z., et al., Mol Cancer Ther **7(2):** 341–349 (2008) Figure 3B **(Reference #226)** *"The DMSO-treated p27 lanes look like the 3 right columns were blurred out/masked."*

Allegation 62: Wang, Z., et al., Mol Cancer Ther **7(2):** 341–349 (2008) Figure 4B **(Reference #226)** *In Figure 4B, there appears to be cut and pasting in every other column in the MEK row. In the MEK row, lanes 1-4 are the same images as in lanes 6-10 (flipped horizontal – see blue boxes). Also, in all the cytosol fraction columns ("C"), the Rb row in has been blurred out/masked" suggesting falsification."*

Allegation 62b: Wang, Z., et al., Mol Cancer Ther **7(2):** 341–349 (2008) Figure 2B (**Reference #226**) *"The images used in the P-Akt, Akt, and Actin bands, and the first 2 lanes of the P27 band, appear to be duplicates of the same image. This indicates falsification or fabrication of data."*

Allegation 63: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007) Figures 2C (**Reference #231**) *"Several blot images appear to have been cut and pasted and/or blurred out/masked for the PDGF-D bands: (top panels) the MIA PaCa and PANC-1 lanes (lanes 6 & 7); (middle panel) the "PS" lanes for the BxPC-3, Colo-357 and MIA PaCa cells (lanes 2, 4 & 6); (bottom panels) the "CP" lane for the MIA PaCa cells (lane 5). These manipulation indicate fabrication or falsification."*
NOTE: There is duplicate use of Rb and/or β-actin bands in this paper (see below).

Allegation 64: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007) Figures 4A (**Reference #231**) *In Figure 4A: the upper Notch-1 band is duplicated and relabeled BCl-2 in . In the lower panel of Figure 4A, apparent manipulations of BXPC-3/MIA PaCa cells for the bottom Notch-1 bands include being stretched and pasted over different background. Notch 1 is BCl-2 in* ***Allegation 74.***

Allegation 65: Gadgeel, S.M., et al., Cancer **110**: 2775–84 (2007) Figure 1A (**Reference #234**) *"Several Western blot lanes appear to be "smudged out" or masked. Specifically, for the COX2, P-STAT-3 and p-Aky bands, the lanes in the (left) H1650 column; and for the pEGFR and P-STAT-3 bands in (middle) H1781 cells. These manipulations indicate falsification of data."*

Allegation 66: Gadgeel, S.M., et al., Cancer **110**: 2775–84 (2007) Figures 5A & 5B (**Reference #234**) *"In Figure 5A & 5B, several lanes for both H1650 and H3255 appear to have images that are pasted over/masked or blurred. Specifically, in the H3255 cells (top panels), the right lanes of the pEGFR bands appear blurred. In the Akt band in Figure 5B (left panels), lane 4 (Gef+Cel column) appears to be masked over. In the lower H1650 panels, the COX-2 and pAkt bands on both Figure 5A and 5B, all lanes appear to be masked over. These manipulations indicate falsification."*

Allegation 67: Banerjee, S., et al., Cancer Res **67(8):**3818–26 (2007) Figure 4D (**Reference #244**) *"The Bcl-xL, Bcl-2 & Bax & Survivin bands are covered up and blurred with masking boxes; For PARP, the first lane ("-/-" condition) showing the cleaved fraction ('85kDa'), was covered up with some kind of overlay/masking. The Survivin band is squeezed together more than the others and the 4th lane of Survivin ('+/+" condition) appears blurred over. These manipulations indicate falsification and/or fabrication".*

Allegation 68: Raffoul, J., et al., Cancer Res 67(5): 2141-2149 (2007) Figures 2D & 4D **(Reference #247)** *"The image for the Rb band used in Figure 2D as a 'nuclear protein loading control' for a Western blot analysis of APE1/Ref-1 in PC-3 cells, is the same image used in Figure 4D for Rb used as "an internal loading control" for nuclear extracts "... subjected to EMSA for evaluation of NF-κB DNA-binding activity... The duplication of the Rb image from different gels for Figures 2D and/or 4D indicates that the ratios could not have been properly generated. This indicates data fabrication or falsification." "*
NOTE: See also other Rb band duplications in Allegations **83a, 83b** and **83c.**

Allegation 69: Raffoul, J., et al., Cancer Res 67(5): 2141-2149 (2007) Figures 5C & 5D **(Reference #247)** *"The image for the Rb band used in Figure 5C as a 'nuclear protein loading control' for a Western blot analysis of APE1/Ref-1 in PC-3 primary prostate tumors, is the same image used in Figure 5D for Rb used as "an internal loading control" for nuclear extracts "... subjected to EMSA for evaluation of NF-κB DNA-binding activity. The duplication of the Rb image from different gels for Figures 5C and/or 5D indicates that the ratios could not have been properly generated. This indicates data fabrication or falsification."*

Allegation 70: El-Rayes, B.F., et al., Cancer Res **66:**10553-10559 (2006). Figure 2A **(Reference #258)** *"Cutting, pasting, altering and masking appears several lanes, specifically survivin lanes 5,6 & 7; Bcl-xL lanes 4, 5, 6 & 7, several lanes in Her-2-neu and β-actin, and Cox-2 lane 5. Several other lanes appear to have been removed or blocked out, specifically Bcl-2 lanes 1, 3 & 4, HER-2 lanes 3 & 4, COX-2 lanes 1 & 3, EGFR(170 kDa) lanes 3, 4 & 7, PhosphoAkt lanes 2, 4 & 6. These manipulations indicate falsification and/or fabrication of data."*

Allegation 71a: El-Rayes, B.F., et al., Cancer Res **66:**10553-10559 (2006). Figures 5A, 5C & 5E **(Reference #258)**: *"In Figure 5A, cutting, pasting and/or copying in EGFR(170 kDa) lane 4, and for EGFR-p-Tyr the 4th lane which also appears to be the same as the 3rd lane at a different exposure. In Figure 5C, lane 4 for EGFR-p-Tyr appears to be pasted. In Figure 5E, the EGFR(170 kDa) and EGFR-p-Tyr rows appear completely blurred out/masked, which is a falsification of data."*

Allegation 71b: El-Rayes, B.F., et al., Cancer Res **66**:10553-10559 (2006). Figures 5B & 5D **(Reference #258)** *"The Rb in Figure 5D is the same image as the β-actin line of Figure 5C (squeezed vertical, squeezed horizontal, background lightened) in Barve, V., et al., J. Med. Chem 49, 3800-3808 (2006) **(Reference #267)**. This duplication and re-labeling constitutes falsification or fabrication of data."*

Allegation 71c: El-Rayes, B.F., et al., Cancer Res **66**:10553-10559 (2006). Figures *5B, 5D & 5F* **(Reference #258)** *Parts of Figures 5B, 5D & 5F, as in Allegation **71b** but with different Rb bands were used in Figure 5 in **Progress Report** for **5R01CA101870-5** (File Name 2007, 03 22 - Sarkar Proposal 07060904.pdf). These manipulations indicate falsification or fabrication of data."*

Allegation **72**: Zhang, Y., et al., Inter. J. Cancer 119: 2071-2077 (2006) Figure 1C **(Reference #263)** *"The Notch-2 row image in Figure 1C is labeled as Notch- 1 (flipped horizontal) in Figure 3B in Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006) **(Reference #278)**. This duplication and re-labeling of an image is fabrication of data."*

Allegation 73: Zhang, Y., et al., Inter. J. Cancer 119: 2071-2077 (2006) Figure 4D **(Reference #263)** *"Histone H1 lane 1 ('CS' condition) is pasted in, suggesting falsification."*

Allegation 74: Wang, Z., et al., Mol Cancer Ther 5(3):483–93 (2006) Figure 5 **(Reference #277)** *"CDK2 lanes 5 & 6 are pasted in and Bcl-2 lanes 5 & 6 are smudged, removed or masked. Also, lanes 1-4 of p27 are used to create VEGF line in Figure 4B in Allegation **75** **(Reference #278)**. The Cyclin-D1 and Bcl-X_L bands are duplicated and re-labeled as Hes-1 and Cyclin-D1, respectively, in Figure 2C of **Paper 3**."*

NOTE: See also duplication in Allegation **79** regarding Figure 7B in **Reference #284**.

NOTE: See also duplication in Allegation **64** regarding Figure 4A in **Reference #231**.

NOTE: See also duplication in Allegation **5a** regarding Figure 2C in **Paper 3**.
NOTE: See also duplication in Allegation **38a** regarding Figure 5B in **Paper 19**.

Allegation 75: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) Figures 3B, 4B & 5A (**Reference #278**) *"Figure 4B lanes 2 & 4 of the VEGF row are the same VEGF row in Figure 5A (stretched and flipped horizontal and re-labeled).*
Figure 5A MMP-9 lanes are duplicated in lanes 2 & 4 of MMP-9 in Figure 3B (flipped horizontal).
Figure 5A, left β-actin lanes for MMP-9 are duplicated as β-actin lanes 2 & 3 for Figure 4B.
Figure 5A, 2 right β-actin lanes for VEGF are duplicated as the β-actin lanes for Figure 1C.
*"Figure 3B, the 2 right β-actin lanes (in columns labeled "CP" & "NP") are duplicated in Figure 1C in Zhang, Y., et al., (2006) **(Reference #263)** in columns labeled "CS" and "JS". (See Allegation **89b**).*
*"Figure 3B, the 2 right Notch-1 lanes (in columns labeled "CP" & "NP") are duplicated in Figure 1C in Zhang, Y., et al., (2006) **(Reference #263)**, flipped and re-labeled as Notch-2, in columns labeled "CS" and "JS". These duplications and re-labeling indicate data fabrication and/or falsification."*
NOTE: See also Allegations **72**, **74** & **131**.

Allegation 76: Mohammad, R.M, et al., Cancer **106**:1260–8 (2006). Figure 2B **(Reference #280)** *"Lane 4 of the $Bclx_L$ lane is same as lane 3 (but flipped horizontal and faded). This duplication is fabrication of data."*
NOTE: See also duplications of Notch-1, Rb and β-actin below.
NOTE: See also Allegation **79a**.

Allegation 77: Zhang, Y., et al., Cancer Res **66(2):** 1025-1032 (2006) Figure 2D (**Reference #282**): *"HPAC/pEGFR lanes 7 & 8 are pasted in suggesting data fabrication and/or falsification."*

Allegation 77a: Zhang, Y., et al., Cancer Res **66(2):** 1025-1032 (2006) Figure 1B (**Reference #282**): *"In Figure 1B, lanes 4 and 6, the "T" condition, of the pEGFR(Y1173) panel appear to be the same image, indicating fabrication by re-use/re-labeling of an image for different cell lines."*

Allegation 78: Zhang, Y., et al., Cancer Res **66(2):** 1025-1032 (2006) Figure 3A & 3B (**Reference #282**): *"In Figure 3A, the BxPC-3 row, pHER2 lanes 4 & 5 appear blurred out, and in Figure 3B, in the BxPC-3 top row, lanes 2 & 5 appear to be pasted in. These manipulations indicate data falsification and/or fabrication."*
NOTE: Other duplicate uses of Rb and/or β-actin in this paper are listed below.
NOTE: Regarding Zhang, Y., et al., Cancer Res 66(2): 1025-1032 (2006) (**Reference #282**): The complainant did not specify allegations, but upon examination of these images, the Committee had no specific concerns:
Figure 1B, comparing lanes 3 and 5 of the pEGFR(Y1173) panel.
Figure 3C, comparing pHER3 panel lanes 2 and 5.
Figure 3C, comparing β-actin band lanes 4 and 9.

Allegation 79: Wang, Z., et al., Int. J. Cancer **118,** 1930–1936 (2006e) Figure 3C (**Reference #284**): *"In Figure 3C, lanes for Hes-1 and Bcl-xL are pasted in. At 72 hours, the 4th lanes of Hes-1 and Cyclin D1 appears removed, smudged or lightened. Figure 3C re-appears in a different configuration as Figure 7B in **Reference #277** with Hes-1 labeled as Cyclin D_1 and Cyclin-D1 labeled Hes-1. In Figure 3C, three*

proteins are matched to one β-actin band. The same β-actin is matched with Cyclin-D1 in Figure 7B in ***Reference #277****, but different β-actin bands are used for Bcl-xL and Hes-1 rows in* ***Reference #277****." NOTE: See Allegation* ***80a*** *regarding re-use of lanes 2 & 3 from Bcl-xL in Figure 3C as Notch-1. See also other duplications of Rb and β-actin below.*

Allegation 79a: Wang, Z., et al., Int. J. Cancer **118,** 1930–1936 (2006e) Figure 3C (**Reference #284**): *"In Figure 6B, the images in the two lanes for IκBα with columns labeled "CS" ("control siRNA") and "NS" ("Notch-1 siRNA") are identical to the images in lanes 1 and 2 of the Bcl-xL band in Figure 3B in Mohammad, R.M, et al., Cancer* ***106****:1260–8 (2006) (****Reference #280****) where the columns are labeled 0 and 10 μM Genistein. This duplication and re-labeling of the images indicates fabrication of data."*

Allegation 80a: Wang, Z., et al., Cancer Res, **66**, 7653-7660, (2006a) (**Paper 3**): Figure 5C - *Notch-1 image was re-used, manipulated, and/or re-named. "Labeled Bcl-2 (compared to Figure 3B in* ***Reference #280*** *and Figure 5A in* Reference #284*. (Lanes 1 & 2 and lanes 3 & 4 are switched). The Caption notes treatment with '5 μg/mL ERRP'."*

Allegation 80b: Wang, Z., et al., Cancer Res, 66, 7653-7660, (2006a) (**Paper 3**): Figure 6 - Notch-1 image was re-used, manipulated, and/or re-named. *"Labeled MMP-9; Compare to Figure 3B in* ***Reference #280*** *(lanes 1 & 2 are flipped horizontal; lane 3 is flipped horizontal and used twice as both lane 3 and lane 4)."*

Allegation 80c: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) (**Reference #277**) Notch-1 image was re-used, manipulated, and/or re-named. Figure 9A as Notch-1 - *(squeezed vertically) Caption notes treatment with '25μMol/L of genistein'."*

Allegation 80d: Wang, Z., et al., International J. Cancer 118, 1930–1936 (2006e) (**Reference #284**) Notch-1 image was re-used, manipulated, and/or re-named. Figure 5A as Notch-1 - (stretched)

Allegation 80e: Wang, Z., et al., International J. Cancer 118, 1930–1936 (2006e) (**Reference #284**) The Bcl-xL image in Figure 3C is a duplication of a different image labeled as Notch-1 in Figure 5A from **Paper 3** (Wang, Z., et al., Cancer Res, 66, 7653-7660, 2006a).

Allegation 80f: Mohammad, R.M, et al., Cancer **106**:1260–8 (2006) (**Reference #280**) Figure 3B, *here labeled Bcl-2 (compared to Reference #284, lanes 1&2 are switch with lanes 3&4; stretched)*

Allegation 80g: **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf) The Bcl-XL image in the upper right panel of Figure 4B in this NIH grant proposal appears to be same image used in both Figure 3C in **Reference #284** and labeled as Bcl-xL and in Figure 5A in **Paper 3** where it is labeled Notch-1. Also, the β-actin bands used in Figure 4B appear to be different from the β-actin bands used Figure 3C in **Reference #284** and in Figure 5A in **Paper 3.**

Allegation 81a: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) Notch-1 image was re-used, manipulated, and/or re-named in Figure 4A – as Notch-1

Allegation 81b: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) **(Reference #277)** Notch-1 image was re-used, manipulated, and/or re-named Figure 8A as Notch-1 (upper group) – *"Lanes 3 is the same as lane 2 in Figure 4A from Wang, Z., et al., International J. Cancer **118, 1930–1936 (2006e) (Reference #284).***

Allegation 81c: In Figure 1D in Reference #277, the band labeled "Notch-1" (upper group) has *several lanes are the same as in Figure 4A from **Reference #284**: Lane 1 is lane 1; Lane 2 is lane 3; Lane 3 is duplicated in Lanes 2, 4 &5; Lane 4 is lane 6."*

Allegation 81d: In Figure 1D in Reference #277 the band labeled "Notch-1" (lower group) has *several lanes that are the same as in Figure 4A **Reference #284**: Lanes 1 & 2 are flipped horizontal and switched; Lane 3 is lanes 3 & 5 (5 is flipped horizontal); Lane 1 is repeated as lane 6. Lane 4 (flipped horizontal) is repeated in lane 1 in Figure 8A)".*

Allegation 81e: Figure 1D in **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf), *Same as Allegations **81b** and **81c** (immediately above)*

Allegation 81f: Figure 5 (upper group) in **APPLICATION: 1 R01 CA120008-01** (File: 2005, 05 20 – Sarkar Proposal 05083189.pdf)

Allegation 81g: Figure 5 (lower group) in **APPLICATION: 1 R01 CA120008-01** (File: 2005, 05 20 – Sarkar Proposal 05083189.pdf) *"Compared to Figure 1D in **Reference #277**, lanes 1 & 2 are switched with 3 & 4 (flipped horizontal); lanes 5 & 6 are lanes 4 & 5 (flipped horizontal)."*

Allegation 81h: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) **(Reference #278)** Figure 3B as Notch -1 "Lanes 1 and 2 are the same as lane 3 from *Wang, Z., et al., International J. Cancer **118, 1930–1936 (2006e) (Reference #284).*** (width increased)."

Allegation 81i: In Figure 1B from Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) **(Reference #277)**, the Notch-1 bands are appear to be a duplication, squeezed horizontally, of lanes 1-3 in the Notch-1 row in Figure 4A from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)**.

Allegation 81j: In Figure 6B from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)**, the IKKα bands at top labeled 'CS' and 'NS' appear to be a duplication, stretched vertically, of lanes 3 & 4 in the Notch-1 row in Figure 4A from the same paper. In contrast to the 'CS' and 'NS' labels in Figure 6B, the caption of Figure 4A says that lanes 3 & 4 are "(3) Notch-1 siRNA and (4) Notch-1 siRNA plus 25μM genistein".

Allegation 81k: In Figure 2B in Wang, Z., *et al., Cancer Res* 66(5): 2778-84 (2006d) **(Reference #278)** the images for the bands in lanes 3 and 4 from the Notch-1 row, labeled 'CP' and 'NP', appear to be duplicated, enlarged, flipped horizontally and labeled as Notch-2 in Figure 1C of Zhang, Y., et al., International J. Cancer 119: 2071-2077 (2006a) **(Reference #263)**, and labeled 'CS' and 'JS'.

Allegation 82a: *Wang, Z., et al., Cancer Res,* **66**, 7653-7660, (2006a) (**Paper 3**): A single 6- and/or 7-lane Rb image was re-used, manipulated, and/or re-named in Figure 3A.

Allegation 82b: *Wang, Z., et al., Cancer Res **67:** 8293-8300 (2007b) (**Paper 19**): A* 6-lane Rb image was re-used, manipulated (stretched), and/or re-named as *β-actin (bottom group) in Figure 1D.*

Allegation 82c: *Raffoul, J., et al., Cancer Res **67(5)**: 2141-2149 (2007)* (**Reference #247**) A single 6- and/or 7-lane Rb image was re-used, manipulated, and/or re-named in Figure 2D.

Allegation 82d: Raffoul, J., et al., *Cancer Res **67(5)***: 2141-2149 (2007) (**Reference #247**) A single 6- and/or 7-lane Rb image was re-used, manipulated, and/or re-named in Figure 4D.

Allegation 82e: *Wang, Z., et al., Cancer Res **67**:*11377-11385 (2007b) (**Reference #231**)
Figure 5A

Allegation 82f: Wang, Z., et al., *Int J Cancer*. **123**(4):958-966 (2008). (**Paper 32**)
Figure1D (left) – *7-lane version*

Allegation 82g: Wang, Z., et al., *Int J Cancer*. 123(4):958-966 (2008). (**Paper 32**) Figure 6C – *a 4-lane version (squeezed horizontal) and composed of pieces of the 6-lane version: lanes 1 through 4 in Figure 6C are the same images as lanes 3, 5, 1 & 2, respectively, in the 6-lane version.*

Allegation 82h: Wang, Z., et al., *Int J Cancer*. 123(4):958-966 (2008). (**Paper 32**) Figure 3A left side of double-panel for BxPC-3 – *a 3-lane version (squeezed horizontal) composed of lanes 2, 3 & 4 of the 6-lane version.*

Allegation 82i: Wang, Z., et al., *Int J Cancer*. 123(4):958-966 (2008). (**Paper 32**) Figure 3A right side of double-panel for BxPC-3 – *a 3-lane version (squeezed horizontal) where lane 1 is now lane 3; lane 1 of this right panel is lane 5 and lane 2 is lane 1)*

Allegation 83a: Raffoul, J., et al., Cancer Res **67(5)**: 2141-2149 (2007) (**Reference #247**) *Rb image was re-used (and manipulated)* Figure 2A & 2B (flipped)

Allegation 83b: Raffoul, J., et al., Cancer Res **67(5)**: 2141-2149 (2007) (**Reference #247**) *Rb image was re-used (and manipulated)* Figure 4A (Soy squeezed horizontally slightly)

Allegation 83c: Raffoul, J., et al., Cancer Res **67(5)**: 2141-2149 (2007) (**Reference #247**) *Rb image was re-used (and manipulated)* Figure 4B (Soy copied; Genistein flipped, stretched and straightened)

Allegation 83d: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference # 272**) Figure 4A and 4B Rb image was re-used

Allegation 83e: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference # 272**) Figure 5D Rb image was re-used

Allegation 83f: Wang, Z., et al., Cancer **106**:2503–13 (2006b) **(Reference # 272)** Figure 6D Rb image was re-used

Allegation 83g: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) **(Reference #277)** Figure 6A and 6B, the 4-lane Rb image was re-used

Allegation 83h: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) **(Reference #277)** Figure 7E, the 4-lane Rb image was re-used (stretched)

Allegation 83i: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) **(Reference #277)** Figure 8D, the 4-lane Rb image was re-used (stretched)

Allegation 83j: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) **(Reference #277)** Figure 9E, the 4-lane Rb image was re-used (stretched, a bit less)

Allegation 83k: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) **(Reference #278)** Figure 2A Rb image was re-used (stretched)

Allegation 83L: Mohammad, R.M, et al., Cancer **106**:1260–8 (2006) **(Reference #280)** Figure 4C Rb image was re-used (stretched)

Allegation 83m: Zhang, Y., et al., Cancer Res **66(2):** 1025-1032 (2006b) **(Reference #282)** Rb image was re-used Figure 4C

Allegation 83n: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** Figure 2A, the 4-lane Rb image was re-used (stretched)

Allegation 83o: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** Figure 2B, the 4-lane Rb image was re-used (stretched more than 2A)

Allegation 83p: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** Rb image was re-used Figure 5B (stretched)

Allegation 83q: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** Rb image was re-used Figure 5C (stretched more than 5B)

Allegation 83r: **APPLICATION: 1 R01 CA131151-01** (File: 2007, 02 01 – Sarkar Proposal 14114-001.pdf) Rb image was re-used Figure 3 (page 48)

Allegation 83s: **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) Rb image was re-used Figures 3A and 3B

Allegation 83t: **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) Rb image was re-used Figure 4E (stretched)

Allegation 83u: APPLICATION: 1 R01 CA131456-01 (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) Rb image was re-used Figure 5C (stretched)

Allegation 83v: APPLICATION: 1 R01 CA131456-01 (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) Rb image was re-used Figure 6D

Allegation 84a: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**) The 4-lane Rb image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 6C

Allegation 84b: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**) The 4-lane Rb image and/or flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 6B (flipped horizontal)

Allegation 84c: Mohammad, R.M, et al., Cancer **106**:1260–8 (2006) (**Reference #280**) The 4-lane Rb image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3A (stretched)

Allegation 84d: **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) The 4-lane Rb image and/or flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3C

Allegation 84e: Wang, Z., et al., *Int J Cancer*. **123**(4):958-966 (2008). (**Paper 32**) The 4-lane Rb image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3A far left panel - (squeezed horizontal; single Colo-357)

Allegation 84f: Wang, Z., et al., *Int J Cancer*. **123**(4):958-966 (2008). (**Paper 32**) The 4-lane Rb image and/or flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3A left side of double-panel for Colo-357 (squeezed horizontal; 3-lane version left 3 lanes only)

Allegation 84g: Wang, Z., et al., *Int J Cancer*. **123**(4):958-966 (2008). (**Paper 32**) The 4-lane Rb image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3A right side of double-panel for Colo-357 (squeezed vertical; 3-lane version left 3 lanes only)

Allegation 85a: Rahman, K.W., et al., Mol Cancer Ther 5: 2747-2756 (2006) (**Reference #257**) *The Rb image was re-used (and manipulated) in* Figure 4A (squeezed horizontal)

Allegation 85b: Rahman, K.W., et al., Mol Cancer Ther 5: 2747-2756 (2006) (**Reference #257**) *The Rb image was re-used (and manipulated) in* Figure 4B (flipped horizontal, squeezed vertical

Allegation 86a: Wang, Z., *et al., Cancer Res*, **66**, 7653-7660, (2006a) (**Paper 3**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 3A

Allegation 86b: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007a) (**Reference #231**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 5A

Allegation 86c: Rahman, K.W., et al., Mol Cancer Ther 5: 2747-2756 (2006) (**Reference #257**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 4C (stretched)

Allegation 86d: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference #272**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 4C (stretched)

Allegation 86e: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) (**Reference #277**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 6B (squeezed horizontal)

Allegation 86f: Wang, Z., et al., Molecular Cancer Ther **5(3)**:483–93 (2006c) (**Reference #277**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 6D (stretched)

Allegation 86g: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) (**Reference #278**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 2B (stretched)

Allegation 86h: Zhang, Y., et al., Cancer Res **66(2):** 1025-1032 (2006b) (**Reference #282**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 4D

Allegation 86i: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) *The 2-lane Rb image was re-used (and manipulated) in* Figure 2C (stretched)

Allegation 86j: APPLICATION: 1 R01 CA131456-01 (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) *The 2-lane Rb image was re-used (and manipulated) in* Figure 3D (flipped horizontal, stretched)

Allegation 86k: Wang, Z., et al., *Int J Cancer*. **123**(4):958-966 (2008). (**Paper 32**) *The 2-lane Rb image was re-used (and manipulated) in* Figure1D (right)

Allegation 87 : Bhuiyan, M., et al., Cancer Res, 66, 10064-10072, (2006) Figures 2A & 2B (**Paper 4**): *"...in Figure 2A, the 24-hours β-actin is the same as Figure 2B 24-hours β-actin: Lanes 1 & 2 of Figure 2A are the same images as in lanes 3 & 4 of Figure 2B (flipped horizontal); lanes 3 & 4 of Figure 2A are the same as lanes 1 & 2 of Figure 2B (all of 2B is squeezed horizontal, then stretched horizontal). In Figure 2B, the 24-hrs β-actin is lanes 1-6 in the 72-hours β-actin; lanes 7&8 are lanes 1&2 (flipped horizontal)."*

Allegation 88 : Banerjee, S., *et al., Int. J. Cancer,* 120, 906-917, (2006) Figures 2 & 3 (**Paper 5**): *"...manipulated β-actin bands in multiple figures in Figure 2C & 2D for L3.6pl cells (as well as the COLO357 cells in the original allegation). In Figures 3A, the β-actin bands for Caspase-3 and, in Figure 3C, the β-actin band for Cystol do not appear to align with the lanes of their respective proteins. The top β-actin for Figure 3A is the L36.pl β-actin of Figure 2C (flipped horizontal)."*

Allegation 89a: Wang, Z., et al., *Cancer Res,* **66**, 7653-7660, (2006a) (**Paper 3**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 5A (squeezed horizontal, then widened)

Allegation 89b: Zhang, Y., et al., Inter. J. Cancer **119:** 2071-2077 (2006) (**Reference #263**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 1C

Allegation 89c: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference #272**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 3D under PANC-1 (background lightened)

Allegation 89d: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference #272**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 5A

Allegation 89e: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 1B (lanes 3 & 4) of β-actin in Figure 1B of Wang, Z., et al., Mol Cancer Ther 5(3):483–93 (2006) (**Reference #277**)."

Allegation 89f: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 7B (under CyclinD1)

Allegation 89g: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) (**Reference #278**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 3B (lanes 2&3, squeezed horizontal)

Allegation 89h: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) (**Reference #278**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 4A (squeezed horizontal a lot)

Allegation 89i: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) (**Reference #278**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 5A (lanes 2&3, squeezed horizontal slightly)

Allegation 89j: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 3C

Allegation 89k: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 6A (lanes 2&3 of 3C, flipped horizontal)

Allegation 89L: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 6B (lanes 2&3 of 3C, squeezed vertical, stretched horizontal)

Allegation 89m: **APPLICATION: 1 R01 CA131456-01** File Name: 2007, 02 01 – Sarkar Proposal 07050620.pdf (PI – F.H. Sarkar) Figure 7 uses the same figures/images as Figure 6B from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**; see Allegation **89L**) and Figure 7B from Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**; see Allegation **89f**)

Allegation 90a: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference #272**) *The 4-lane β-Actin image was re-used and manipulated in* Figure 6A (flipped horizontal)

Allegation 90b: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) **(Reference #277)** *The 4-lane β-Actin image was re-used and manipulated in* Figure 7B (under Notch-1)

Allegation 90c: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** *The 4-lane β-Actin image was re-used and manipulated in* Figure 3A

Allegation 91a: Wang, Z., et al., Cancer Res, **66,** 7653-7660, (2006a) **(Paper 3)** *The β-Actin image was re-used and manipulated in* Figure 5C (squeezed horizontal)

Allegation 91b: Wang, Z., et al., Cancer Res **67:** 8293-8300 (2007b) **(Paper 19)** *The β-Actin image was re-used and manipulated in* Figure 5B (6 lanes)

Allegation 91c: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) **(Reference #277)** *The β-Actin image was re-used and manipulated in* Figure 5 (lanes 1- 4)

Allegation 91d: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) **(Reference #278)** *The β-Actin image was re-used and manipulated in* Figure 1C *(β-actin under Notch-1, lanes 2&3 stretched horizontal)*

Allegation 91e: Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006d) **(Reference #278)** *The β-Actin image was re-used and manipulated in* Figure 5A *(β-actin under VEGF, lanes 2&3)*

Allegation 91f: Mohammad, R.M, et al., Cancer **106**:1260–8 (2006) **(Reference #280)** *The β-Actin image was re-used and manipulated in* Figure 3B

Allegation 91g: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** The *β-Actin image was re-used and manipulated in* Figure 5A

Allegation 92a: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) **(Reference #277)** *The 6-lane β-Actin image was re-used and manipulated in* Figure 1D (bottom)

Allegation 92b: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** *The 6-lane β-Actin image was re-used and manipulated in* Figure 4A (using lanes 1-4)

Allegation 92c: APPLICATION: 1 R01 CA120008-01 (File Name: 2005, 05 20 – Sarkar Proposal 05083189.pdf) *The 6-lane β-Actin image was re-used and manipulated in* Figure 5A (squeezed horizontal)

Allegation 93a: *Wang, Z., et al., Cancer Res, **66,** 7653-7660, (2006a)* **(Paper 3)** *The 6-lane β-Actin image was re-used and manipulated in* Figure 2C (lanes 1-5)

Allegation 93b: *Wang, Z., et al., Cancer Res, **66,** 7653-7660, (2006a)* **(Paper 3)** *The 6-lane β-Actin image was re-used and manipulated in* Figure 2D (squeezed horizontal and darkened)

Allegation 93g: *Wang, Z., et al., Cancer Res **67:** 8293-8300 (2007b)* (**Paper 19**) *The 6-lane β-Actin image was re-used and manipulated in* Figure 1B (using lanes 1-4)

Allegation 93c: *Wang, Z., et al., Cancer Res **67:** 8293-8300 (2007b)* (**Paper 19**) *The 6-lane β-Actin image was re-used and manipulated in* Figure 1D (top group; FoxM1 CS/PS line)

Allegation 93d: *Wang, Z., et al., Cancer Res **67:** 8293-8300 (2007b)* (**Paper 19**) *The 6-lane β-Actin image was re-used and manipulated in* Figure 4C

Allegation 93e: Zhang, Y., et al., Inter. J. Cancer **119:** 2071-2077 (2006) (**Reference #263**) *The 6-lane β-Actin image was re-used and manipulated in* Figure 1B (same as lanes 1-4, stretched)

Allegation 93f: Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**) *The 6-lane β-Actin image was re-used and manipulated in* Figure 1D (top)

Allegation 94a: *Wang, Z., et al., Cancer Res **67:** 8293-8300 (2007a)* (**Paper 19**) *The 7-lane β-Actin image was re-used and/or manipulated in* Figure 1A (lane 1 is duplicated and flipped in lane 7; cut line between lanes 1 & 2)

Allegation 94b: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007b) (**Reference #231**) *The 7-lane β-Actin image was re-used and/or manipulated in* Figure 2C (top: β-actin for PDGF-D; cut line between lanes 1 & 2)

Allegation 94c: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007b) (**Reference #231**) *The 7-lane β-Actin image was re-used and/or manipulated in* Figure 2C (middle: lanes 1&2 flipped horizontal; lanes 4-8 widened horizontal and blurred)

Allegation 94d: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007b) (**Reference #231**) *The 7-lane β-Actin image was re-used and/or manipulated in* Figure 2C (lanes 3-6 switch to lanes 1-4; lanes 1 & 2 become lanes 5 & 6)

Allegation 94e: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007b) (**Reference #231**) *The 7-lane β-Actin image was re-used and/or manipulated in* Figure 4A (same β-actin as 2C bottom)

Allegation 94f: Wang, Z., et al., *Int J Cancer*. 123(4):958-966 (2008). (**Paper 32**) *The 7-lane β-Actin image was re-used and/or manipulated in* Figure 1C (β-actin for Bcl-2 (lane 1 is lane 7)

Allegation 95: **APPLICATION: 1 R01 CA120008-01** (File Name: 2005, 05 20 – Sarkar Proposal 05083189.pdf) *"Figure 3 in the application appears to be made of the same image as in Figure 7B from Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006) (**Reference #277**). However, the band labeled Jagged-1 in the NIH grant application (Figure 3C) is labeled Cyclin D1 in Figure 7B Wang, et al (2007). This re-use of the same image with a different label is falsification of data."* See also Figure 5B in Application 1 R01 CA124512-01 in File: 2006, 01 26 - Sarkar Proposal 06040451

There is no Allegation 96

Allegation 97: APPLICATION: 1 R01 CA131151-01 (File Name: 2007, 02 01 – Sarkar Proposal 14114-001.pdf) *Figure 14B (page 50) – The DMSO control and 10 μM B-DIM images are the same image cropped differently. Note identical pattern of spots in top right quadrant of the DMSO control panel and the center left region of the 10 μM B-DIM panel. This duplicate use of the same image with different labels is falsification of data.* NOTE: See also Allegation 3 where these duplicated images are used a publication – **Paper 2.**

Allegation 98: APPLICATION: 1 R01 CA131151-01 (File Name: 2007, 02 01 – Sarkar Proposal 14114-001.pdf) *Figure 18 (page 53) – Figure 18 (page 53) – There is blurring/masking over of lane 1 of the lower PARP band; and pasting in over lane 4 (B-DIM+Er) of the EGFR band. These manipulations indicate fabrication and/or falsification of data." Figure 18 in the NIH grant application is the same figure as the left half of Figure 3 in Allegation 59 – Ali, S., et al., Mol Cancer Ther 7, 1708-1719 (2008) (**Reference #217**)."*

Allegation 99: PROGRESS REPORT 5R01CA101870-5 (File Name: 2007, 03 22 - Sarkar Proposal 07060904.pdf) *"Figure 1 – Several lanes appear to blurred out or masked with an overlay, specifically for the "Bcl-2" band (lanes 1, 3 & 4); Her-2-neu" (lane 4); COX-2 (lanes 1 & 3); EGFR (lanes 3 & 4); and PhosphoAKT (lane 2). These manipulations indicate data falsification or fabrication. Also, the β-actin band is spliced together between lanes 1 & 2, 2 & 3 and 4 & 5). These splices are not seen in the other bands indicating the controls were not from same blots and so is fabrication."*

Allegation 100: PROGRESS REPORT - 5R01CA101870-5(File Name: 2007, 03 22 - Sarkar Proposal 07060904.pdf) *Figure 5 - is almost the same as Figure 5 in Allegations **71a, 71b** & **71c** El-Rayes, B.F., et al., Cancer Res 66:10553-10559 (2006) (**Reference #258**) with all the same concerns listed in those allegations. The β-actin bands in Figure 5E in the progress report differ from the publication (**Reference #258**)."*

Allegation 101: PROGRESS REPORT - 5R01CA101870-5(File Name: 2007, 03 22 - Sarkar Proposal 07060904.pdf) *Figure 5 is the same as Figure 5 in **Reference #258,** El-Rayes, B.F., et al., Cancer Res 66:10553-10559 (2006) and has all the same concerns listed there. The Rb bands in Figures 5B, 5D & 5F appear to be different (different images and/or cropped differently). There is a question about why Figure 5 might be different (and/or differently cropped versions) of images in the grant than in the previously published paper."*

Allegation 102: Figure 8 – *"The Akt band in the bottom right appears to be the same image used in the β-actin bands at the top left (rotated 180° clockwise) and the top right (flipped horizontally). These duplications, manipulations and re-labeling indicate data fabrication and/or falsification."*

Allegation 103: PROGRESS REPORT 5R01CA131151-2 (File Name: 2009, 04 10 - Sarkar Proposal 09071199.pdf) Figure 1 – *"Certain lanes are blurred or masked with an overlay. Specifically, the EGFR band (lane 5), Bcl-2 band (lane 7), and Mcl-1 band (lane 7). These manipulations indicate falsification."*

Allegation 104: PROGRESS REPORT 5R01CA131151-2 (File Name: 2009, 04 10 - Sarkar Proposal 09071199.pdf) Figure 7– *"In the DIM 72-hour gel, the slope of the β-actin band (rising left to right) differs from the other bands: falling for p-Akt and Bax bands; straight for the XIAP, IAP pan and Survivin bands. None of the protein bands align with the loading control actin band. This indicates fabrication since a single loading control cannot have been used for all these data."*

Allegation 105: PROGRESS REPORT 5R01CA131151-2 (File Name: 2009, 04 10 - Sarkar Proposal 09071199.pdf) Figure 9B –*The Caspase-3 has 9 lanes here rather than 8, like all the other bands, indicating data fabrication. The PARP lanes are spliced together and left 2 lanes of the lower PARP band appear to be masked by an overlay, indicating data falsification.*

Allegation 106: PROGRESS REPORT 5R01CA131151-2 (File Name: 2009, 04 10 - Sarkar Proposal 09071199.pdf) Figure 10C – *Made to appear as one gel but cells are spliced together. See also Allegation **34a** involving Banerjee, S., et al., Cancer Res, 69, 5592-5600, (2009) Figure 4C **(Paper 18)***

Allegation 107: PROGRESS REPORT 5R01CA131151-2 (File: 2009, 04 10 - Sarkar Proposal 09071199.pdf) Figure 12A – *Appears to be horizontally spliced together across most lanes, indicating fabrication.*

Allegation 108: Patent application WO 2011/126544 A2 (Filed: 28 March 2011 / Inter. Pub Date: 13 October 2011) included the altered image described for Figure 5A above in Allegation **51** regarding Banerjee, S., et al., Pharm Res **27:** 1146–1158 (2010) **(Reference #149)** (File: 10-967 PCT_US2011_000561) *"There is reason to believe that that image is manipulated by stretching, rotating, flipping and/or pasting in of images, that alter presentation of Western blot data for Caspace-3, PARP and Bcl-2 bands."*

Allegation 109: Banerjee, S., et al., Cancer Res 2009;69:5575-5583 Figure 2A **(Reference #186)**: *"Possible masking of the 3 left lanes for cleaved Caspase-3 and the space between the Caspase-3 lanes, suggesting fabrication and/or falsification.*

Allegation 110: Levi, E., *et al., Anticancer Research* 24: 2885-2892 (2004) Figure 5B (right side) **(Paper 27)**: *"Figure 5B. Comparing the 6-hour and the 24-hour alpha-tubulin panels, the images for alpha-tubulin appear to be identical. Fabrication is indicated since the same image cannot represent both time points."*
NOTE: This paper is earlier than the period under investigation.

Allegation 111: Li Y., et al., *Cancer Res.* 66(9): 4816-25 (2006) Figure 3 (right side) **(Paper 28)**: *"Figure 3C, the OPG panel appears to be clearly assembled from cut and pasted images whereas there is no cutting and pasting in the β-actin band, suggesting fabrication of OPG panel."*
NOTE: The complainant did not specify the nature of the allegation. Upon examining the indicated images, the Committee had no other concerns specific to lanes 3 and 7 of the pEGFR(Y1173) panel in Figure 3C.

Allegation 112: Wang, Z., et al., *Cancer Res.* 69(7):2757-65 (2009) Figure 3A **(Paper 29)**
"In the left panel, there are indications of cutting and pasting in several bands, especially between lanes 3 and 4 for CDK4, CDK6 & Cyclin A, across the top of lanes 2 to 6 in Cyclin B1, and between lanes

4 and 5 of Cyclin E, all suggesting inappropriate manipulation of data. In the right panel, the images in the ß-actin lanes 3 and 6 appear identical which would be falsification since the lanes are of different cell types."

Allegation 113: Wang, Z., et al., *Cancer Res.* 69(7):2757-65 (2009) Figure 4A (**Paper 29**) *"The Hey-1 band shows evidence of cutting and pasting between lanes 3 and 4 that is not clear in the ß-actin band suggestion fabrication of data. Other lanes appear to have been blurred by masking the images (i.e., Notch-1 lanes 2,3 and 6; Jagged-1 lane 5; and the top of the ß-actin band across all lanes)."*

Allegation 114: Ali, S., et al, *Clin Cancer Res*. 10(13):4412-6 (2004) Figure 2 (**Paper 30**) *"Vertical, straight changes" are seen indicating cutting and pasting in the p16 panel (between lanes 5 & 6 and 8 & 9) and in the ß-actin band (between lanes 7 & 8). This "differential splicing" suggests fabrication or falsification.* NOTE: This paper is earlier than the period under investigation.

Allegation 115: Thakur, A., et al., *Clin Cancer Res*. 14(14):4427-36 (2008) Figure 1A (**Paper 31**). *In the top panel (7-lane rows labeled RSK4, ß-actin & c-Myc top to bottom), lanes 4 and 5 of RSK4 appear pasted in and partly masked suggesting fabrication. Lane 4 (MCF-7 column) of the c-Myc row appears pasted in and differing from both lanes 1 to 3, and lanes 5 to 7, suggesting fabrication. In the second row, right panel (4-lane rows labeled RSK4, c-Myc & ß-actin, top to bottom), lanes 1 and 2 of RSK4 appear pasted in and all 4 lanes appear variously masked, suggesting fabrication. In the lowest panel of Figure 1A (8-lane rows of RSK4 and Rb), lanes 1 to 4 for RSK4 appear pasted in, and Rb lanes 1, 3, 5 and 7, the "C" ("cytoplasmic"? lanes) appear to be masked indicating fabrication and/or falsification*.

Allegation 116: Thakur, A., et al., *Clin Cancer Res*. 14(14):4427-36 (2008) Figure 5A (**Paper 31**). *"In Figure 5A, parts of lanes 3 through 6 of the RSK4 band appear pasted in, and areas between lanes 3 & 4, and 4 & 5 appear to have been masked. Lanes 5 & 6 for the MycER row also appear to have been masked, suggesting fabrication and/or falsification."*

Allegation 117: Wang, Z., et al., *Int J Cancer*. 123(4):958-966 (2008). Figure 3 (**Paper 32**) *"In the Cyclin D1 and Survivin bands, the right lanes (500uM) appear to be pasted in suggesting fabrication."* NOTE: There are also several Rbs that are duplicated within this paper in others. Refer to Allegations 82 to 86, and 94

Allegation 118: Singh-Gupta, V., et al., *Int J Cancer.* 124(7):1675-1684 (2009). Figures 4B & 4C (**Paper 33**) *The APE1/Ref-1 bands in Figures 4B (9 lanes), 4C (right 8 lanes) & 5A (9 lanes) are the same. This re-use does not in itself appear to constitute a problem since the figure captions describe them as the same. The Rbs in 4B and 5A are the same but a different Rb bands is used in Figure 4C. However, two different Rb bands are used in Figures 4B and 4C, and they cannot both be the control band for APE1-Ref-1.*

Allegation 119: Jaiswal, A.S., et al., *Mol Cancer Res*. 7(12):1973-83 (2009) Figures 2A & 2B (**Paper 34**) *"At the bottom of Figure 2A, lane 2 and lanes 3 & 4 appear to be pasted in (red circle). In Figure 2B, there is a splice between lanes 3 and 4 (blue box). For both Figures 2A and 2B, lane 1 appears to have been masked with an overlay. These manipulations indicate fabrication and/or falsification."*

Allegation 120: Jaiswal, A.S., et al., *Mol Cancer Res*. 7(12):1973-83 (2009) Figure 4A (**Paper 34**) *"The top of lane 1 in Figure 4A appear to be pasted-in and/or partially masked, indicating fabrication or falsification."*

Allegation 121: Wang, Z., et al., J Cellular Biochem **112**:78–88 (2011) Figure 2C (**Reference #139**) *"The β-actin bands are duplicated and manipulated and re-used for different treatment conditions: The β-actin band for the LY294002 condition with PC-3 cells (far left) is flipped and widened and re-used/re-labeled for the Wortmanin condition in the C4-2B cells (far right). Also, the β-actin band for the Wortmanin condition in the PC-3 cells (middle left) is flipped and re-used/re-labeled for the LY294002 condition with the C4-2B cells (middle right). This duplication and re-labeling constitutes falsification or fabrication of data."*

Allegation 122: Wang, Z., et al., J Cellular Biochem **112**:78–88 (2011) Figures 1A & 3C (**Reference #139**) *"The β-actin bands are duplicated and manipulated and re-used for different treatment conditions: The β-actin band for the LNCaP and C4-2B columns in Figure 2A is duplicated, rotated slightly and re-used and re-labeled for PC-3 and PC-3ICN cells in Figure 3C."*

Allegation 123: Wang, S., et al., *Transl Oncol* 6(2):216-25 (2013) Figure 2B (**Paper 35**) *"The image has vertical cut lines in background to the left of the last lane ("Input") for all 3 bands. The HPAC band also has a vertical line in background in lane 4. These cut and paste lines indicate that the image has been manipulated/fabricated."*

Allegation 124: Giri, B., et al., *Anticancer Res* 29(1):395-401 (2009) Figure 3A (**Paper 36**) *"In the Cyclin B panel, there are eraser marks between lanes 2 and 3 and there is evidence of masking above lanes 1-3.*

Allegation 125: Giri, B., et al., *Anticancer Res* 29(1):395-401 (2009) Figure 4 (**Paper 36**) *"In the 'Bad' band, lanes 2-4 are duplicates of the images for lanes 2-4 of the β-actin band (flipped horizontal and squeezed vertical). Lane 2 of 'Bad' is lane 4 of β-actin, lane 3 is lane 3, and lane 4 of 'Bad' is lane 2 of β-actin)."*

Allegation 126: Giri, B., et al., *Anticancer Res* 29(1):395-401 (2009) Figure 5 (**Paper 36**) *"At the top of lane 4 (the '+/+' condition), there is a horizontal cut/paste line and blurring/masking just above NF-κB band."*

Allegation 127: Solomon, L.A., et al., *J Ovarian Res* 1(1):9 (2009) Figure 3 (**Paper 37**) *"In the Survivin band in the upper A2780 panel, there are cut lines and pasted images in lanes 3 and 8, indicating fabrication and/or falsification of data. In both of the PARP bands in the lower C200 panel, all of the lanes appear to be cut, pasted and blurred images. These manipulations indicate fabrication and/or falsification of data."*

Allegation 128: Raffoul, J.J., et al., *BMC Cancer* 26(6):107- (2006) Figure 5A & 5B (**Paper 38**)
"In Figure 5A (top), the blot in lane 3 ("Rad") appears to be pasted in, and lane 4 ("Gen + Rad") appears to have been masked over. In Figure 5B, all lanes in the cleaved PARP band are constructed of pasted in images, and lane 1 ("Con") also appears to have been masked."

Allegation 129: Ali, S., et al., *Cancer Letters* 278 (2009) 201–209 Figure 5 (**Paper 39**)
"The left 2 or 4 lanes of the lower PARP bands for the ME-180PT and UMSCC-5 panels, respectively, appear to have been masked by an overlay, and the right 2 lanes of the Survivin band in the UMSCC-5 panel are pasted in, indicating data fabrication or falsification."

Allegation 130: Ma, J., et al., *PLoS One*. 8(7):e69485 (2013) Figures 5B & 6B (**Paper 40**)
"In Figure 5B, lane 1 of the β-actin band (labeled "4T1 cells") is the same image used in Figure 6B for lane 1 of the β-actin band (re-labeled "A clone"). Lane 2 of the β-actin band in Figure 5B (labeled "C clone") is the same image as lane 2 of the β-actin band in Figure 6B (re-labeled "A clone shRNA). Lane 5 of the β-actin band in Figure 5B (labeled "D clone +NAC") is the same image as lane 1 of the HIF-1 band in Figure 6B (re-labeled "A clone). See green boxes. These duplications and re-labelings indicate data falsification. In Figure 5B, there is also a cut mark between lanes 1 and 2 in the Hypoxic HIF-1α band indicating pasting."

Allegation 131: Li, Y., et al, Cancer Res 65(15): 6934-6942 (2005) (**Paper 41**)
*"Figure 4E is duplicated in Wang, Z., et al., (2006d) (**Reference #278)** as Figure 2B, and in Rahman, et al., (2006) **Reference #257**, as Figure 4C. These duplications represent plagiarism and/or falsification."*

Allegation 132: Wang, Z., *et al., Cancer Res*, **66:**7653-7660 (2006) Figure 4 (**Paper 3**) (also see Allegation 5) and Wang, Z., *et al., Int J Cancer*, **123**(4): 958-966 (2008). Figure 5B (**Paper 32**) (also see Allegation 117) *"Figure 4 from **Paper 3**, for the "ERRP" condition for the "PANC-1' call panels (bottom right panel) is the same image, rotated 90° counterclockwise, as Figure 5b, labeled "Treatment" and captioned as "250 nM TW-37-treated cells," for the invasion assay (right panel), in **Paper 32**. This duplication and re-labeling of the same image across two papers constitutes plagiarism, and fabrication and/or falsification of data."*

Allegation 133: Patzko, A., et al., *Brain* **135**:3551–3566 (2012) Figure 2A (**Reference #026**): *"In the top row of Figure 2A (the '+/+' mice), the "untreated" (left) and "CO"-treated conditions are the same image cropped differently. This duplication and re-labeling of the same image constitutes fabrication or falsification of data."*

Allegation 134: Wang, Z., et al., Cancer Res 66(5): 2778-2784 (2006d) (**Reference #278**) "Figure 1D, the panel labeled "NP" (for "NP, Notch-1 plasmid") is depicted as "Notch-1 cDNA–transfected cells ..." and is the same image re-used in Figure 5B where it is labeled and captioned as a control condition "siRNA-transfected BxPC-3 cells". The images are cropped differently and Figure 5B is a stretched version of Figure 1D. This duplication and re-labeling of the same image constitutes plagiarism, fabrication and/or falsification of data.

Allegation 135: Ma, J., et al., *PLoS One.* 8(7):e69485 (2013) Figures 2A, 4C, 4D, 6C & 6D (**Paper 40**) *"In Figure 2A, the panel labeled "A Clone+NAC" is a stretched re-use of the image in the Figure 6D panel labeled "A Clone". In Figure 4C, the panel labeled "Mito-TEMPO" is a smaller re-use of the image in Figure 6D panel labeled "A Clone shRNA". In Figure 4D, the panel labeled "Control" is a differently cropped and smaller version of part of the same image re-used in the Figure 6C panel labeled "A Clone". These duplications and re-labelings indicate plagiarism and data fabrication and/or falsification."* (See also Allegation 130 for this paper)

Allegation 136: Li, Y., et al., Cancer Prev Res, 4, 1495-1506, (2011) Figure 6A (**Paper 20**): *"The PSA band in Figure 6A for VCaP cells has evidence of cutting and pasting seen in "... Vertical changes in background between lanes 1 and 2, 3 and 4, and between lanes 5 and 6. No vertical chnages* [sic] *in background in the other 4 panels." Cutting and pasting of lanes 1, 2, 3, 4&5, and 6 is clear. This manipulation in one band and not the control GAPDH band indicates fabrication or falsification of data."*

Allegation 137: Wang, Z., et al., PLoS ONE 6(6): e20537, (2011) (**Reference #099**) The 12 bands for "Notch 4" in Figure 1D appear to have been copied, stretched horizontally, squeezed vertically, and re-labeled as lanes 1 through 12 of the 13 bands in the "Bcl-2" row in Figure 3A.

Allegation 138: Figure 1C in Wang, et al, Inter. J. Cancer 118, 1930–1936 (2006**e**) (**Reference #284**) appears to have been copied and progressively manipulated (resized, cropped, stretched and/or squeezed) and re-used repeatedly as Figure 6D in Wang, et al, Molecular Cancer Ther 5(3):483–93, 2006**c**, (**Reference #277**), and as Figure 4C in Wang, et al, Cancer 106:2503–13 2006**b** (**Reference #272**), and as Figure 1D in Wang, et al, Int J Cancer. 123(4):958-66 2008 (**Paper 32**). NOTE: The Rb bands were also duplicated and this is already detailed in Allegation 86.

Allegation 139: Bao B, et al., PLoS One. 6(3):e17850, 2011 (**Reference #111**): In Figure 5C, 3 photomicrographs of cells in culture appear to be copied and re-labeled as different treatments within the same figure. Specifically, the "AsPC-1 20 nmol/L GEM" image (2nd image in left panel) is duplicated as "CDF-pre-treated AsPC-1 0 nmol/L GEM" (1st image in right panel); the "AsPC-1 40 nmol/L GEM" image (4th image in left panel) is duplicated as "AsPC-1 6 µmol/L CDF" (6th image in left panel); and the "CDF-pre-treated AsPC-1 40 nmol/L GEM" image (4th image in right panel) is duplicated as "CDF-pre-treated AsPC-1 8 µmol/L CDF" (7th image in right panel).

Allegation 140: Wang Z, et al., J Cell Biochem. 109(4):726-736, 2010 (**Reference #167**) Blots from Figure 5A appear to be duplicated in Figure 3A in **Reference #139**. Specifically, the Notch-1 band lanes labeled "CS" and "JS," for control and Jagged-1 siRNA treatment, respectively, in what the text of the paper implies are PC-1 cells in Figure 5A of Reference #167, appear to be duplicated ("CS" blot) and duplicated and re-labeled ("JS" blot re-labeled "NS" for Notch-1 siRNA) in the Notch-1 band of the panel labeled "C4-2B" cells in Figure 3A of **Reference #139** (i.e., Wang, Z., et al., J Cellular Biochem 112:78–88 (2011). Further, the middle "NS" lane of the Notch-1 band in Figure 5A of Reference #167 appears to be blurred out or masked over.

Allegation 141: Bao B, et al., Stem Cells Dev. (2014). PMID: 24734907 (**Reference #296**): PubPeer stated "See problematic images here" and indicated apparent cut marks in Figure 1D that show up in a "contrast enhanced" image. There appears to be evidence of cutting and pasting and/or masking/blurring of images in the p21 band of Figure 1D.

Allegation 142: Bao B, et al., J Biol Chem. (2014) PMID: 24719318 (**Reference #297**): In Figure 7B, there appear to be instances of cutting and pasting and/or masking the "Triple negative" column (i.e., left) side of the Western blots in the EpCAM, Snail and HIF-1α bands, and less clearly so for the IL-6 band. The two β-actin bands do not show the same blot separation as all the other protein bands. The Snail image that PubPeer posted for Figure 7B was actually from Figure 10B. The EpCAM and Snail bands in Figure 10B, appear to have cutting and pasting and/or masking marks in the "MiaPaCa-2" column (i.e., right) side of the Western blot. The EZH2 band in Figure 10D appears to have cutting and pasting and/or masking marks in the "CSLC, anti-FoxQ1" column on the left of the blot.

Allegation 143: Lian F, et al., Nutr Cancer. 1999;33(2):125-131. (**Reference #301**) In Figure 5, the β-actin band on the upper right accompanying the p53 protein band in H322 cells, is copied, flipped left-to-right and re-used as the β-actin band on the lower left accompanying the p21 protein band in H460 cells. This publication is outside the period under investigation. However, it was cited in support of the following NIH grant applications submitted by the Dr. Sarkar, as PI, during the period under investigation:

2006	R01CA1 21 092-01A1	SPA#06050814	Citation #82
2006	R01 CA121092-01	SPA#05083241	Citation #77
2008	R01CA132794-01A1	SPA#08050727	Citation # 9

Allegation 144: NIH grant application 2R01CA083695-05 A1, titled "Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer" with Dr. Sarkar as PI. File: "2006, 10 26 - Sarkar Proposal 07010062" All of Figure 8A on page 42 in the grant application, depicting changes in AR, PSA and β-actin protein levels over 72 hours after treatment with "Isoflavone (20μM)" [caption reads: "Effect of soy isoflavone (20μM equivalent of genistein)..."], appears to be identical to the image in the top panel of Figure 2B in **Paper 4** (see Allegation 8) – Bhuiyan, et al., Cancer Res, 66, 10064-10072, (2006) – in which the treatment is labeled "10μM B-DIM."

Allegation 145: The LNCaP, C4-2B and PC-3 lanes of the Notch-1 band in Figure 1B of **Reference #139** (i.e., lanes 3, 4 & 1 in Wang, Z., et al., 2011, J. Cell. Biochem., 112: 78–88), are re-ordered and manipulated (flipped horizontally) and re-labeled copies of the BxPC-3, HPAC and PANC-28 lanes (lanes 2, 3 & 5, respectively) of the Fox-M1 band in Figure 3A of **Reference #157** (Wang, Z., et al., (2010) Pharm Res 27:1159–1168). Also, the 4-lane β-actin band in Figure 1B of Reference #139 is a copy of lanes 1 to 4 from Figure 3A of Reference #157.

IV.

PHS Support

IV. PHS SUPPORT

The following provides a list of the NIH grants, and publications/presentations supported by these grants, that the committee identified as being directly involved in the alleged research misconduct:

PHS Support (Grant Applications & Progress Reports

1. **1 R01 CA120008-01** 2005, 05 20 – Sarkar Proposal 05083189.pdf Targeting notch signaling for pancreatic cancer
2. **1 R01 CA131151-01** 2007, 02 01 – Sarkar Proposal 14114-001.pdf A novel and targeted approach to inhibit invasion and angiogenesis
3. **1 R01 CA131456-01** 2007, 02 05 – Sarkar Proposal 07050620.pdf Chemoprevention of pancreatic tumor progression
4. **Progress Report: 5R01CA101870-5** 2007, 03 22 - Sarkar Proposal 07060904.pdf Targeting Akt/NF-kappa beta for Pancreatic Cancer Therapy
5. **Progress Report: 5R01CA131151-2** 2009, 04 10 - Sarkar Proposal 09071199.pdf A novel and targeted approach to inhibit invasion and angiogenesis (Same project as application #2 above)
6. **2R01CA083695-05 A1** 2006, 10 26 - Sarkar Proposal 07010062.pdf Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer

Papers:

How the publications were numbered in the Investigation.
The original complaint involved 24 numbered "papers." When additional anonymous complaints arrived, those papers were numbered 'Paper 25' on. As part of the Investigation, the RIO's office downloaded all of Dr. Sarkar's publications from PubMed, including those already under investigation, and those numbered in reverse chronological order from Reference #001 to Reference #351. This led to the two numbering systems. By the time the extent of the investigation was recognized, it would have been more confusing to change the numbering of publications. All the publications are listed here with both "Paper" number and "Reference #." These numbers are cross-indexed in the next section.

ORDERED BY SEQUENTIAL **PAPER** *NUMBERS*

Paper 1 (Reference #179): Ahmad, A., Wang, Z., Kong, D., Ali, S., Li, Y., Banerjee, S., Ali, R., Sarkar, F.H. FoxM1 down-regulation leads to inhibition of proliferation, migration and invasion of breast cancer cells through the modulation of extra-cellular matrix degrading factors. *Breast Cancer Res Treat* **122**, 337-346 (2010)

Paper 2 (Reference #245): Kong, D., Li, Y., Wang, Z., Banerjee, S., Sarkar, F.H. Inhibition of angiogenesis and invasion by 3,3'-diindolylmethane is mediated by the NF-KB downstream target genes MMP-9 and uPA that regulated bioavailability of VEGF in prostate cancer. *Cancer Res* **67**, 3310-3319, (2007)

Paper 3 (Reference #262): Wang, Z., Sengupta, R., Banerjee, S., Li, Y., Zhang, Y., Rahman, K.M.W., Aboukameel, A., Mohammad, R., Majumdar, A.P.N., Abbruzzese, J.L., Sarkar, F.H. Epidermal growth factor receptor–related protein inhibits cell growth and invasion in pancreatic cancer. *Cancer Res*, **66**, 7653-7660, (2006a)

Paper 4 (Reference #259): Bhuiyan, M.M.R., Li, Y., Banerjee, S., Ahmed, F., Wang, Z., Ali, S., Sarkar, F.H. Down-regulation of androgen receptor by 3,3'-diindolylmethane contributes to inhibition of cell proliferation and induction of apoptosis in both hormone-sensitive LNCaP and insensitive C4-2B prostate cancer cells. *Cancer Res*, **66**, 10064-10072, (2006)

Paper 5 (Reference #255): Banerjee, S., Zhang, Y., Wang, Z., Mingxin, C., Chiao, P.J., Abbruzzese, J.L., Sarkar, F.H. *In vitro* and *in vivo* molecular evidence of genistein action in augmenting the efficacy of cisplatin in pancreatic cancer. *Int. J. Cancer*, **120**, 906-917, (2006)

Paper 6 (Reference #050): Wang, Z., Ali, S., Banerjee, S., Bao, B., Li, Y., Azmi, A.S., Korc, M., Sarkar, F.H. Activated K-Ras and INK4a/Arf deficiency promote aggressiveness of pancreatic cancer by induction of EMT consistent with cancer stem cell phenotype. *J Cell Physiol,* **228**(3), 556-562 (2013)

Paper 7 (Reference #061): Soubani, O., Ali, A.S., Logna, F., Ali, S., Philip, P.A., Sarkar, F.H. Re-expression of *miR-200* by novel approaches regulates the expression of PTEN and MT1-MMP in pancreatic cancer. *Carcinogenesis*, **33**(8):1563-1771 (2012)

Paper 8 (Reference #241) Li, Y., Wang, Z., Kong, D., Murthy, S., Dou, Q.P., Sheng, S., Reddy, G.P.V., Sarkar, F.H. Regulation of FOXO3a/β-catenin/GSK-3β signaling by 3,3'-diindolylmethane contributes to inhibition of cell proliferation and induction of apoptosis in prostate cancer cells. *J Biol Chem*, **282**, 21542-21550, (2007)

Paper 9 (Reference #077): Ali, S., Ahmad, A., Aboukameel, A., Bao, B., Padhye, S., Philip, P.A., Sarkar, F.H. Increased Ras GTPase activity is regulated by miRNAs that can be attenuated by CDF treatment in pancreatic cancer cells. *Cancer Lett*, **319**, 173-181, (2012)

Paper 10 (Reference #079): Ali, S., Banerjee, S., Logna, F., Bao, B., Philip, P.A., Korc, M., Sarkar, F.H. Inactivation of Ink4a/Arf leads to deregulated expression of miRNAs in K-Ras transgenic mouse model of pancreatic cancer. *J Cell Physiol*, **227**, 3373-3380, (2012)

Paper 11 (Reference #287): Prasad, A., Bao, B., Beck, F.W.J., Kucuk, O., Sarkar, F.H. Antioxidant effect of zinc in humans. *Free Rad Biol Med*, **37**, 1182-1190, (2004)

Paper 12 (Reference #151): Philip, P.A., Sarkar, F.H. Gemcitabine sensitivity can be induced in pancreatic cancer cells through modulation of miR-200 and miR-21 expression by curcumin or its analogue CDF. *Cancer Res*, **70**, 3606-3617, (2010)

Paper 13 (Reference #152): Ahmad, A., Wang, Z., Kong, D., Ali, R., Ali, S., Banerjee, S., Sarkar, F.H. Platelet-derived growth factor-D contributes to aggressiveness of breast cancer cells by up-regulating Notch and NF-κB signaling pathways. *Breast Cancer Res Treat*, **126**, 15-25, (2011)

Paper 14 (Reference #122): Ali, S., Almhanna, K., Chen, W., Philip, P.A., Sarkar, F.H. Differentially expressed miRNAs in the plasma may provide a molecular signature for aggressive pancreatic cancer. *Am J Trans Res*, **3**, 28-47, (2011)

Paper 15 (Reference #072): Kong, D., Heath, E., Chen, W., Cher, M., Powell, I., Heilbrun, L., Li, Y., Ali, S., Sethi, S., Hassan, O., Hwang, C., Gupta, N., Chitale, D., Sakr, W.A., Menon, M., Sarkar, F.K. Epigenetic silencing of miR-34a in human prostate cancer cells and tumor tissue specimens can be reversed by BRDIM treatment. *Am J Trans Res*, **4**, 14-23, (2012)

Paper 16 (Reference #130): Banerjee, S., Kong, D., Azmi, A.S., Wang, Z., Ahmad, A., Sethi, S., Sarkar, F.H., Restoring sensitivity to oxaliplatin by a novel approach in gemcitabine-resistant pancreatic cancer cells in vitro and in vivo. *Int. J. Cancer*, **128**, 1240-1250, (2010)

Paper 17 (Reference #162): Ali, S., Banerjee, S., Schaffert, J.M., El-Rayes,B.F., Philip, P.A., Sarkar, F.H. Concurrent inhibition of NF-κB, cyclooxygenase-2, and epidermal growth factor receptor leads to greater anti-tumor activity in pancreatic cancer. *J Cellul Biochem*, **110**, 171-181, (2010)

Paper 18 (Reference #188): Banerjee, S., Wang, Z., Kong, D., Sarkar, F.H. 3,3'-Diindolylmethane enhances chemosensitivity of multiple chemotherapeutic agents in pancreatic cancer. *Cancer Res*, **69**, 5592-5600, (2009)

Paper 19 (Reference #236): Wang, Z., Banerjee, S., Kong, D., LI, Y., Sarkar, F.H. Down-regulation of Forkhead Box M1 transcription factor leads to the inhibition of invasion and angiogenesis of pancreatic cancer cells. *Cancer Res*, **67**, 8293-8300, (2007a)

Paper 20 (Reference #097): Li, Y., Kong, D., Wang, Z., Ahmad, A., Bao, B., Padhye, S., Sarkar, F.H. Inactivation of AR/TMPRSS2-ERG/Wnt signaling networks attenuates the aggressive behavior of prostate cancer cells. *Cancer Prev Res*, **4**, 1495-1506, (2011)

Paper 21 (Reference #106): Bao, B., Wang, Z., Ali, S., Kong, D., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Miele, L., Sarkar, F.H. Over-expression of FoxM1 Leads to epithelial–mesenchymal transition and cancer stem cell phenotype in pancreatic cancer cells. *J Cellul Biochem*, **112**, 2296-2306 (2011)

Paper 22 (Reference #086): Bao, B., Wang, Z., Ali, S., Ahmad, A., Azmi, A.S., Sarkar, S.H., Banerjee, S., Kong, D., Li, Y., Thakur, S., Sarkar, F.H. Metformin inhibits cell proliferation, migration and invasion by attenuating CSC function mediated by deregulating miRNAs in pancreatic cancer cells. *Cancer Prev Res*, **5**, 355-364, (2012)

Paper 23 (Reference #085): Bao, B., Ali, S., Banerjee, S., Wang, Z., Logna, F., Azmi, A.S., Kong, D., Ahmad, A., Li, Y., Padhye, S., Sarkar, F.H. Curcumin analogue CDF inhibits pancreatic tumor growth by switching on suppressor microRNAs and attenuating EZH2 expression. *Cancer Res*, **72**, 335-345, (2012)

Paper 24 (Reference #182): Ahmad, A., Kong, D., Wang, Z., Sarkar, S.H., Banerjee, S., Sarkar, F.H. Down-regulation of uPA and uPAR by 3,3'-diindolylmethane contributes to the inhibition of cell growth and migration of breast cancer cells. *J Cell Biochem*, **108**, 916-925 (2009)

Paper 25 (Reference #046): Xia, J., Li, Y. [Youlian], Yang, Q., Mei, C., Chen, Z., Bao, B., Ahmad, A., Miele, L., Sarkar, F.H., Wang, Z. Arsenic trioxide inhibits cell growth and induces apoptosis through inactivation of notch signaling pathway in breast cancer. *Intern. J. Molecular Sci*, 13, 9627-9641 (2012)

Paper 26 (Reference #083): Singh-Gupta, V., Banerjee, S., Yunker, C., Rakowski, J.T., Jiner, M.C., Konskiu, A.A., Sarkar, F.H., Hillman, G.G. B-DIM impairs radiation-induced survival pathways independently of androgen receptor expression and augments radiation efficacy in prostate cancer. *Cancer Letters*, 318, 86-92 (2012)

Paper 27 (Reference #285): Levi, E., Mohammad, R., Kodali, U., Marciniak, D., Reddy, S., Abroukameel, A., Sarkar, F.H., Kucuk, O., Rishi, A.K., Majumdar, A.P.N. EGF-receptor related protein causes cell cycle arrest and induces apoptosis of colon cancer cells in vitro and in vivo. *Anticancer Research* **24**: 2885-2892 (2004)

Paper 28 (Reference #270): Li Y., Kucuk, O., Hussain, M., Abrams, J., Cher, M.L., Sarkar, F.H. Antitumor and antimetastatic activities of docetaxel are enhanced by genistein through regulation of osteoprotegerin/receptor activator of Nuclear Factor-κB(RANK)/RANK ligand/MMP-9 signaling in prostate cancer. *Cancer Res.* **66**(9): 4816-25 (2006)

Paper 29 (Reference #194): Wang, Z., Azmi, A.S., Ahmad, A., Banerjee, S., Wang, S., Sarkar, F.H., Mohammad, R. TW-37, a small-molecule inhibitor of Bcl-2, inhibits cell growth and induces apoptosis in pancreatic cancer: involvement of Notch-1 signaling pathway. *Cancer Res.* **69**(7):2757-65 (2009)

Paper 30 (Reference #286): Ali, S., El-Rayes, B.F., Heilbrun, L.K., Sarkar, F.H., Ensley, J.F., Kucuk, O., Philip, P.A. Cytochrome P450 and glutathione transferase expression in squamous cell cancer. *Clin Cancer Res.* **10**(13):4412-6 (2004)

Paper 31 (Reference #216): Thakur, A., Sun, Y., Bollig, A., Wu, J., Biliran, H., Banerjee, S., Sarkar, F.H., Liao, D.J., Anti-invasive and antimetastatic activities of ribosomal protein S6Kinase 4 in breast cancer cells. *Clin Cancer Res.* **14**(14):4427-36 (2008)

Paper 32 (Reference #218): Wang, Z., Song, W., Aboukameel, A., Mohammad, M., Wang, G., Banerjee, S., Wang, S., Kang, D., Wang, S., Sarkar, F.H., Mohammad, R. TW-37, a small-

molecule inhibitor of Bcl-2, inhibits cell growth and invasion in pancreatic cancer. *Int J Cancer.* **123**(4):958-66 (2008)

Paper 33 (Reference #202): Singh-Gupta, V., Zhang, H., Banerjee, S., Kong, D., Raffoul, J.J., Sarkar, F.H., Hillman, G.G. Radiation-induced HIF-1a cell survival pathway is inhibited by soy isoflavones in prostate cancer cells. *Int J Cancer.* **124**(7):1675-84 (2009)

Paper 34 (Reference #173): Jaiswal, A.S., Banerjee, S., Panda, H., Bulkin, C.D., Izumi, T., Sarkar, F.H., Ostrov, D.A., Narayan, S. A novel inhibitor of DNA polymerase β enhances the ability of temozolomide to impair the growth of colon cancer cells. *Mol Cancer Res.* **7**(12):1973-83 (2009)

Paper 35 (Reference #011): Wang, S., Wu, Y., Hou, Y., Guan, X., Castelvetere, M.P., Oblak, J.J., Banerjee, S., Filtz, T.M., Sarkar, F.H., Chen, X., Jena, B.P., Li, C. CXCR2 macromolecular complex in pancreatic cancer: A potential therapeutic target in tumor growth. *Transl Oncol* **6**(2):216-225. (2013)

Paper 36 (Reference #191): Giri, B., Gomes, A., Sengupta, R., Banerjee, S., Nautiyal, Y., Sarkar, F.H., Majumdar, A.P.N. Curcumin synergizes the growth inhibitory properties of Indian toad (*bufo melanostictus Schneider*) skin-derived factor (BM-ANF1) in HCT-116 colon cancer cells. *Anticancer Res* **29**(1):395-402 (2009)

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Paper 38 (Reference #271): Raffoul, J.J., Wang, Y., Kucuk, O., Forman, J.D., Sarkar, F.H., Hillman, G.G. Genistein inhibits radiation-induced activation of NF-κB in prostate cancer cells promoting apoptosis and G2/M cell cycle arrest. *BMC Cancer* **26**(6):107- (2006)

Paper 39 (Reference #198): Ali, S., Varghese, L., Pereira, L., Tulunay-Ugur, O.E., Kucuk, O., Carey, T.E., Wolf, G.T., Sarkar, F.H. Sensitization of squamous cell carcinoma to cisplatin induced killing by natural agents. *Cancer Letters* **278:** 201–209 (2009)

Paper 40 (Reference #291): Ma, J., Zhang, Q., Chen, S., Fang, B., Yang, Q., Chen, C., Miele, L., Sarkar, F.H., Xia, J., Wang, Z. Mitochondrial dysfunction promotes breast cancer cell migration and invasion through HIF1a accumulation via increased production of reactive oxygen species. *PLoS One.* **8**(7):e69485 (2013)

Paper 41 (Reference #292): Li, Y., Ahmed, F., Ali, S., Philip, P.A., Kucuk, O., Sarkar, F.H. Inactivation of Nuclear Factor κB soy isoflavone genistein contributes to increased apoptosis induced by chemotherapeutic agents in human cancer cells. *Cancer Res* **65**(15): 6934-6942 (2005)

Paper 42 (Reference #026): Patzkó, Á., Bai, Y., Saporta, M.A., Katona, I., Wu, X., Vizzuso, D., Feltri, L.M., Wang, S., Dillon, L.M., Kamholz, J., Kirschner, D., Sarkar, F.H., Wrabetz,L., Shy, M.E.

Curcumin derivatives promote Schwann cell differentiation and improve neuropathy in R98C CMT1B mice. Brain 135:3551–3566 (2012)

FROM HERE ON, THIS LIST IS ORDERED BY SEQUENTIAL **REFERENCE #'S**

Paper 69 (**Reference #099**): Wang, Z., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Gunn, J.R., Kong, D., Bao, B., Ali, S., Gao, J., Mohammad, R.M., Miele, L., Korc, M., Sarkar, F.H. Activated K-ras and INK4a/Arf deficiency cooperate during the development of pancreatic cancer by activation of Notch and NF-κB signaling pathways. PLoS ONE 6(6): e20537, (2011)

Paper 43 (**Reference #107**): Bao, B., Wang, S., Ali, S., Kong, D., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Miele, L., Sarkar, F.H. Notch-1 induces epithelial–mesenchymal transition consistent with cancer stem cell phenotype in pancreatic cancer cells. Cancer Letters 307(1): 26–36 (2011)

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Paper 44 (**Reference #118**): Maitah, M.A., Ali, S., Ahmad, A., Gadgeel, S., Sarkar, F.H. Up-regulation of sonic hedgehog contributes to TGF-b1-induced epithelial to mesenchymal transition in NSCLC Cells. PLoS ONE 6 (1): e16068 (2011)

Paper 45 (**Reference #120**): Kanwar, S.S., Yu, Y., Nautiyal, J., Patel, B.B., Padhye, S., Sarkar, F.H., Majumdar, A.P.N. Difluorinated-curcumin (CDF): a novel curcumin analog is a potent inhibitor of colon cancer stem-like cells. Pharm Res 28:827-838 (2011)

Paper 46 (**Reference #139**): Wang, Z., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Kong, D., Wojewod, C., Miele, L., Sarkar, F.H. , Down-Regulation of Notch-1 is associated with Akt and FoxM1 in inducing cell growth inhibition and apoptosis in prostate cancer cells. Journal of Cellular Biochemistry 112:78–88 (2011)

Paper 47 (**Reference #149**): Banerjee, S., Azmi, A.S., Padhye, S., Singh, M.W., Baruah, J.B., Philip, P.A., Sarkar, F.H., Mohammad, R.M. Structure-activity studies on therapeutic potential of thymoquinone analogs in pancreatic cancer. Pharm Res 27: 1146–1158 (2010)

Paper 76 (**Reference #157**): Wang, Z., Li, Y., Ahmad, A., Banerjee, S., Azmi, A. S., Kong, D., Li, Y., Sarkar, F. H. FoxM1 is a novel target of a natural agent in pancreatic. Pharm Res 27:1159–1168 (2010)

Paper 72 (**Reference #167**): Wang Z, Li Y, Banerjee S, Kong D, Ahmad A, Nogueira V, Hay N, Sarkar FH. Down-regulation of Notch-1 and Jagged-1 inhibits prostate cancer cell growth, migration and invasion, and induces apoptosis via inactivation of Akt, mTOR, and NF-kappaB signaling pathways. J Cell Biochem. 109(4):726-736. (2010)

Paper 48 (**Reference #177**): Majumdar, A.P.N., Banerjee, S., Nautiyal, J., Patel, B.B., Patel, V., Du, J., Yu, Y., Elliott, A.A., Levi, E., Sarkar, F.H., Curcumin synergizes with resveratrol to inhibit colon cancer. Nutrition and Cancer, 61(4), 544–553 (2009)

Paper 49 (**Reference #186**): Banerjee, S., Kaseb, A.O., Wang, Z., Kong, D., Mohammad, M., Padhye, S., Sarkar, F.H., Mohammad, R.M. Antitumor activity of gemcitabine and oxaliplatin is augmented by thymoquinone in pancreatic cancer Cancer Res 69:5575-5583 (2009).

Paper 50 (**Reference #193**): Ali, S., Al-Sukhun, S., El-Rayes, B.F., Sarkar, F.H., Heilbrun, L.K., Philip, P.A., Protein kinases C isozymes are differentially expressed in human breast carcinomas. Life Sciences 84 766–771 (2009)

Paper 51 (**Reference #196**): Gadgeel, S.M., Ali, S., Philip, P.A., Wozniak, A., Sarkar, F.H. Genistein enhances the effect of epidermal growth factor receptor tyrosine kinase inhibitors and inhibits nuclear factor kappa B in cell lung cancer cell lines. Cancer 115:2165–2176 (2009)

Paper 52 (**Reference #213**): Li, Y., Wang, Z., Kong, D., Li, R., Sarkar, S.H., Sarkar, F.H. Regulation of Akt/FOXO3a/GSK-3β/AR signaling network by isoflavone in prostate cancer cells. J Biological Chem 283(41) 27707–27716 (2008)

Paper 53 (**Reference #217**): Ali, S., Banerjee, S., Ahmad, A., El-Rayes, B.F., Philip, P.A., Sarkar, F.H. Apoptosis-inducing effect of erlotinib is potentiated by 3,3'-diindolylmethane *in vitro* and *in vivo* using an orthotopic model of pancreatic cancer. Mol Cancer Ther 7, 1708-1719 (2008)

Paper 54 (**Reference #226**): Wang, Z., Yu, B.W., Rahman, K.M.W., Ahmad, F., Sarkar, F.H. Induction of growth arrest and apoptosis in human breast cancer cells by 3,3-diindolylmethane is associated with induction and nuclear localization of $p27^{kip}$. Mol Cancer Ther 7(2): 341–349 (2008)

Paper 55 (**Reference #231**): Wang, Z., Kong, D., Banerjee, S., Li, Y., Adsay, N.V., Abbruzzese, J., Sarkar, F.H. Down-regulation of platelet-derived growth factor-D inhibits cell growth and angiogenesis through inactivation of Notch-1 and Nuclear Factor-κB signaling. Cancer Res 67:11377-11385 (2007b)

Paper 56 (**Reference #234**): Gadgeel, S.M., Ali, S., Philip, P.A., Ahmed, F., Wozniak, A., Sarkar, F.H. Response to dual blockade of epidermal growth factor receptor (EGFR) and cycloxygenase-2 in nonsmall cell lung cancer may be dependent on the EGFR mutational status of the tumor. Cancer 110: 2775–2784 (2007)

Paper 57 (**Reference #244**): Banerjee, S., Hussain, M., Wang, Z., Saliganan, A., Che, M., Bonfil, D., Cher, M., Sarkar, F.H. *In vitro* and *in vivo* molecular evidence for better therapeutic efficacy of ABT-627 and taxotere combination in prostate cancer. Cancer Res 67(8):3818–3826 (2007)

Paper 58 (**Reference #247**): Raffoul, J.J, Banerjee, S., Singh-Gupta, V., Knoll, Z.E., Fite, A., Zhang, H., Abrams, J., Sarkar, F.H., Hillman, G.G. Down-regulation of apurinic/apyrimidinic endonuclease 1/Redox Factor-1 expression by soy isoflavones enhances prostate cancer radiotherapy In vitro and In vivo. Cancer Res 67(5): 2141-2149 (2007)

Paper 59 (**Reference #257**): Rahman, K.M.W., Sarkar, F.H., Banerjee, S., Wang, Z., Liao, D.J., Hong, X., Sarkar, N.H. Therapeutic intervention of experimental breast cancer bone metastasis by indole-3-carbinol in SCID-human mouse model. Mol Cancer Ther 5: 2747-2756 (2006)

Paper 60 (**Reference #258**): El-Rayes, B.F., Ali, S., Ali, I.F., Philip, P.A., Abbruzzese, J., Sarkar, F.H. Potentiation of the effect of erlotinib by genistein in pancreatic cancer: The role of Akt and Nuclear Factor-κB. Cancer Res 66:10553-10559 (2006)

Paper 61 (**Reference #263**): Zhang, Y., Wang, Z., Ahmed, F., Banerjee, S., Li, Y., Sarkar, F.H. Down-regulation of Jagged-1 induces cell growth inhibition and S phase arrest in prostate cancer cells. International J. Cancer 119: 2071-2077 (2006a)

Paper 62 (**Reference #267**): Barve, V., Ahmed, F., Adsule, S., Banerjee, S., Kulkarni, S., Katiyar, P., Anson, C.E., Powell, A.K., Padhye, S., Sarkar, F.H. Synthesis, molecular characterization, and biological activity of novel synthetic derivatives of chromen-4-one in human cancer cells J. Med. Chem 49, 3800-3808 (2006)

Paper 63 (**Reference #272**): Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. Notch-1 down-regulation by curcumin is associated with the inhibition of cell growth and the induction of apoptosis in pancreatic cancer cells. Cancer 106:2503–2513 (2006b)

Paper 64 (**Reference #277**): Wang, Z., Zhang, Y., Li, Y., Banerjee, S., Liao, J., Sarkar, F.H. Down-regulation of Notch-1 contributes to cell growth inhibition and apoptosis in pancreatic cancer cells. Molecular Cancer Ther 5(3):483–493 (2006c)

Paper 65 (**Reference #278**): Wang, Z., Banerjee, S., Li, Y., Rahman, K.M.W., Zhang, Y., Sarkar, F.H. Down-regulation of Notch-1 inhibits invasion by inactivation of nuclear factor-κB, vascular endothelial growth factor, and matrix metalloproteinase-9 in pancreatic cancer cells. Cancer Res 66(5): 2778-2784 (2006d)

Paper 66 (**Reference #280**): Mohammad, R.M, Banerjee, S., Li, Y., Aboukameel, A., Kucuk, O., Sarkar, F.H. Cisplatin-induced antitumor activity is potentiated by the soy isoflavone genistein in BxPC-3 pancreatic tumor xenografts. Cancer 106:1260–1268 (2006)

Paper 67 (**Reference #282**): Zhang, Y., Banerjee, S., Wang, Z., Xu, H., Zhang, L., Mohammad, R., Aboukameel, A., Adsay, N.Z., Che, M., Abbruzzese, J.L., Majumdar, A.P.N., Sarkar, F.H. Antitumor activity of epidermal growth factor receptor-related protein is mediated by inactivation of ErbB receptors and Nuclear Factor-κB in pancreatic cancer. Cancer Res 66(2): 1025-1032 (2006b)

Paper 68 (**Reference #284**): Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. Inhibition of nuclear factor κB activity by genistein is mediated *via* Notch-1 signaling pathway in pancreatic cancer cells. Inter. J. Cancer 118, 1930–1936 (2006e)

Paper 70 (**Reference #293**): Rahman, K.M.W., Ali, S., Aboukameel, A., Sarkar, S.H., Wang, Z., Philip, P.A., Sakr, W.A., Raz, A. Inactivation of NF-KB by 3,3'-diindolylmethane contributes to increased apoptosis induced by chemotherapeutic agent in breast cancer cells. Mol Cancer Ther 6(10), 2757-2765 (2007) **(Not Dr. F.H Sarkar)**

Paper 73 (**Reference #296**): Bao B, Ali S, Ahmad A, Li Y, Banerjee S, Kong D, Aboukameel A, Mohammad R, Van Buren E, Azmi AS, Sarkar FH. Differentially expressed miRNAs in cancer-stem-like cells: markers for tumor cell aggressiveness of pancreatic cancer. Stem Cells Dev. 23(16):1947-1958 (2014)

Paper 74 (**Reference #297**): Bao B, Azmi A, Aboukameel A, Ahmad A, Bolling-Fischer A, Sethi S, Ali S, Li Y, Kong D, Banerjee S, Back J, Sarkar FH. Pancreatic cancer stem-like cells display aggressive behavior mediated via activation of FoxQ1. J Biol Chem (2014)

Paper 75 (**Reference #301**): Lian F, Li Y, Bhuiyan M, Sarkar FH. p53-independent apoptosis induced by genistein in lung cancer cells. Nutr Cancer. 33(2):125-131 (1999)

Patent Application

WO 2011/126544 A2 10-967 PCT_US2011_000561
Thymoquinone Analogs for the Treatment of Pancreatic Cancer
(File: ramzi lecture.tq presentation.ppt, dated August 13, 2008)

Dissertation

Wang, Zhiwei (2006) Notch Signaling: A Potential Therapeutic Target for Pancreatic Cancer. (Doctoral Dissertation) Wayne State University. UMI Number: 3243059

V.

Institutional Investigation Analysis

V. INSTITUTIONAL INVESTIGATION: ANALYSIS

All the *RESPONSES, ANALYSES and CONCLUSIONS* are presented in Section A.

The *ANALYSES* are ordered generally by Paper (or Reference #) or Grant application, and then by allegation number, except when Papers (References) or allegations are more appropriately discussed together with other allegations with which they are connected (e.g., by duplication of images across papers). Other sets of analyses are grouped together that have the same images duplicated, manipulated, and re-labeled in different figures across many publications and grant applications. These grouped analyses are:

The *RESPONSES* and *ANALYSES* reference specific slides in Powerpoint files which contain the images upon which the investigation of allegations is based. The images are from the publications, grants, responses, files on sequestered computers and drives, and scans of lab notebook pages and films. The .pptx files use animation which is visible in 'presentation mode' to highlight key features of the analyses, such as demonstrating how images are identical and/or have been manipulated.
These .pptx files are:

DIO4915 Image File A	slides 1 - 179	Papers 1 to 12, & 24
DIO4915 Image File B	slides 180 - 357	Papers 13 to 19
DIO4915 Image File C	slides 358 - 534	Papers 20 to 50
DIO4915 Image File D	slides 535 - 682	Papers 51 to 65
DIO4915 Image File E	slides 684 - 744	Papers 66 to 75

- numbers 683, and 745 through 800 are not used for slides

DIO4915 Image File F	slides 801 - 846	Notch-1
DIO4915 Image File G	slides 847 - 941	Rb bands
DIO4915 Image File H	slides 942 - 1046	β-Actin
DIO4915 Image File I	slides 1047 - 1099	Grants and Patent

Section A.

Dr. Fazlul H. Sarkar

Section A.

Papers 1 & 24

Paper 1 (Reference #179): Ahmad A, Wang Z, Kong D, Ali S, Li Y, Banerjee S, Ali R, Sarkar FH (2010) FoxM1 down-regulation leads to inhibition of proliferation, migration and invasion of breast cancer cells through the modulation of extra-cellular matrix degrading factors. *Breast Cancer Res Treat* **122**: 337-46.

Publication History: Received July 2, 2009; Accepted September 24, 2009; Published online October 8, 2009
NIH Funding: None cited

Paper 24 (Reference #182): Ahmad A, Kong D, Wang Z, Sarkar SH, Banerjee S, Sarkar FH (2009) Down-regulation of uPA and uPAR by 3,3'-diindolylmethane contributes to the inhibition of cell growth and migration of breast cancer cells. *J Cell Biochem* **108**: 916-25.

Publication History: Received June 6, 2009; Accepted July 24, 2009; Published online August 19, 2009
NIH Funding: 5R01CA108535-06 (PI: F.H Sarkar)

NOTE: Paper 1 and Paper 24 are considered together because the allegations pertain to copying between these two publications.

Allegation 1: In Figure 5 of Paper 1, two overlapping micrograph images (i.e. same field of cells) were used to represent both the "NS" condition for SUM149 cells in a migration assay (Figure 5A) and the "NS" condition for MDA-MB-231 cells in an invasion assay (Figure 5B).

Allegation 2: In Figure 6C of Paper 1, two overlapping micrograph images (i.e. same field of cells) were used to represent both the "NS" and "UC/FS" conditions for SUM149 cells in an invasion assay.

Allegation 44: In Figure 5A of Paper 1 and Figure 5C of Paper 24, two overlapping micrograph images (i.e. same field of cells) were used in two different manuscripts to represent either the "NC" condition for SKBR3 cells (Paper 1) or the "uPA" condition for MCF-7 cells (Paper 24).

RESPONSE:

In his response (Response Letter-Final-Nov 27th-2012.pdf), Dr. Sarkar agreed that the overlapping images were inappropriate since the same field of cells cannot be representative of either different cell lines or different conditions. He indicated that the micrograph images for the three figures from Paper 1 and Paper 24 were all acquired on the same day and that mistakes likely had occurred. Relevant pages of Dr. Ahmad's lab notebook were provided to back up this assertion (DIO4915 Image File A, slides 8 & 9). Dr. Sarkar also noted the scientific redundancy built into the invasion/migration assays, with the cell images being supported by direct fluorometric assessment for each treatment condition, and that the fluorescence measurements were generally viewed to be the more reliable of the two assessments.

This issue was also explored in depth in an interview with Dr. Ahmad (Ahmad Transcript, pp.75-130). Dr. Ahmad took full responsibility as first author for data published in both papers. But he said that since he was relatively new in Dr. Sarkar's laboratory at the time, the images for the invasion/migration assays were acquired by Zhiwei Wang. Dr. Ahmad said he set up the platings, Dr. Wang did the microscopy

(image acquisition), and Dr. Wang returned the invasion/migration plates to Dr. Ahmad for fluorometric analyses (Ahmad Transcript, pp.115-116). Dr. Ahmad said that Dr. Wang had taken two or more images per condition and then gave him the photos on a flash-drive. Dr. Ahmad testified he would "typically select the first figure," one that "...does not have to fit with the story" (Ahmad Transcript, p.50, ll.17-23), an approach he reckoned to be unbiased (extensive discussion in Ahmad Transcript, pp.118-126).

ANALYSIS:

See DIO4915 Image File A, slides 1-9.
Allegation 1, Allegation 2, and Allegation 44 from **Paper 1** and **Paper 24** are similar and share several authors including Drs. Ahmad (first author), Banerjee, Kong, Wang and Sarkar (corresponding author). In each allegation, duplicate images of the same overlapping fields of cells – either different photos of the same field of cells or re-cropped versions of the same photos – are used to represent different assays (invasion or migration), different cell types, and/or different treatment conditions. In addition, in a secondary analysis, overall fluorescence levels are measured in labeled cells eluted from the filter. These data are reported in accompanying histograms. Dr. Sarkar and Dr. Ahmad admit the images are the same (DIO4915 Image File A, slides 2-7), but that it was a mistake.

The Committee's analyses of the image files identified from the sequestered hard-drives, generally support Dr. Sarkar's and Dr. Ahmad's explanation. Consistent with Dr. Sarkar's point that four experiments all were done at the same time in November, 2008, a folder was identified (25 KCI Dec 2013\P_homes\ahmada\my documents\Aamir\results\migration\Migration_invasion_110508) with 42 .tif images which were judged, given their labels, to be the 'extra' images for these four experiments. The images that were submitted as "alternates" for the migration and invasion assays in Figure 5 and the invasion assay in Figure 6C were found in this folder:

Figure 5A: "M_149_C2.tif" & "M_149_C3.tif" (Migration- SUM149-NS)
Figure 5B: "I_231_C4.tif" & "I_231_C3.tif" (Invasion- MBA-MB-231-NS).
Figure 6C: "I_149_F_U2.tif" (SUM149 NS) & "I_149_NS2.tif" (SUM149-UC/FS);

However, the published images, including the duplicated images, are not found in this folder but instead are in other folders linked to the two papers: ("P_homes\ahmada\my documents\Aamir\papers\Published\FoxM1\Aamir\ Migration-Invasion" and "\P_homes\ahmada\my documents\Aamir\papers\Published\upA_uPAR\Breast\MigrationInvasion").
Also, the 28 published image files show "12/11/08" creation dates, while the other image files have creation dates of "11/06/08." This is consistent with Dr. Ahmad's testimony indicating perhaps that all the images were acquired on 11/06/08 and that 28 images selected for publication were subsequently "saved" with new descriptive file names to different folders. On the other hand, this discrepancy in dates and not finding originals of the published images stored with all the others in the "Migration_invasion_110508" folder created on 11/06/08, raise doubts about the source of the published images. None of the unpublished images were found to have overlapping fields of view or re-cropped versions; only the published images did.

The criterion Dr. Ahmad used to select the 28 images for publication – picking the first – is not as unbiased as he believes. Also, the 28 published images moved to another drive are generally of higher quality that the 42 unpublished images, including the "alternates" submitted in the response. Many of the unpublished images seem inappropriate for publication, being either too dim, too bright or out-of-focus. It seems quite unlikely that only clear quality images would have been the "first" ones selected and published. This suggests that images may have been selected based on image quality, including re-using and re-cropping images if it was difficult to find acceptable images for some cell lines and treatment

conditions. On the other hand, it appears that the published photos may have underestimated the magnitude of treatment effects that are depicted in the fluorescence assays.

If these are innocent mistakes, then there are a lot of mistakes – six of the 28 images published in these 3 figures show overlapping/identical fields of view. That both experiments were done on the same day may account for how the same image might be used in two papers: it does not explain re-using images in the first place. Dr. Ahmad was unable to provide a clear explanation about how the "mistakes" in these 3 allegations occurred. This high error rate lowers confidence in the validity of the other images within these figures. Mistakes, which happen to lack easily detectable overlaps, would have gone undetected.

CONCLUSION:

The Committee finds in **Allegations 1, 2** and **44** that images were re-used and re-labeled. The explanation of an honest mistake may be plausible based on some of the notebook evidence and the fact the re-used images do not appear to have enhanced the conclusions drawn from accompanying fluorescent studies. But this explanation is also in doubt given the number of "mistakes," how images were selected and re-cropped, and suspicions about Dr. Wang's role in acquiring these images. The Committee concludes that although the re-uses and re-labeling of images in **Figures 5A, 5B** and **6C** in **Paper 1** and in **Figure 5C** in **Paper 24** are part of a pattern of poor practices common to Dr. Sarkar's laboratory, in these instances, there is insufficient evidence of intentional or knowing data fabrication and/or falsification, or of reckless publishing of fabricated and/or falsified data by Dr. Sarkar. The Committee concludes there is insufficient evidence of research misconduct for **Allegations 1, 2** and **44.**

Paper 2 (Reference #045): Kong, D., Li, Y., Wang, Z., Banerjee, S., Sarkar, F.H. Inhibition of angiogenesis and invasion by 3,3'-diindolylmethane is mediated by the NF-KB downstream target genes MMP-9 and uPA that regulated bioavailability of VEGF in prostate cancer. Cancer Res 67, 3310-3319, (2007)

Publication History: Received: November 21, 2006; Revised: January 8, 2007; Accepted: January 29, 2007
NIH Funding: 5R01CA108535-03 (PI: FH Sarkar).
Other Funding: Department of Defense Prostate Cancer Research Program grant DAMD17-03-1-0042 (PI: FH Sarkar)

Allegation 3: In Figure 6B, the same picture is used to represent DMSO control and 10 μM B-DIM. The B-DIM photograph is an enhanced version of the DMSO Figure 6B.

RESPONSE:

Dr. Sarkar wrote that "Dr. Wang took more than 40 pictures for invasion assay for C4-2B cells treated with DIM or DMSO. All the Jpg files were created on Dec 6, 2005" (Response Letter-Final-Nov 27th-2012, p.5). The file names for "invasion pictures for C4-2B cells" were reported to be from DSC01063 to DSC01071 for DMSO controls, from DSC01008 to DSC01025for 10uM DIM, and from DSC01044 to DSC01062 for 25uM DIM (DIO4915 Image File A, slide 17).

Dr. Sarkar wrote that "DSC01071 and DSC01070 were mistakenly from the same picture with different area. In fact, both DSC01071 and DSC01070 were DMSO treatment. This is an honest mistake, and corrected picture for the figure is taken from DSC01009 JPG, 2005 Dec 6, 7:07pm." Dr. Sarkar concluded that: "...based on the original data and the correction of the minor error, the conclusions of this paper

remain the same. An error occurred in the final editing meaning that we used the incorrect image although this minor error has no impact on the overall data and the conclusion" (p.5).

Dr. Wang testified he did the experiment, took the photos "of the same well in the assay" and gave Figure 6B to Dr. Kong, the first author (Wang Transcript, V.1, p.280, ll.1-18; p.281, ll.9-12). Drs. Sarkar and Kong confirm this (Sarkar Transcript, V.1, p.210, ll.13-17; Kong Transcript, V.1, p.164, ll.6-25). Dr. Wang explained that when he saved the photo he "labelled it B-DIM instead of DMSO" and that this was a "mistake" (Wang Transcript, V.1, p.281, ll.13-18). Dr. Sarkar was uncertain if file names include experimental conditions and said information logged in a notebook would identify "which one is control, which one is treated with what, and that's the images you have..." (Sarkar Transcript, V.1, p.212, ll.14 to p.217, ll.6).

Dr. Wang explained how he wrote a list of automatically-generated file names of photo-micrographs on a piece of paper in one room, then "...just move this picture...", presumably on a thumb-drive, to another floor and into computer folders with treatment names (e.g., "DMSO"). He did not keep the paper or record that information elsewhere after files were moved (Wang Transcript, V.1, p.285, ll.5 to p.285, ll.17). Dr. Wang testified that he knows the source files are from a different group "...according to that paper" which he admitted he threw out years before, based on which folder the files were in (Wang Transcript, V.1, p.285, ll.20 to p.286, ll.5). He did not answer a direct question about how he could prove what is correct when "... there is no record." Yet Dr. Wang was confident he found the correct file (Wang Transcript, V.1, p.286, ll.5 to p.288, ll.4).

Dr. Kong testified that Dr. Sarkar decided to put Figure 6B into the publication and that she had not seen the raw data, did not know how the duplication happened, nor had she examined the figure (Kong Transcript, V.1, p.165, ll.1-19; p.168, ll.24 to p.169, ll.16). Dr. Kong said it was her responsibility as first author "...in Dr. Sarkar's lab ... for what goes into the paper...", but that other authors who provide data should also be responsible (Kong Transcript, V.1, p.169, ll.19 to p.170, ll.3).

ANALYSIS:

See DIO4915 Image File A, slides 12-20.
In Figure 6B, the panels labeled "DMSO" and "10 µg/m B-DIM" are different photos of the same assay well, consistent with Dr. Wang's testimony (DIO4915 Image File A, slides 14-16). Both files are located in the "DMSO" folder for C4-2B cells. There are two copies of DSC01070.jpg, one on "E:\OriginalData\20 Jerry Wang HP USB\Kong DIM paper\" and the other in a subdirectory: "E:\OriginalData\20 Jerry Wang HP USB\Kong DIM paper\C4-2B invasion\Treatment with DIM\Control," both dated 12\08\2005. This is a thumb drive which contradicts Dr. Wang's testimony that he moved the image files from where the photos were taken to a lab computer on a different floor. The only other copies with these names are located on the "P:\" share drive and are dated in November of 2012 when Dr. Sarkar composed his first response to these allegations.

The images submitted in response are shown on slides 17 and 18 in DIO4915 Image File A. Three files found on "E:\DataSubmittedWithFSInquiry\Dr. Kong's All data\" named "2005-12-08 13.08.20.jpg," "2005-12-08 13.07.20.jpg" and "2005-12-06 15.07.27" are identical to files "DSC01070.jpg," "DSC01071.jpg" and "DSC01009.jpg," respectively, that is, the images published as "DMSO" and "10µmol/L DIM" in Figure 6B, and a "corrected" version of the "10µmol/L DIM" photo. There is no explanation why the files Dr. Sarkar submitted with his response have different names than those listed in his response. To validate the claim of a "minor error," the Committee searched also for the original image of the "25 µmol/L DIM" panel in Figure 6B. The file "DSC01008.jpg," when cropped, matches the published photo (DIO4915 Image File A,

slide 20). However, this file was found in the folder named "10um DIM" on "E:\OriginalData\20 Jerry Wang HP USB\Kong DIM paper\C4-2B invasion\Treatment with DIM\10um DIM\" and not in the "25um DIM" folder. An identical image is found in the file named "2005-12-06 15.07.18.jpg" on "E:\DataSubmittedWithFSInquiry\Dr. Kong's All data\." This 10μmol/L panel was also cropped and enlarged to publish a relatively smaller portion of the whole field of view than in the "DMSO" and "10μmol/L DIM" photos (DIO4915 Image File A, slide 20), thus giving the false impression of relatively fewer (and larger) fluorescing cells than were actually present (DIO4915 Image File A, slides 19-20). This published image for the 25μmol/L condition, and also one submitted by Dr. Sarkar and Dr. Kong as part of a correction to a "mistake" in Figure 6B, is itself manipulated to misrepresent the dose-dependent effects of B-DIM. A simple comparison of the "corrected" 10μmol/L image with the proportionally cropped, so-called "25μmol/L" image outlined in yellow (DIO4915 Image File A, slide 20) shows them to be very similar, and not showing the B-DIM-induced decrease in cell invasion reported in Paper 2.

No photo files have identifying treatment information in their names and this contradicts Dr. Wang's testimony that he labeled files "B-DIM instead of DMSO" by mistake. (These files are in a folder labeled "DIM" and not "B-DIM.") Although there are numerous .tif and .jpg files with examples of these pictures apparently prepared well before the submission of the manuscript, there is no evidence or record that can verify that any file in the directories relevant to Figure 6B or in any lab notebook are actually photos of the correct treatment group.

CONCLUSION:

The Committee finds, in **Allegation 3,** that it is not plausible only a "minor error" was made in selecting a photo for **Figure 6B** in **Paper 2** because using a wrong photo is repeated and there is no record to verify what treatments the images actually represent. The Committee also finds that the 25μmol/L image was intentionally cropped and misrepresents the effects of B-DIM. The Committee concludes that the lack of information in the research record, which may have made an "error" unavoidable and makes a validated correction impossible, is directly related to the poor record keeping common to Dr. Sarkar's laboratory. Dr. Sarkar also submitted fabricated and/or falsified results to the Committee in his response. The Committee concludes that it is highly unlikely that the selection and manipulation of images was a mistake. Therefore, the Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 6B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 4: In Figures 4C and 4D, the Western blots for the MMP-9 bands appear the same and are labelled for different cells: LNCaP (Figure 4C) and C4-2B (Figure 4D). The MMP-9 bands for C4-2B cells may have been pasted in. It appears from the spacing between the β-actin bands that those bands do not correspond to the same gel as the MMP-9 bands.

Note: The same figure is used in grant proposal 1 R01 CA131151-01 (File: 2007, 02 01 – Sarkar Proposal 14114-001.pdf)

RESPONSE:

Dr. Kong provided material for a response Dr. Sarkar submitted in February of 2014. They wrote that "in the figure 4C and 4D, the image are incorrect..." Scans and figures offered in correction were submitted in February, 2014, in file "Kong-Response.pptx" (DIO4915 Image File A, slides 21 & 22). Related files were

submitted in November, 2012 in a thumb drive and directory named "E:\DataSubmittedWithFSInquiry\Dr. Kong's All data\."

ANALYSIS:

See DIO4915 Image File A, slides 21-25.
Drs. Sarkar and Kong admit the MMP-9 bands are the same image, as alleged. Visual evaluation of enlarged MMP-9 bands shows that the images are manipulated duplicates. Image files (e.g., .ppt, .psd, .tif) that were apparently used to produce the final published figures were found on drive: "E:\OriginalData\4\[NTFS]\Documents and Settings\Kongd\MyDocuments\kdj\..." in folders in subdirectories named: "\excel", "\Paper", "\powerpoint" and "\Scan" (DIO4915 Image File A, slide 22). However, the scans of Western blots identifiable as source(s) of either the original MMP-9 or β-actin bands, or of those submitted as "corrected" versions, were not found among the files in the "Scan\MMP-9" subdirectory. File "020606MMP-9.tif" appears to be a cropped copy of part of another image (020606MMP-9a.tif) and that was highly manipulated by masking or "brushing" out much of the background staining (DIO4915 Image File A, slide 22). This is clear because brush marks, such as are used in photoshop, are evident at the margins of the bands. Dr. Kong testified that she uses photoshop (Kong Transcript, V.1, p.29, ll.9-19; p.98, ll.20 to p.99, ll.12) although she later said she did not (Kong Transcript, V.2, p.198 to 202).

Dr. Sarkar and Dr. Kong give no explanation for how "the image are incorrect" in Figures 4C and 4D, and did not indicate if the "corrected" scans they submitted were from original or repeated experiments. The submitted scans were not labeled so it could not be determined if they were in fact the correct gel, or that the β-actin bands were from the same gel (DIO4915 Image File A, slide 23). No effort was made to justify the conclusions or how the quantification was done. The relative intensities of MMP-9 protein expression in the C4-2B cells between the "MMP-9" and "MMP-9 + B-DIM" bands are different in published Figure 4D compared to the "corrected" images (DIO4915 Image File A, slides 24 & 25).

Examination of the lab notebook for 2006 (Exhibit 06 – DIO 4915 Kong#2.pdf) did not confirm that the submitted Western blots were in fact run on the date indicated. The notebook describes another experiment. Even if the gel is correct, the "corrected" figure substantially changes the conclusions of the publication that MMP-9 transfection significantly increases VEGF levels in LNCaP and C4-2B cells and that B-DIM "...dramatically reduced the release of VEGF..." and "... repressed MMP-9 expression..." in transfected cells (p.3314).

CONCLUSION:

The Committee finds in **Allegation 4** that the published **Figures 4C** and **4D** in **Paper 2** are manipulated copies of some common image: Dr. Sarkar and Dr. Kong admitted that the figures were not correct. There is clear evidence of MMP-9 Western blots being "photoshopped." The Committee was provided insufficient evidence that the blots submitted as a correction are correct, and the responses indicate that Dr. Sarkar (and Dr. Kong and Dr. Wang), likely do not know what the correct data are. The Committee finds that the "corrected" figure does not reflect the results published in Paper 2 about the effects of B-DIM. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figures 4C and 4D in Paper 2, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 3 (Reference #262): Wang, Z., Sengupta, R., Banerjee, S., Li, Y., Zhang, Y., Rahman, K.M.W., Aboukameel, A., Mohammad, R., Majumdar, A.P.N., Abbruzzese, J.L., Sarkar, F.H. Epidermal growth factor receptor–related protein inhibits cell growth and invasion in pancreatic cancer. *Cancer Res*, 66, 7653-7660, (2006).

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NIH Funding: 1R01CA101870-02 (PI: F.H. Sarkar) and P20CA101936-02 (PI of sub contract: F.H. Sarkar; P20 PI/PD: J. Abbruzzese – Specialized Programs of Research Excellence (SPORE) grant to University of Texas, MD Anderson Cancer Center)
Other Funding: Puschelberg Foundation

Allegation 5: In Figure 2C, identical bands appear to have been used to indicate results from different experimental conditions (DIO4915 Image File A, slide 27), and in Figure 2D, a heavy band appears to have been overlaid/pasted onto lane 2 in the middle Notch row (DIO4915 Image File A, slide 28).

Allegation 5a: In the Figure 2C, Hes-1 panel lanes 3 and 5 appear to be duplicates flipped vertically. Figure 2D is cut and pasted in all columns for the middle row Notch-1 bands (i.e., per caption, those treated with HB-EGF). Lanes 1 to 3 of the top Notch-1 band in Figure 2D appear to be the same image (manipulated) as lanes 2 to 4 in the Hes-1 band in Figure 2C. Lanes 4 & 5 of the top Notch-1 band in Figure 2D seem constructed from images in lanes 5 & 6 in the Hes-1 band in Figure 2C. Finally, the Hes-1 and Cyclin-D1 bands in Figure 2C appear to be duplicated in Reference #277 and re-labeled as Cyclin-D1 and Bcl-X_L, respectively (DIO4915 Image File A, slide 29).

Note: For Paper 3, see also several other allegations, including Allegations 74 & 132; Allegations 80a & 80b (Notch-1 duplications); Allegations 82a & 82b (Rb band duplications), Allegations 89a, 91a, 93a & 93b (β-actin duplications), and more.

RESPONSE:

Regarding **Allegation 5**, Dr. Sarkar admits in his written response that three of the four images published in Figure 2C are not authentic, but instead are "put together" from separate blots, writing further that such practice is quite common (Response Letter-Final-Nov 27th-2012.pdf, p.6). The three original blots that were spliced together to yield the published Cyclin D1 image were provided, while original images for the published Hes-1 and Notch-1 images were not ("raw data is missing from our record due to computer break down"; Wang-Response-1.pptx, slide 1). Dr. Sarkar instead provides results from "repeat" experiments for Hes-1 and Notch-1, purportedly done contemporaneously with the originals in December of 2005 (Response Letter-Final-Nov 27th-2012.pdf, p.6). Using these "repeat" blots, Dr. Sarkar claimed that such images can be spliced together (as the published images presumably were) to yield images similar to those published in Figure 3C (DIO4915 Image File A, slide 30). Dr. Sarkar also provides scans of blots that he purports to be more 'repeats' of this experiment, also done contemporaneously with the published images. Finally, using these "repeat" blots, Dr. Sarkar assembles a new Figure 2C that he writes could be used as "an alternate experiment and as a proof of repeatable data". He concludes: "the data published remains the same and there was no error in the published figure." (Response Letter-Final-Nov 27th-2012.pdf, p.6).

Regarding **Allegation 5a**, Dr. Sarkar and Dr. Wang wrote that: "We were unable to locate the original autoradiograms for Figure 2C (raw data is missing from our record due to computer break down); however we found a duplicate autoradiogram from the same set of replicate experiments showing similar results,

and to our judgment there is no manipulation. No further action would be required" (Wang-Response-1.pptx, slide 1). See DIO4915 Image File A, slides 31& 32; same three images as submitted in November, 2012). In response to **Allegation 5a**, Dr. Sarkar provides raw film scans that correspond to the two Notch-1 images of Figure 2D (Wang-Response.ppt; Response Letter (2nd)-Feb. 4th-2014). Dr. Sarkar testified that he agrees portions of these images were inappropriately re-used between Figures 2C and 2D (Sarkar Transcript, V.2, pp.377-394) to represent different cell lines (Sarkar Transcript, V.2, p.393, ll.13-15). Dr. Wang testified that the images in Figure 2D were correct and that the same images were copied and reused in Figure 2C (Wang Transcript, V.1, p.207, ll.18; p.213, ll.12; p.224, ll.20-22). Dr. Sarkar and Dr. Wang also wrote that, "Figure 2D has no mistake. No errors, so no further action would be required." They submitted images that purported to be original images used for the two Notch-1 lanes published in Figure 2D (DIO4915 Image File A, slide 36).

ANALYSIS:

See DIO4915 Image File A, slides 26-41.
Simple visual inspection shows both clear cut and paste marks and evidence that images of individual gel bands and multi-band blot images were re-used to represent different proteins and treatments both between Figures 2C and 2D (DIO4915 Image File A, slide 27-29) and elsewhere (e.g., Allegation 74). The captions in Figures 2C and 2D show identical bands were re-labeled as different cell lines and/or conditions. The Committee found no original images or lab records with data supporting the experiment conducted for Figure 2C.

The inability of Drs. Sarkar and Wang to provide raw data for two of the three images in Figure 2C raises doubt about the validity of all submitted images. A computer breakdown does not explain failing to provide original films. Drs. Sarkar and Wang submitted two sets of alternate images that they claim substantiate the published results for Notch-1, Hes-1 and Cyclin D1 in Figure 2C. The first set has 2-lane segments corresponding to "C" and "T" treatment conditions for each cell line (DIO4915 Image File A, slide 30). These scans appear to derive from different gels or blots. Dr. Sarkar's response documents how the three images in Figure 2C were fabricated from three different scans by cropping and re-assembling bands to yield the published image (DIO4915 Image File A, slide 31). Also, the labels identifying cell types and treatment conditions in the submitted scans were typed in apparently at a later time. No scan files or films were provided, just the pdf of the response. No information about the either the original or the replacement films is provided or found in the laboratory record. The Committee concludes that presenting these three 6-lane images in Figure 2C as if they are from single Western blots is deceptive because comparing expression levels among different blots is valid only when samples are blotted on the same membrane.

A second set of images (DIO4915 Image File A, slides 31-35) purported to be repeat experiments has single rows of bands containing all three cell lines and labeled consistently with the published figure. The Committee is skeptical of Dr. Sarkar's and Dr. Wang's explanation that these images are also from experiments conducted in December 2005 since there is no information provided or found in the laboratory record to confirm where or when the images are from. The Committee finds it extremely unlikely that Dr. Wang would have taken the time to construct the original Figure 2C from multiple sources as described in the response and revealed in the *ANALYSIS* if the experiment had already been repeated in full in 2005 with Western blots with lanes already organized as published. The Committee concludes that either these images are not authentic but were created at a later time, post-publication, or as a response to these allegations, or they are not accurately labeled. Indeed, Dr. Sarkar confirmed that he had no way to validate that the autoradiograms submitted in the response were the cell lines indicated (Sarkar Transcript, V.2, p.393, ll.17).

While Dr. Wang admitted re-using images from the upper Notch-1 band in Figure 2D in the Hes-1 band in Figure 2C, he also maintained, in contradiction to Dr. Sarkar's testimony, this was a mistake rather than intentional image re-use and manipulation. The most egregious issue is the re-use of the same image to represent two different proteins in Figures 2C and 2D where a 3-lane blot labeled "Hes-1" in Figure 2C is re-labeled "Notch-1" in Figure 2D (DIO4915 Image File A, slide 39). Dr. Wang admitted to this image re-use, saying it was a mistake rather than intentional manipulation (Wang Transcript, V.1, pp.204-238). The Committee finds this explanation dubious since the images re-used in Figure 2C are highly manipulated relative to the "original" image in Figure 2D. The Committee concludes it is highly unlikely that an image that was accidentally copied and mislabeled from one figure to another would also have been re-sized, that lanes 4 and 5 would have been rotated vertically, or that the background would have been changed, as are the case between Figure 2D and 2C. Also arguing against these images being re-used as an innocent mistake, is the fact that the same images were duplicated as yet other proteins in another publication (see **Allegation 74**, where the Hes-1 & Cyclin D1 images of Figure 2C are re-used and re-labeled "Cyclin D1" & "Bcl-xL," respectively, in Figure 5 of Reference #278). Finally, an innocent mistake is not plausibly explained by deficient labeling of the original films because, as documented above (see **Allegation 5**), the Hes-1 and Cyclin D1 bands in Figure 2C are fabrications constructed by splicing together digital images.

CONCLUSION:

The Committee finds in **Allegations 5** and **5a**, that Western blot bands were copied, re-ordered, re-labeled and manipulated in and between **Figures 2C** and **2D** in **Paper 3** and misrepresent the results. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published these fabricated and/or falsified data, and that in each instance this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 5b: In Figure 6, the MMP-9 panel, lanes 3 and 4 appear to be identical images (DIO4915 Image File A, slide 42). This allegation is addressed thoroughly in Allegation 80b.

Allegation 6: In Figure 4, the circled images are identical but are presented as showing results for different experimental conditions. The two images are labeled as "Control HPAC" and "ERRP HPAC" respectively (DIO4915 Image File A, slide 43).

Note: For Paper 3, see also Allegation 132 (re-use of this same image in Paper 32).

RESPONSE:

Regarding **Allegation 6**, Dr. Sarkar wrote that the "invasion assay for three pancreatic cancer cells is shown including BxPC-3, HPAC, and PANC-1 treated with ERRP. Dr. Wang took more than 50 pictures for this assay. All the Jpg files were created on Dec 6, 2005. 'Before HPAC Control invasion' was taken from DSC00994, while "HPAC ERRP invasion' was taken from DSC00990. The mistake here is that DSC00994 and DSC00990 were from the same picture with different area. In fact, both DSC00994 and DSC00990 were HPAC ERRP treatment. Now for the Fig 4 middle panel the correct 'HPAC Control invasion' picture is shown which is taken from DSC01085 JPG" (Response Letter-Final-Nov 27th-2012.pdf, p.7). Dr. Sarkar's response included information about the labeling of the photos taken of this experiment:

"Invasion for HPAC control: DSC01078, DSC01079, DSC01084, DSC01085
Invasion for HPAC ERRP: from DSC00990 to DSC01007."

Proposed new images for both the Control and ERRP images, as well as a table showing the relative fluorescence units of these images was included in the response (DIO4915 Image File A, slide 44).

Dr. Sarkar wrote, "We have all the original data that was used to create the figures and alternate data which corroborate the figure in the original paper. The conclusions in this paper remain the same, although we do believe that correction request for figures (as shown above) could be sent to the journal should the committee recommend to take such action" (Response Letter-Final-Nov 27th-2012.pdf, p.7).

ANALYSIS:

See DIO4915 Image File A, slides 42-44.
Simple visual inspection shows clearly that the images labeled as "Control HPAC" and "ERRP HPAC" in Figure 4 overlap indicating that both are from the same field of cells and therefore cannot represent different treatments (DIO4915 Image File A, slide 43). Dr. Sarkar admitted that the images were both of the ERRP-treated cells in his November 2012 response. Dr. Wang also testified that both HPAC images in Figure 4 were images of the ERRP-treated HPAC cells (Wang Transcript, V.1, p.97-98). The image file names bear no identifying information and Dr. Sarkar produced lab notebooks linking the files or the images in the files with this experiment. However, the file provided as "the correct 'HPAC Control invasion' picture" ("DSC01085.jpg," dated 12/6/2005) was found in a directory named "E:\OriginalData\20 Jerry Wang HP USB\Wang ERRP paper\HPAC Control\" which is consistent with the experiment (DIO4915 Image File A, slide 44). Finally, the published control image underestimated the hypothesized effect of ERRP treatment.

CONCLUSION:

The Committee makes no determination of research misconduct for **Allegation 5b** (see Allegation 80b). The Committee finds in **Allegation 6**, that images in **Figure 4** in **Paper 3** were re-labeled and apparently manipulated copies of the same culture plate. The Committee finds that while this re-use and re-labeling of images is a common practice in Dr. Sarkar's laboratory, in this instance there is insufficient evidence of research misconduct by Dr. Sarkar.

Allegation 7: The Notch 1 (Figure 5C) and MMP-9 (Figure 6) bands appear to be identical, and the MMP-9 image flipped horizontally and the contrast altered (DIO4915 Image File A, slide 45).

RESPONSE:

Regarding **Allegation 7**, Dr. Sarkar wrote that the "Fig 5C is correct and is taken from "Notch cDNA and ERRP.jpg. The Western blotting bands for MMP-9 in Fig-6 appear to be an honest mistake. We did the Western blotting for Fig 5C and Fig 6 (MMP-9) at the same time. Both Fig 5C and MMP-9 on Fig-6 were marked as 1, 2, 3 and 4. This mix-up could be due to the use of the same markers. Now, we provide the correct figure for Fig 6 MMP-9 as shown (corrected Fig-6). Fig 6 MMP-9 is taken from 'MMP-9 in vivo. JPG'" (Response Letter-Final-Nov 27th-2012.pdf, p.7). Dr. Sarkar provided an alternative Figure 6 (DIO4915 Image File A, slide 46).

Dr. Sarkar wrote, "We have all the original data that was used to create the figures and alternate data which corroborate the figure in the original paper. The conclusions in this paper remain the same, although we do believe that correction request for figures ... could be sent to the journal should the committee recommend to take such action" (Response Letter-Final-Nov 27th-2012.pdf, p.7).

ANALYSIS:

See DIO4915 Image File A, slides 45-46.
The Committee's analysis of the published images demonstrates that the images included as the control bands in lanes 1 and 2 of the MMP-9 band of Figure 6 have been copied, flipped, squeezed, and re-used in lanes 3 and 4 of the Notch-1 lane of Figure 5C (DIO4915 Image File A, slide 45). Dr. Sarkar stated in the November, 2012 response that the images as used in Figure 5C were corrected and that the re-use and manipulation of the images in Figure 6 was a mistake. The Committee found this explanation dubious since the images re-used in Figure 6 are highly manipulated relative to the original image in Figure 5C. The Committee finds that it is highly unlikely that an image accidentally copied and mislabeled from one figure to another would also have been re-sized and rotated vertically, or that the background would have been changed, as are the case between Figures 5C and 6. Dr. Wang testified that he did not agree that the images were the same (Wang Transcript, V.1, p.262). The Committee was not able to find original files or lab notebook records for this experiment. Moreover, the Committee has and was provided no information that allows verification of the origin of the images described as "MMP-9 in vivo.JPG" which were used in control lanes of the MMP-9 lane in the replacement figure submitted with the November 2012 response.

CONCLUSION:

The Committee finds in **Allegation 7**, that images in **Figures 5C** and **6** in **Paper 3** were copied, re-labeled and manipulated. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified data and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 4 (Reference #259): Bhuiyan, M.M.R., Li, Y., Banerjee, S., Ahmed, F., Wang, Z., Ali, S., Sarkar, F.H. (2006) Down-regulation of androgen receptor by 3,3`diindolylmethane contributes to inhibition of cell proliferation and induction of apoptosis in both hormone-sensitive LNCaP and insensitive C4-2B prostate cancer cells. *Cancer Research*, 66(20):10064-10072.

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Other Funding: DOD - DAMD17-03-1-0042 (PI: Fazlul Sarkar)
Note: Footnote says that M.M.R. Bhuiyan and Y. Li "contributed equally to this work".
Clinical Trials: Karmanos Study 2007-128, Phase II Therapeutic

Allegation 8: The complaint about **Paper 4** stated the "same β-actin control (first six lanes in B) was used in two different experiments...." Specifically, in Figure 2B, the six left lanes of the β-actin band in the top panel for a time course study were copied and manipulated and relabeled as the six lanes of the dose-response study in the middle panel of Figure 2B (DIO4915 Image File A, slide 48).

RESPONSE:

Dr. Sarkar wrote that "... Bhuiyan is the first author and has left our laboratory many years ago ... we do not believe that there has been any mistake made for the β-actin blot in the final figure..." (Response Letter-Final-Nov 27th-2012, p.8). Dr. Sarkar wrote: "However, he [Dr. Bhuiyan] also conducted another similar experiment using DIM instead of B-DIM, which is a DIM with an improved bioavailability (DIO4915

Image File A, slide 49). The result is similar ... and appropriate actin lane is shown (please see following figure 2A and figure file "Yiwei Li\3rd data\Mahbub\All Fig. jpg\Fig2.jpg)". Dr. Sarkar wrote that the figure submitted in response was supposed to have been the one published. Dr. Sarkar's later response ("Bhuiyan Allegation 87.docx") accompanying duplicate data stated that "because the expression of β-actin did not change after B-DIM treatment, all the actin bands look similar." Dr. Li (co-first author) testifying about where the β-actin images in Figures 2A and 2B came from said that he could not "... tell which--exactly which one, but I think I check that all Beta-actin is most the same. I just random pick one there, random pick up one, because they all is for the control" (Li Transcript, V.1, p.127, ll.11-15).

ANALYSIS:

See DIO4915 Image File A, slides 47-49.
The testimony that β-actin bands were selected at random suggests falsification. Simple visual comparison of the β-actin bands for C4-2B cells in Figure 2B (right panels) showed that the six left lanes for the upper time-course panel (0 to 72hrs with 10μM B-DIM) and the six lanes of the middle dose-response panel (0 to 50 μM at 24 hrs) are manipulated (cropped & re-sized) copies of the same bands (DIO4915 Image File A, slide 48). The figure submitted in response by Dr. Sarkar does not match the published blots, and the Committee considered the images submitted from a different study with "DIM" are not relevant to this study of "B-DIM."

The Committee found files on drive "E:\OriginalData\5\Yiwei Li\3rd data\Mahbub\All Fig. jpg\", parts of which are identical to panels published in Figure 2. Specifically, panels in files named "Fig.4.jpg", "Fig 2.jpg" and "Fig.5.jpg" match the β-actin bands in the top, middle and bottom panels, respectively, of Figure 2B. However, these composite images (not scans of films) contain no information identifying the experiment (e.g., title, date, cell type, etc.). The submitted "duplicate" β-actin bands are also seen in the same directories/files. None of the images in the file Dr. Sarkar submitted in February, 2014 (Exhibit 86 – "Bhuiyan received 02 04 2014.pdf") match any of the bands in Figure 2. No other films, or files with scans of films, were found that show the original Western blots. None of the images Dr. Sarkar submitted as alternate figures (e.g., "E:\OriginalData\5\Yiwei Li\3rd data\Mahbub\All Fig. jpg\Fig3.jpg"), nor figures from experiments using DIM instead of B-DIM, address the allegation.

CONCLUSION:

The Committee finds in **Allegation 8** that the β-actin bands in the top and middle panels of **Figure 2B** in **Paper 4** were manipulated (cropped & resized) and re-labeled copies of the same image used for different experiments. The Committee concludes by a preponderance of the evidence that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 2B in Paper 4 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 9: In Figure 2A, top panel, the PSA band at 72 hours appears to be covered over with a white box. Figure 2B, the bottom panel PSA band in lane 4 also appears to be covered over with a white box. Also, in the middle panels of Figure 2A and 2B, the 5 left lanes for PSA in Figure 2B (doses 0 to 25 μM of B-DIM) appear to be the same images as PSA lanes 2 through 6 in Figure 2A (doses 0.1 to 50 μM B-DIM). Also in Figure 2A, the 24 hour β-actin band is the same as Figure 2B 24 hours β-actin: lanes 1 & 2 of Figure 2A are the same images as in lanes 3 & 4 of Figure 2B (flipped horizontal). Lanes 3 & 4 of Figure 2A are the same as lanes 1 & 2 of Figure 2B" (DIO4915 Image File A, slide 50).

RESPONSE:

Dr. Sarkar wrote that "We did not cover the PSA bands with white box. Because B-DIM has significant inhibitory effects on the expression of AR and PSA, the signals of AR and PSA were very week or none with longer or higher concentration of B-DIM treatment... We have similar results from duplicated experiments ..." (file: "Bhuiyan Allegation 09.docx," p.1). A later response relevant to Figure 2 in Paper 4 (file: "Bhuiyan Allegation 87.docx"), accompanying duplicated data, stated that "because the expression of β-actin did not change after B-DIM treatment, all the actin bands look similar" (DIO4915 Image File A, slide 51). In testimony about where the β-actin images in Figures 2A and 2B came from, Dr. Li, the co-first author, said that he could not "... tell which--exactly which one, but I think I check that all Beta-actin is most the same. I just random pick one there, random pick up one, because they all is for the control" (Li Testimony, V.1, p.127, ll.11-15).

ANALYSIS:

See DIO4915 Image File A, slides 50-55.
The testimony that β-actin bands were selected at random suggests falsification. Regarding masking certain lanes in PSA bands in Figure 2A (top panel) and Figure 2B (bottom panel) (see DIO4915 Image File A, slide 52), Dr. Sarkar submitted original images of film scans (file: "Bhuiyan Allegation 09.docx") that appear to show bands with no PSA expression in the corresponding lanes (DIO4915 Image File A, slide 51). The blots in the other lanes appear to match blots in the published bands. Files with these images found on the "P" share drive are dated "11/20/2013," suggesting they were prepared for the response and are not the original images.

Close examination of the PSA bands in the middle panels (dose-response at 24 hours) of Figures 2A and 2B, show that the 5 left lanes for PSA in Figure 2B (doses 0 to 25 μM of B-DIM) in C4-2B cells are the exact same images as PSA lanes 2 through 6 in Figure 2A (doses 0.1 to 50 μM B-DIM), but labeled LNCaP cells (DIO4915 Image File A, slide 53). There was no response regarding this specific allegation. No films, or files with scans of films, were found in any drive that show the original Western blots. Dr. Sarkar submitted alternate figures purportedly from repeated experiments.

Regarding β-actin bands in the middle panels of Figure 2, no films or files of original source scans were submitted by Dr. Sarkar. The Committee found none. "Duplicate" images were submitted (DIO4915 Image File A, slide 51). Direct visual comparison of the dose-response β-actin bands for LNCaP cells and C4-2B cells in the middle panel of Figures 2A and Figure 2B, respectively, show that lanes 1 & 2 in Figure 2A are copied and manipulated (flipped vertically and squeezed) into lanes 3 & 4 in Figure 2B; and that lanes 3 & 4 in Figure 2A are copied into lanes 1 & 2 in Figure 2B. See DIO4915 Image File A, slides 53-55.

CONCLUSION:

Despite the lack of original films or scans, the Committee finds, in **Allegation 9**, insufficient evidence that individual lanes indicated in PSA bands in Figures 2A and 2B were masked or blotted out with a "white box" and therefore concludes that there is no research misconduct in this instance. However, the Committee also finds that the PSA bands in the middle panels of **Figures 2A** and **2B** in **Paper 4** are copies of each other, re-used and re-labeled for different cell types and doses. Further, the same β-actin bands images were re-used in the middle panels of Figures 2A and 2B, manipulated and with lanes re-ordered and re-labeled for different cell types. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figures 2A and 2B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 10: In Figure 3A, for AR in both right and left bands, lane 7 (labeled "PC-3") seems to have been removed and "smudged," overlayed or masked (DIO4915 Image File A, slide 56)

RESPONSE:

In February, 2014, Dr. Sarkar wrote ("Bhuiyan Allegation 10.docx") "we did not remove or smudge the 7th lane in left and right panels of Figure 3A. Because PC-3 cells do not express AR, we used PC-3 cells as negative control and no signal was observed in the 7th lanes..." Dr. Sarkar submitted images purporting to be original scans of AR bands published in Figure 3A.

ANALYSIS:

See DIO4915 Image File A, slides 56-58.
Close visual examination of the PC-3 lanes in the AR bands in Figure 3A show white areas with edges that may be pasted boxes but there is also sufficient pixilation within those bands and across the edges to suggest there was no pasting (DIO4915 Image File A, slide 56). The images Dr. Sarkar submitted ("Bhuiyan Allegation 10.docx") appear to be scans of Western blots that match the published AR bands in Figure 3A, including the blank PC-3 lanes (DIO4915 Image File A, slide 57). Dr. Sarkar's response also referenced file "PC-3 AR trans BD AR 2.jpg" as the source image. This file was found on the "P" share drive: "P_home\liyi\" and there are no signs of a band for AR in the PC-3 lane in that image. The labels on the Western blot scan match the published conditions but there is no date on the scan (DIO4915 Image File A, slide 58). However, the file "PC-3 AR trans BD AR 2.jpg" was created/saved on November 21, 2013 and so was saved after the investigation began. Neither the original film nor earlier copies of this jpg file or the Western blot images were found. (In contrast to Dr. Sarkar's and Dr. Li's claim that PC-3 cells do not express AR, the research literature does include an example of PC-3 cells expressing AR: Alimirah, et al., FEBS Lett. 580(9):2294-2300, 2006).

CONCLUSION:

The Committee finds in **Allegation 10** that despite not finding original data or copies of the scans from the time Paper 4 was written, there is insufficient evidence that the PC-3 lanes in the AR bands in **Figure 3A** of **Paper 4** are inaccurate or manipulated to mask or overlay the PC-3 lanes. The Committee concludes there is insufficient evidence that Dr. Sarkar engaged in research misconduct in publishing Figure 3A in Paper 4.

Allegation 11: In Figure 4 in Paper 4, identical PSA lanes appear as representing data for two different cell lines. Also in Figure 4, there is evidence that data were overlaid/pasted in the "Nuclear AR" band for the LNCaP cells (DIO4915 Image File A, slides 59-60).

RESPONSE:

Regarding the duplicate PSA bands in Figure 4, Dr. Sarkar wrote that Dr. Yiwei Li provided Figure 4 and Dr. Sarkar admitted that "... two identical images of PSA appear in two cell lines in the same figure" (Response Letter-Final-Nov 27th-2012, p.8). Dr. Sarkar explained that "...this figure was started before all the data was completed with place-holder for PSA and accidentally never replaced..." Dr. Sarkar referenced a file with the original data: "Yiwei Li\3rd data\BDIM\Akt trans Western\Akt trans Western 3 FOXM1\PSA Atrans FOXM1 C4 LN.jpg" and also wrote that a "... repeated LNCaP PSA Western Blot experiment with similar data as obtained for C4-2B is shown in this image."

Dr. Li testified "... that when I making a figure, I just put one image in there to fit all the screen and to see if that ... size and orientation is fit, is meeting the requirement of journal. So is same as last time, if one data is not available, I put another data in there as the placeholder ... [but] I forgot to replace that one with the LNCaP PSA" (Li Transcript, V1, p.117, ll.14 to p.118, ll.3).

Regarding the pasting in the "Nuclear AR" bands, Dr. Sarkar wrote in November 2012: "The pasted lane in LNCaP nuclear AR from the complainant is only a reordering of original data and there is no error (please see the original scanned image in the file "Yiwei Li\3rd data\BDIM\Akt trans Western\Akt trans Western 2\AR C4 LN NE Cyto.jpg).

ANALYSIS:

See DIO4915 Image File A, slides 59-68.
Regarding the copied and re-used PSA bands, Dr. Sarkar admitted that the PSA images are identical but that is was a mistake not to replace a "placeholder." This is supported by Dr. Li's testimony. However, Dr. Sarkar did not provide data intended for the figure. A "repeated ... Western Blot experiment with similar data" was submitted in response but looks nothing like the images for LNCaP cells in the original Western blots the Committee found in the "PSA Atrans FOXM1 C4 LN 1.jpg" file (DIO4915 Image File A, slide 61-62). The image cited as original data does show the published PSA band for the C4-2B cells, but there are no visible bands for the LNCaP cells at all in either "PSA Atrans FOXM1 C4 LN 1.jpg" (DIO4915 Image File A, slide 62) or in another file apparently showing a longer exposure of the same gel: "PSA Atrans FOXM1 C4 LN 2.jpg" (DIO4915 Image File A, slide 63-64). This indicates that PSA is not expressed in LNCaP as claimed and reported, and that re-use of the C4-2B bands misrepresented the research record.

Regarding the pasted lanes in the Nuclear AR band for LNCaP cells in Figure 4 (DIO4915 Image File A, slide 65), Dr. Sarkar said that there was a pasted lane in LNCaP nuclear AR due to "only a reordering of original data." Examination of the band shows white areas with edges consistent with Dr. Sarkar's admission of cutting and pasting. There are four versions of the image file Dr. Sarkar indicated as the original scan on Dr. Sarkar's computers (i.e., AR C4 LN NE Cyto 1.jpg, AR C4 LN NE Cyto 2.jpg, AR C4 LN NE Cyto 3.jpg, AR C4 LN NE Cyto 4.jpg) in that directory and all files are dated February 11, 2006. The images vary in exposure (DIO4915 Image File A, slide 66). The Committee concludes that file "AR C4 LN NE Cyto 1.jpg" was the source of the published Nuclear AR image for LNCaP cells. Comparison of the LNCaP Nuclear AR band published in Figure 4 of Paper 4 and in file "AR C4 LN NE Cyto 1.jpg", however, shows that images in lanes 3 and 5 were switch in the publication (DIO4915 Image File A, slide 67). Only file "AR C4 LN NE Cyto 3.jpg" included labels for the lanes and those labels were written only on the C4-2B side of the image. However, the order of the labels written in file "AR C4 LN NE Cyto 3.jpg" matches the order of lane labels Dr. Li's lab notebook (Exhibit 16 DIO4915 Li #4, p.24-25; DIO4915 Image File A, slide 68), and both of those match the order of labels for Figure 4 in the publication. The Committee concludes, therefore, that the cutting and pasting of lanes was not "only a reordering of original data" as Dr. Sarkar claimed, but that the scans he submitted in response make clear that lanes were switched to misrepresent the results (DIO4915 Image File A, slide 67).

CONCLUSION

The Committee finds, in **Allegation 11**, that Dr. Sarkar knowingly re-used and relabeled a PSA band image from C4-2B cells as LNCaP cells in **Figure 4** of **Paper 4** because the original data he submitted in response for the LNCaP cells shows no band at all. Dr. Sarkar also knowingly cut and pasted lanes in the Nuclear AR band for LNCaP cell in Figure 4 to switch images for Wild-type and Mutant Atk conditions and thereby misrepresent the results. The Committee concludes that Dr. Sarkar did these manipulations knowingly and intentionally because he re-submitted the same images, with bars added, as a correction to the journal and to the Committee after this investigation began. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar engaged in research misconduct, as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103, by knowingly and intentionally publishing fabricated and/or falsified results in Figure 4 of Paper 4, and again by re-submitting essentially the same figure as a "correction."

Allegation 87: The β-actin bands in the dose-response experiment in the middle panels of Figures 2A (LNCaP cells) and Figure 2B (C4-2B cells) in **Paper 4** are the same image. The same image is used for LNCaP cells lanes 1 & 2 (Figure 2A) and C4-2B cells lanes 3 & 4 (Figure 2B), flipped horizontal; and lanes 3 & 4 of Figure 2A (LNCaP cells) are the same image as lanes 1 & 2 of Figure 2B (C4-2B cells).

RESPONSE:

Dr. Sarkar addressed issues with β-actin bands in Figure 2 in his responses to Allegations 8 and 9 above.

ANALYSIS:

See DIO4915 Image File A, slide 69.
Close visual examination of all lanes in the β-actin bands for B-DIM dose-response panels at 24 hours for the LNCaP cells in Figure 2A and the C4-2B cells in Figure 2B show sufficient differences so that the Committee finds that the bands are not copies (DIO4915 Image File A, slide 69). On the other hand, the whole row of bands in the C4-2B cells in the middle panel is copied from the top panel in Figure 2B (addressed in Allegation 8, above), and certain lanes within the β-actin bands in the middle panels for the LNCaP cells (Figure 2A) and C4-2B cells (Figure 2B) are manipulated copies of each other (addressed in Allegation 9, above).

CONCLUSION:

The Committee finds that the concerns with **Figure 2** in **Paper 4** in **Allegation 87** are redundant with Allegations 8 and 9, and they are addressed above. The Committee finds no evidence of further research misconduct regarding the β-actin bands for the middle panels in Figures 2A and Figure 2B. This is another instance of the common practice in Dr. Sarkar's laboratory of using "random" loading control images because they are considered all the same, and this is another indicator of the recklessness with which Dr. Sarkar approached his research.

Paper 5 (Reference #255) Banerjee, S., Zhang, Y., Wang, Z., Che, M., Chio, P., Abbruzzese, J., and Sarkar, F.H. *In vitro* and *in vivo* molecular evidence of genistein action in augmenting the efficacy of cisplatin in pancreatic cancer. *Int. J. Cancer*: 120, 906-917 (2006)

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Allegation 12: In Figures 2 & 3: "... the same Actin load controls were used to represent data from different experiments. The reuse was disguised by means of horizontal and/or vertical rotation."
Note: Allegation 12 applies specifically to comparisons of the β-actin bands in Figure 2C (top), and Figure 2D (top), and Figure 3A (middle) in Paper 5 (DIO4915 Image File A, slide 71).

RESPONSE:

Dr. Sarkar wrote that the β-actin bands had not been flipped and included an image of the relevant figures and rows with cell lines, treatments, doses, and time frames highlighted in red. He wrote that "the same actin is shown here because it was representative of the actin for these blots" and that there is "no error

or mistake" (Response Letter-Final-Nov 27th-2012, p.8-9). Dr. Banerjee had contributed to Dr. Sarkar's response letter of November, 2012 (DIO4915 Image File A, slides 72-73).

Dr. Sarkar's testimony about Allegation 12 is covered in Sarkar Transcript, V.2, p.346, ll.14 to p.351, ll.4. Dr. Sarkar's testified that he did "concur" that the β-actins bands in Figure 2C (top), Figure 2D (top), and Figure 3A (middle) in Paper 5 "... are the same image that are manipulated and copied" (Sarkar Transcript, V.2, p.351, ll.2-4).

Dr. Banerjee's testimony about Allegation 12 is covered in Banerjee Transcript, V.1, p.210, ll.14 to p.223, ll.21). Dr. Banerjee testified that the β-actin bands shown in the relevant figures are "representative" because all the proteins in the figures were loaded at the same time, that all their β-actin bands were similar, and that he had used this approach in other papers: "the same actin image, because coming from the same extract and different proteins" (Banerjee Transcript, V.1, p.211, ll.25 to p.212, ll.15). Dr. Banerjee agreed that there was rotation of the β-actin bands in the figures and that it was "a mistake," which conflicts with their statement that "... to our judgment the actin has not been flipped" (Response Letter-Final-Nov 27th-2012.pdf, p.8). Dr. Banerjee testified that the statement made in the November, 2012 letter about flipping images was "not correct" (Banerjee Transcript, V.1, p. 222, ll.13-21). When shown the animation of scans found by the Committee that visualized the rotation of the flipping of the β-actin bands, Dr. Banerjee agreed that the images had been flipped and rotated. When asked why the β-actin bands were manipulated if the published bands served only as a "representative" blot, Dr. Banerjee had no answer. Dr. Banerjee said that Dr. Sarkar did not know he had intended to use the same β-actin for all these figures. Dr. Sarkar approved these figures for publication "... but definitely he didn't see this actin, that this has been 'flipped'" (Banerjee Transcript, V.1, p.218, ll.16 to p.219, ll.22). Dr. Banerjee claims that the flipping of the β-actin was not intentional but the result of either carelessness or by producing the scans at different times, which is belied by the time stamp of the scans used for the β-actins (Banerjee Transcript, V.1, p.220, ll.2 to p.221, ll.8).

ANALYSIS:

See DIO4915 Image File A, slides 70-77.
Visual comparison of the β-actin bands published in Figure 2C (top panel), and Figure 2D (top panel) and Figure 3A (middle panel) shows they are the same copied image, manipulated by flipping and re-sizing (DIO4915 Image File A, slides 74-75). The Committee found images of scans in two files that relate to the β-actin bands published in Figures 2C (top), 2D (top) and 3A (middle). Files "actin-1.jpg" (dated 7/27/2005, 12:08 pm) and "actin-2.jpg" (dated 7/27/2005, 12:10 pm) are on sequestered computer drive E:\OriginalData\8\[NTFS]\From Home\Sanjeev\My Document\New Folder (2)\. See unique features showing identity of Figures 2C and 2D (DIO4915 Image File A, slide 76). These images are cropped from larger scans of whole gels. Since neither the scans nor the gels nor references in lab notebooks were found, it cannot be verified that these files actually correspond to the experiments described in these figures in Paper 5.

The captions for Figures 2C, 2D and 3A describe Western blot analysis of various proteins (i.e., Figure 2C: Bcl-2 & Bcl-xL; Figure 2D: p-Akt & Akt; Figure 3A: caspaces) after various doses of genistein in COLO357 cells. There is no information about what protein(s) were done on any one Western blot. The text indicates that Figures 2C and 2D each contain two separate experiments, one with the COLO-357 cells and another with L3.6pl cells. The caption for Figures 3A, 3B and 3C similarly describe Western blots for various proteins in "whole cell lysates prepared from COLO-357 and L3.6pl cells after treatment with different concentrations of genistein for 72 hr. The caption states that "β-actin protein was used as

loading control as shown for each membrane" indicates that multiple gel membranes were used, therefore requiring separate β-actin loading controls.

A visual comparison shows that the image in file "actin-1.jpg" is the source of the β-actin in Figure 2C (top) and file "actin-2.jpg," the source of the β-actin row in Figure 2D (top), is simply another exposure or version of the film in "actin-1.jpg" (DIO4915 Image File A, slides 75 & 76). However, Figure 2D (top) shows the image from "actin-2.jpg" flipped horizontally which means the lane order is reversed in the publication (i.e., the control lane is now the 100-μM lane). The "actin-1.jpg" image is used in Figure 2C (top) as the loading control for Bcl-xL and Bcl-2; "actin-2 jpg" is used in Figure 2D (top) as the loading control for p-Akt (Ser-473) and Akt. Also, "actin-1.jpg" is the source of the β-actin bands in Figure 3A (middle), the same scan used in Figure 2C (top). However, in Figure 3A (middle), the scan is stretched and flipped vertical and horizontal. Both the orientation and order of the lanes in "actin-1.jpg" is changed in the publication. In Figure 3A (middle), the altered version of "actin-1.jpg" is used as the loading control for Caspase-9 and cleaved Caspase-9 (DIO4915 Image File A, slides 74-77).

A second exposure of the same image in "actin-2.jpg" was flipped horizontal and used as the β-actin for Figure 2D (top), and the image in "actin-1.jpg" was copied, stretched, flipped horizontal, and flipped vertical and re-used as the β-actin in Figure 3A (middle) (DIO4915 Image File A, slides 76). The same β-actins appear as the loading for different proteins each separate membranes should have a distinct loading control. There is no way to confirm that the images in "actin-1.jpg" and "actin-2.jpg" actually correspond to the experiments described in these figures or any others in Paper 5.

The explanation by both Dr. Sarkar and Dr. Banerjee that the same β-actin bands image was re-used because it was representative of the loading control for multiple proteins is contradicted by all the manipulations that disguised the identity of the β-actin bands. The Committee knows of no reason to change the appearance of bands if they are intended as merely representative controls.

CONCLUSION:

The Committee finds, in **Allegation 12**, that the β-actin bands images in **Figure 2C (top panel), Figure 2D (top panel),** and **Figure 3A (middle panel)** in **Paper 5** were re-used and manipulated. Two β-actin source image files are actually the same image. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data by re-using manipulated copies of images to give the impression that the β-actin loading controls were done for each Western blot in Figures 2C, 2D and Figure 3A in Paper 5 when there is no evidence that they had been done. The Committee concludes that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103

Allegation 12a: In Figures 2C and 3A, all BCl-xL bands in Figure 2C are either altered (copied and flipped) and/or labeled for other proteins. The top β-actin for Figure 3A with COLO 357 cells is the same image manipulated (flipped and squeezed) and re-used as the β-actin for L36.pl cells in Figure 2C (blue arrow). These duplications and manipulations indicate fabrication or falsification of data."

Note: Allegation 12a concerns the labeling of Bcl-xL bands in Figure 2C (top panel: COLO357 cells) and Figure 2C (bottom panel: L3.6pl cells), and duplication and manipulation of the β-actin bands in Figure 2C (bottom panel: L3.6pl cells) and Figure 3A (top panel: COLO357 cells) in Paper 5 (DIO4915 Image File A, slides 77-78).

RESPONSE:

Dr. Sarkar and Dr. Banerjee wrote that they "...could not find the original blots" for the Bcl-xL data (Banerjee-Response.pptx, slide 1) and that "due to error during compilation of the figure, this mistake had crept in" (Banerjee-Response.pptx, slide 2). They submitted scans of bands labeled Bcl-xL for Figure 2C (top: COLO-357 cells) and Figure 2C (bottom: L3.6pl cells). See DIO4915 Image File A, slides 79-80; 82.

Dr. Sarkar's testimony about Allegation 12a and the images in Figures 2C and 3A is covered in Sarkar Transcript, V.2, p.351, ll.5 to p.361, ll.22. Dr. Sarkar testified that he did "concur that these images are the same" when shown analyses of the images during the interview, but only because of the way the analysis was presented. Dr. Sarkar referred to that analysis presentation as "science fiction," saying that it was only the "technology" that allowed this interpretation, "not the data" (Sarkar Transcript, V.2, p.351, ll.19 to p.352, ll.21). Regarding β-actin of Figure 3A (top: COLO-357 cells), Dr. Sarkar explained that he considered that the same β-actin control blots can serve as the loading control for multiple proteins, but he also agreed that β-actin probes run for each protein individually "may not be 100% exactly" but that one will serve as a representative β-actin for multiple proteins so "... within the margin of error it would be the same" (Sarkar Transcript, V.2, p.361, ll.1-22).

Dr. Banerjee's testimony about Allegation 12a is covered in Banerjee Transcript, V.1, p.223, ll.11 to p.250, ll.18, and Banerjee Transcript, V.3, p.615, ll.8 to p.642, ll.6). In contrast to Dr. Sarkar testifying that the same β-actin bands can be used for multiple proteins, Dr. Banerjee testified that having the same β-actins bands for Figure 2C (bottom: L3.6pl cells) and Figure 3A (top: COLO357 cells) is a mistake, and "...this paper only has so many mistakes." He also said "these Beta-actins they look so similar... sometimes it gets confusing to me also" and claimed that he is "usually" aware of which bands go with which experiment, although he also agreed that "there should be no way to mistake the samples from one cell to another" (Banerjee Transcript, V.1, p.223, ll.25 to p.225, ll.16). Dr. Banerjee testified he would recognize the orientation and correct side of a film by turning down a particular corner of the film and putting "the markers lane also on the film" (Banerjee Transcript, V.1, p.225, ll.25 to p.229, ll.14). Dr. Banerjee testified that because of space limitations in papers, he squeezes the Bcl-2 band in Figure 2C (bottom: L3.6pl cells) to "accommodate all my figures there" (Banerjee Transcript, V.1, p.237, ll.19 to p.238, ll.8). He also stated that if he takes multiple films of a gels and scans them, he will only put marks on one which he then uses to determine which of the computer files of all those scans are correct. He said Dr. Sarkar was not aware that he has both marked and unmarked films (Banerjee Transcript, V.1, p.240, ll. 11 to p.245, ll.4).

Later Dr. Banerjee acknowledged he "had copied and manipulation these Beta-actin bands" in Figure 2C (bottom: L3.6pl cells) and Figure 3A (top: COLO-357 cells) and that it was a mistake (Banerjee Transcript, V.3, p.615, ll.20 to p.616, ll.16). However, he still had no answer for how the image got flipped and rotated (Banerjee Transcript, V.3, p.621, ll.15-24). Dr. Banerjee admitted he intentionally re-used images (Banerjee Transcript, V.3, p.622, ll.9-15) and that, regarding β-actins, "I really didn't took it that seriously... they all look the identical... I was not careful enough" (Banerjee Transcript, V.3, p.623, ll.6 to p.624, ll.3) and "truthfully, while doing Beta-actin it was not taken that seriously" (Banerjee Transcript, V.3, p.628, ll.8-10). Dr. Banerjee said "Bcl-2 [scan] is mis-labeled as Bcl-xl. Actually it should be the other way around" in Fig. 2C (bottom/L3.6pl) (Banerjee Transcript, V.3, p.637, ll.24 to p.638, ll.23).

ANALYSIS:

See DIO4915 Image File A, slides 78-90.

All Bcl-xL bands in Figure 2C are either altered (copied and flipped) and/or labeled for other proteins. Visual analysis of the Bcl-xL bands in Figure 2C, both top panel (COLO-357 cells) and bottom panel (L3.6pl cells) shows that they are either altered or derived from source labeled other than as published (DIO4915 Image File A, slides 78-80). The source image for the Bcl-xL band in the COLO-357 panel is from the file named "bcl-xl.jpg," stretched vertical and squeezed horizontal to appear as published in Figure 2C. The source image for the band labeled Bcl-xL in the L3.6pl panel is from the file named "bcl-2.jpg:" the scan labels are switched between proteins Bcl-2 and Bcl-xL (DIO4915 Image File A, slide 83).

A visual analysis shows that all the bands in Figure 2C (bottom panel: L3.6pl cells) are either altered or derived from sources with different labels. The source for the band labeled "Bcl-2" is the file named "bcl-xl-ii.jpg." This scan was also squeezed horizontal a lot. The source for the band labeled Bcl-xL is a file named "bcl-2.jpg." And the source for the β-actin bands is a manipulated scan labeled "actin-ii bcl2-xl.jpg," which also bears a time stamp five days after the other scans (DIO4915 Image File A, slides 83-85).

The top β-actin for Figure 3A with COLO-357 cells is the same image manipulated (flipped and squeezed) and re-used and re-labeled as the β-actin bands for L36.pl cells in Figure 2C. A visual analysis of the β-actin bands in Figure 2C (bottom panel; L3.6pl cells) shows it to be the same image as in Figure 3A (top panel; COLO-357 cells), flipped horizontal and squeezed vertical. The β-actin bands were therefore, re-ordered so that the control lane became the 100-μM-dose lane. Dr. Banerjee stated that an error had occurred with the β-actin bands for Figure 2C (bottom panel: L3.6pl cells) and submitted a new scan for that β-actin (no date or file name) and a new version of Figure 2C (bottom panel: L3.6pl cells). Therefore, according to Dr. Banerjee, the top β-actin row in Figure 3A is correct and is the manipulated version of the scan in file "actin-ii bcl2-xl.jpg." This means that a β-actin labeled as a loading control for the proteins Bcl-2 and Bcl-xL was used as a loading control for the caspase-3 and cleaved caspase-3 blots (DIO4915 Image File A, slides 85-90).

The Committee found the relevant files of scans of images in Figure 2C: bcl-xl.jpg, 6/7/2005 1:44 am; bcl-xl-ii.jpg, 6/7/2005 1:44 am; bcl-2.jpg, 6/7/2005, 12:44 am; and actin-ii bcl2-xl.jpg, 6/12/2005, 12:05 am. These are on various sequestered computer drives:

E:\OriginalData\8\[NTFS]\Documents and Settings\banerjes\My Documents\April2009\October 2008\New Folder (2)\New Folder (3)\New Folder (6)\New Folder (3)\CISPLATIN-Fig\New Folder (2);
E:\OriginalData\8\[NTFS]\From Home\Sanjeev\Desktop-Aprl-2007\New-IJC\See if need\CISPLATIN\CISPLATIN-Fig\New Folder (2);
E:\OriginalData\8\[NTFS]\From Home\Sanjeev\Desktop-Sep2007\New-IJC\See if need\CISPLATIN\CISPLATIN-Fig\New Folder (2);
G:\KCI Dec 2013\P_homes\banerjes\Old Computer\April2009\October 2008\New Folder (2)\New Folder (3)\New Folder (6)\New Folder (3)\CISPLATIN-Fig\New Folder (2);

These images were cropped from larger scans of whole gels. The Committee found none of the original films or full scans. The submitted scan had no date or file name (Banerjee-Response.pptx, slides 1 & 2). Therefore, it cannot be verified that these scans actually correspond to the experiments described in these figures in Paper 5.

CONCLUSION:

The Committee finds, in **Allegation 12a**, that there was duplication and manipulation and re-labeling of various protein and control bands in and between **Figures 2C** and **3A** in **Paper 5**. Labels for Bcl-2 and Bcl-xL bands were reversed, and images were squeezed and/or flipped and repositioned and re-oriented to make the blots look quite different and to represent different conditions. The Committee concludes that

Dr. Sarkar knew that these figures were constructed with re-used control bands because they were "representative" images. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar knowingly published fabricated and/or falsified results in Figures 2C and 3A in Paper 5 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 13: Figures 5 & 6: "...another reuse of material to represent different experiments, ie, here the Actin and AKT bands are identical. Similarly the Rb control was recycled to represent results in different experiments."

Note: Allegation 13 refers to comparisons between the Akt bands below the Phospho-GSK-3aB bands and the β-actin bands under Bcl-2 of Figure 5A, as well as to the Rb bands in Figure 5C and Figure 6C (DIO4915 Image File A, slide 91-93).

RESPONSE:

Dr. Sarkar submitted a response stating that "due to an error in judgment between the two proteins, identification of the right blot while compiling the figures was compromised" (Response Letter-Final-Nov 27th-2012, p.8-9). Dr. Banerjee's contribution to this response included what they called the "original Akt protein blot" and the "corrected fig for Ms" (Response Letter-Final-Nov 27th-2012, p.8-9).

Dr. Sarkar's testimony about Allegation 13 argued this was a mistake (Sarkar Transcript, V.2, p.361, ll.23 to p.369, ll.11). Dr. Sarkar testified that he expected films of gels and/or the lab notebooks would have hand-written marks indicating when, and what, and what order the blot was run, with details referencing the image and the experiment written down in the notebook (Sarkar Transcript, V.2, p.364, ll.1-5). Dr. Sarkar said he saw only the image submitted, not the actual film. Upon being shown problems with the submitted scan (*ANALYSIS* below; DIO4915 Image File A, slides 92-94), Dr. Sarkar admitted he "was not careful enough" and blamed this on his work demands and on the time spent dealing with all the allegations (Sarkar Transcript, V.2, p.366, ll.20 to p.369, ll.11).

Dr. Banerjee argued that re-use and re-labeling of the bands in Allegation 13 was a mistake and he testified to recently labeling the scan submitted in Response Letter-Final-Nov 27th-2012 (p.8-9), meant to replace the Akt band in Figure 5A, so he had not labeled it when the experiment was done (Banerjee Transcripts, V.1, p.250, ll.19 to p.259, ll.19; V.3, p.648, ll.24 to p.657, ll.1). When confronted with a discrepancy in lane labels between the published and submitted images, Dr. Banerjee said that the submitted scan was mislabeled because "I was also tensed up with all these things, so maybe that I right here made a mistake" (Banerjee Transcript, V.1, p.259, ll.3 to p.261, ll.19). Dr. Banerjee could not find this experiment in his lab notebooks and was not sure that it could be found (Banerjee Transcript, V.1, p.259, l.3 to p.261, l.19).

Dr. Banerjee testified that confusion about Rb bands in Figures 5C and 6C of Paper 5 was a "mistake, it happened because ... there were two Rb blots, and they all had four bands, and they look identical" and were both labeled COLO-357 "because both are from Colo-357 line" even though one was from SCID mice "but they were injected with Colo-357 cells" (Banerjee Transcript, V.3, p.652, ll.1 to p.653, ll.3). Dr. Banerjee stated that he manipulates the Rb bands for "cosmetic" reasons "just for my personal view, for the figures to look good" but that the size and shape of the lanes in the Rb band does not make a difference because "I am not doing any quantification so it just doesn't matter to me" (Banerjee Transcript, V.3, p.655, ll.11 to p.657, ll.1).

ANALYSIS:

See DIO4915 Image File A, slides 91-101.
A visual evaluation of the β-actin bands under the Bcl-2 bands and the Akt bands under Phospho-GSK-3αβ in Figure 5A of Paper 5 shows that the images are identical and that the Akt bands are flipped horizontal (DIO4915 Image File A, slide 94). Dr. Sarkar and Dr. Banerjee admitted that the wrong Akt image had been used while constructing Figure 5A and submitted both the "original blot and the corrected fig for Ms" (Response Letter-Final-Nov 27th-2012.pdf, p. 8-9). The submitted scan had no date or file name (Banerjee-Response.pptx, slides 1 & 2; (DIO4915 Image File A, slide 95). The scan was squeezed vertical and rotated 7º CCW to appear as it does as the revised Akt in Figure 5A. Further, the replacement scan showed that labeling of treatment lanes mixed up genistein and cisplatin and does not match the published order in Figure 5A (DIO4915 Image File A, slides 96-97).

Similarly, the Rb control bands image was reused to represent results in different experiments.
A simple visual comparison of the Rb bands in Figures 5C and 6C shows they are the same image and Figure 5C is stretched vertical so the lanes appear thicker. While the doses and treatment durations are the same, the text of Paper 5 (pp.906-908) indicates the experiment in Figure 5C was *in vitro* using COLO-357 cells whereas the one in Figure 6C was *in vivo* (using mouse tumor tissues). In further contrast to Figure 5C, where COLO-357 cells were assessed after *in vitro* treatment with genistein (30 μM/72 hrs) and/or CDDP (2.5 μM/2.5 hrs), Figure 6C assessed tumor tissue from SCID mice after systemic treatments with "single bolus" genistein (1 mg/day/mouse, p.o.) and/or cisplatin (9 mg/kg, i.p.). The source image of the Rb bands in Figures 5C and 6C is the scan in "rb-4.jpg" which was stretched vertical to create the Rb bands for Figure 5C and squeezed vertical to create the Rb bands for Figure 6C (DIO4915 Image File A, slides 99-100). The source of both Rb bands is the scan rb-4.jpg; the Committee did not find an original whole gel or scan of the gel from which rb-4.jpg was cropped and re-used for experiments that differed in design, tissue types and treatment conditions. The only copy of rb-4.jpg (dated 7/27/2005, 11:11 am), the cropped source of the bands in both Figures 5C and 6C, was found on "E:\OriginalData\8\[NTFS]\From Home\Sanjeev\My Documents\New Folder(2)\".

It is also noted that, relevant to Allegations 12a and 13, the same 3-lane Rb bands image from Figure 5C, where COLO-357 cells were treated with genistein (30 μM/72 hrs) and/or CDDP (2.5 μM/2.5 hrs), was copied and manipulated and published also in Figure 2A. Here, in contrast to Figure 5C, COLO-357 and L3.6pl cells were both treated with 0, 25 or 50 μM genistein only. The Rb bands used in Figure 2A are also in contrast to Figure 6C where mouse tumor tissues were assayed instead of *in vitro* cells (DIO4915 Image File A, slide 101).

CONCLUSION:

The Committee finds, in **Allegation 13**, that there was intentional duplication and manipulation and re-labeling between the β-actin and Akt bands in **Figure 5A** of **Paper 5**, and intentional duplication and manipulation of the Rb bands in **Figures 5C** and **6C** in **Paper 5**, as well as further duplication, manipulation and relabeling of the same Rb bands image in Figure 2A. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Paper 5 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. This kind of re-use and re-labeling of data, especially control bands, is common in Dr. Sarkar's laboratory.

Allegation 13a: Figures 1C & 5A: "The 3 lanes for β-actin for 3 different cell types (Colo-357, L3.6pl & BxCP-3 cells) in Figure 1C is the same image re-used and manipulated as lanes 1-3 of the β-actin band for PARP in

Figure 5A (width changed) where the image is labeled for different combinations of Genistein and CDDP in Colo 357 cells. This duplication, manipulation and re-labelling is falsification or fabrication" (DIO4915 Image File A, slide 102).

RESPONSE:

Dr. Sarkar and Dr. Banerjee wrote in response that due to an error during construction of the figure, the β-actin bands in Figure 1C was incorrect. Dr. Banerjee submitted a scan intended to be the correct β-actin, but there was no date or file name for the scan (Banerjee-Response.pptx, slide 3; DIO4915 Image File A, slides 104-105).

Dr. Sarkar testified that he did not notice any discrepancy in lane labeling on the scan of Akt bands he received from Dr. Banerjee and submitted in his response (Sarkar Transcript, V.2, p.369, l.12 to p.373, l.9; Banerjee-Response.pptx, slide 3). Sarkar also stated that he had "looked at the image, and then the image in the Beta-actin to my naked eyes looked the same sequence... in my naked eyes it didn't occur to me that it is a flipped image...I'm not always looking with that investigative eye, so-to-speak, to see what is the height or the distance and everything else" (Sarkar Transcript, V.2, p.371, ll.15 to p.372, ll.8).

Dr. Banerjee testified about Allegation 13a (Banerjee Transcript, V.1, p.262, ll.1 to p.272, ll.3; and V.3, p.657, ll.12 to p.666, ll.2). Dr. Banerjee testified, when shown an analysis of the scanned image he submitted as the correction for the Akt band in Figure 1C, that the labeling was wrong (Banerjee Transcript, V.1, p.266, ll.25 to p.266, ll.4). He called it a mistake and that "to me all the bands look identical, so I really didn't analyze it that critically" (Banerjee Transcript, V.1, p.267, ll.12-15). Dr. Banerjee stated that Dr. Sarkar had seen the corrected Akt film and the corrected Figure 1C (that had already been sent to the journal as a correction), but not the flipping and stretching of the Akt band (Banerjee Transcript, V.1, p.270, ll.18 to p.271, ll.13). Dr. Banerjee said that the mistake with the β-actin bands in Figures 1C and 5A was that the files "were not properly filed in a proper way as it should be" and wanting to "make the figure all in a hurry and finish the job" (Banerjee Transcript, V.3, p.659, ll.24 to p.661, l.14). Dr. Banerjee stated that he was sure that the β-actin for Figure 5A was correct (Banerjee Transcript, V.3, p.664, ll.17 to p.666, ll.2).

ANALYSIS:

See DIO4915 Image File A, slides 102-105.
A visual comparison shows the 3-lane β-actin in Figure 1C in Paper 5 is identical to lanes 1-3 of the 4-lane β-actin bands in Figure 5A (DIO4915 Image File A, slides 102-103). In contrast to Figure 1C, which depicts protein expression in 3 cells lines, Figure 5A depicts treatment of cells only treated with genistein or cisplatin: the same β-actin control bands cannot be used for both. Drs. Sarkar and Banerjee admitted an error and submitted a scan claiming to show the correct 3-lane row for Figure 1C. The scan contained no date or file name. However, examination of the blots in the new scan shows clearly the orientation of the blots on the submitted scan are opposite to the orientation of the β-actin blots in the revised Figure 1C. The image was flipped left-to-right which reversed the order of the cell lines so that the blot labeled "COLO-357" on the scan appears as BxPC-3 in the figure, and the "BxPC-3" blot on the scan becomes labeled "COLO357." The scan was also stretched horizontal in the revised Figure 1C (DIO4915 Image File A, slides 104-105). There is no date or other identifying information on the submitted scan and so no way to confirm that this scan actually corresponds to the experiment described in Figure 1C of Paper 5. The inability to provide correct or correctly labeled images, and the apparent ready re-use of images, indicate very poor records keeping in Dr. Sarkar's lab and, again, disregard for the importance of loading controls.

CONCLUSION:

The Committee finds, in **Allegation 13a**, that Western blot bands in **Figures 1C** and **5A** in **Paper 5**, are manipulated and re-labeled and/or duplicates of the same image, and that the β-actin scan submitted by Dr. Sarkar in response as a correction in a revised Figure 1C was also manipulated and mis-labeled. The Committee concludes that it seems highly unlikely that Dr. Sarkar knows what loading control bands, if any, actually belong to either published figure. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified images of uncertain origin to misrepresent the results in Paper 5, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 88: "...manipulated β-actin bands in multiple figures in Figure 2C & 2D for L3.6pl cells (as well as the COLO357 cells in the original allegation). The β-actin for Figure 3A is the L36.pl β-actin of Figure 2C (flipped horizontal)."

CONCLUSION:

These parts of Allegation 88 are redundant with Allegation 12a and are covered there.

Allegation 88 (*continued*): In Figure 3A, the β-actin bands for caspase-3, and Figure 3C, the β-actin band under the cytochrome C row in the cytosol fraction panel, do not appear to align with the lanes of their respective proteins.

RESPONSE:

Dr. Banerjee addressed Allegation 88 and testified that he did not remember this well and agreed he probably ran the loading controls on a different gel than the Cytochrome C (Banerjee Transcript, V.3, p.642, ll.7 to p.648, ll.23).

ANALYSIS:

See DIO4915 Image File A, slides 106-109.
A visual examination shows that the file labeled "actin- iiibcl2-xl.jpg" is the source of the β-actin bands image under the "Caspase-3" and "cleaved Caspase-3" rows in Figure 3A in Paper 5 (DIO4915 Image File A, slides 106-107). The image was squeezed horizontal and then enlarged so that the published lanes appear shorter and thicker. Analysis also shows that a scan labeled "actin-6.jpg" is the source of the β-actin bands under Cytochrome C row in Figure 3C in Paper 5 (DIO4915 Image File A, slide 107). This image scan was stretched vertical so that the lanes appear thicker. Comparing the β-actin row with the Cytochrome C row above it (Cytosol section) shows a misalignment of lanes indicating the β-actin and protein bands are from different Western blots (DIO4915 Image File A, slides 108-109). (Refer also to Allegation 12a, which showed that the β-actin bands in Figure 3C were a manipulated duplicate of bands in Figure 2C.) The Committee, finds that the β-actin bands in Figures 3A and 3C are misaligned with the protein bands above them and so that they cannot be the correct loading control bands.

Multiple copies of the source scans related to Figures 3A and 3C in Paper 5 were found on the sequestered computer drives: File "actin- iii bcl2-xl.jpg" is found with various date/time stamps in 2005 on:

E:\OriginalData\8\[NTFS]\Documents and Settings\banerjes\My Documents\April2009\October 2008\New Folder (2)\New Folder (3)\New Folder (6)\New Folder (3)\CISPLATIN-Fig\New Folder (2); and
G:\KCI Dec 2013\P_homes\banerjes\Old Computer\April2009\October 2008\New Folder (2)\New Folder (3)\New Folder (6)\New Folder (3)\CISPLATIN-Fig\New Folder (2);

Files named "actin-6.jpg" were also found, with various date/time stamps in 2005, on:
E:\OriginalData\8\[NTFS]\From Home\Sanjeev\My Document\New Folder (2)\
E:\OriginalData\8\[NTFS]\From Home\Sanjeev\My Document\Gemzar-final\REVISED Gezmar-1\GEMCIT-DATA\Actins\
E:\OriginalData\8\[NTFS]\Documents and Settings\banerjes\Desktop\New Folder (3)\Toshiba\Gemzar-final\REVISED Gezmar-1\GEMCIT-DATA\Actins\ and on:
G:\KCI Dec 2013\P_homes\banerjes\Old Computer\desktop\New Folder (3)\ \Toshiba\Gemzar-final\REVISED Gezmar-1\GEMCIT-DATA\Actins\

CONCLUSION:

The Committee, finds in **Allegation 88**, that β-actin bands in **Figures 3A** and **3C** in **Paper 5** are unlikely to be the correct loading control bands. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified β-actin images to misrepresent the results in Paper 5, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 6 (Reference #050): Wang, Z., Ali, S., Banerjee, S., Bao, B., Li, Y., Azmi, A.S., Korc, M., Sarkar, F.H. Activated K-Ras and INK4a/Arf deficiency promote aggressiveness of pancreatic cancer by induction of EMT consistent with cancer stem cell phenotype. *J Cell Physiol,* **228**(3), 556-562 (2013)

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NIH Funding: NIH R01CA131151 (PI: F.H. Sarkar); R01CA132794 (PI: F.H. Sarkar); R01CA154321 (PI: F.H. Sarkar)
Other Funding: National Science Foundation of China (No. 81172087); Puschelberg Foundation; Guido Foundation.
Note: "Z. Wang, S. Ali, and S. Banerjee contributed equally to this work."

Allegation 14: In Figure 4, an identical band set was rotated horizontally to represent results for two different proteins (EZH2 and E-Cadherin) (DIO4915 Image File A, slide 111).

RESPONSE:

Dr. Sarkar wrote that "the band for E-cadherin was correct, whereas the EzH2 band used was due to an inadvertent error. Looking at the paper, it shows that our conclusions were based on the correct data, but the wrong picture was put into the figure. This is an honest mistake ..." He also submitted a scan purporting to show the "corrected raw data" for EzH2, purportedly from a file named "WB EzH2.tif" that was created on April 28, 2011 (Response Letter-Final-Nov 27th-2012, p.9). Dr. Wang testified that he found the scan of the original films of the both E-cadherin and EzH2 Western blots on his computer in China and sent them to Dr. Sarkar. However, in the response only a cropped image from a Western labeled EzH2 was shown (DIO4915 Image File A, slide 113). Dr. Wang said he did not prepare the response,

Dr. Sarkar did (Wang Transcript, V.1, pp.76-78). Although Dr. Wang said he labels films of Western blots with experimental conditions and cell types, he could not provide a reasonable explanation why the scan of the EzH2 bands submitted by him and Dr. Sarkar had no labels for any lanes (Wang Transcript, V.1, p.76, ll.22-25).

ANALYSIS:

See DIO4915 Image File A, slides 110-115.
Simple visual comparison of the EzH2 and E-cadherin bands in Figures 4C and 4B, respectively, shows clearly that, as admitted by both Dr. Sarkar and Dr. Wang, they are the same image, rotated and squeezed (DIO4915 Image File A, slide 112). Considerable discussion (i.e., Wang Transcript, V.1, pp.75-90) yielded no insight as to why Dr. Wang had scans that were not labeled properly in contrast to what he testified was his normal procedure, or how the duplication and stretching and rotating of the published bands occurred.

The indicated source file, "WB EZH2," is not a .tif file, as claimed, but was found as a .jpg file:
"G:\25 KCI Dec 2013\P_homes\sarkarf\Published Manuscript Corrections Nov 2012\Jerry Sarkar-2nd flash drive – 2012\JCP\WB EZH2.jpg."

See DIO4915 Image File A, slide 113. Per the date stamp, "WB EZH2.jpg" was saved originally on 4/28/2011, as claimed. But, curiously, the only copy of the file "WB EZH2.jpg" was found on the share drive in a directory made, per the folder names, in November 2012 after the initiation of this investigation. There are no other files named "WB EZH2" (whether .jpg or .tif or any other format) found anywhere else on any sequestered lab computer drive.

The scan in the "WB EZH2.jpg" file appears to be the source of the EzH2 bands that Dr. Sarkar and Dr. Wang claim are the correct data and that Dr. Sarkar submitted as a cropped image (DIO4915 Image File A, slide 114). However, there are no dates or lane labels on the image. On the other hand, file "WB EZH2.jpg" has the full scan of the Western blot, with both "EzH2" and "E-Cad" bands on the same film (DIO4915 Image File A, slide 114). Those bands appears to match the image that was published originally for both the E-cadherin row in Figure 4C and, rotated and squeezed, for the EzH2 row in Figure 4B (DIO4915 Image File A, slides 114-115). The image also matches the film scanned into "Exhibit 84A – Wang #2 (Additional).pdf (p.33) which the Committee judges to be a longer exposure than what appears in "WB EH2.jpg" of Paper 6 (DIO4915, Image File A, slide 115). Other images similar to the E-cadherin bands are also found in Exhibit 84A – Wang #2 (Additional).pdf (e.g., p.21) raising further doubts about the authenticity of the "original" images. Given their testimonies about Paper 6, the Committee finds that Dr. Wang and Dr. Sarkar either did not know that the published and duplicated E-cadherin bands were on the same film scan file, as the purportedly correct EzH2 bands, or they submitted only part of the image to conceal the original E-cadherin bands. This duplication, manipulation and re-labeling of Western blot data is consistent with a common practice in Dr. Sarkar's lab of re-use and re-labeling images.

Although Ms. Ali and Dr. Banerjee are both listed with Dr. Wang as co-first authors, there is no evidence that Ms. Ali or Dr. Banerjee were involved in running these Western blots, composing Figure 4, or publishing the falsified data, or what role, if any, they did have.

CONCLUSION:

The Committee finds, in **Allegation 14**, that there is an obviously manipulated and re-labeled copy of the same image in **Figures 4B** and **4C** in **Paper 6**, and that there was no reasonable explanation presented for how the image could have been rotated and squeezed and re-labeled. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in

Figures 4B and 4C in Paper 6 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 7 (Reference #061): Soubani, O., Ali, A.S., Logna, F., Ali, S., Philip, P.A., Sarkar, F.H. Re-expression of miR-200 by novel approaches regulates the expression of PTEN and MT1-MMP in pancreatic cancer. Carcinogenesis, 33(8):1563-1771 (2012)

Publication History: Received: February 1, 2012; Revised: May 15, 2012; Accepted May 22, 2012
NIH Funding: 5R01-CA131151; 3R01-CA131151-02 S109; 1R0-1CA154321; 1R01-CA132794 (PI: F.H. Sarkar)
Other Funding: Puschelberg Foundation; Guido Foundation
Note: Soubani and Azfur S. Ali "... contributed equally to this work" (p. 1563).

Allegation 15: The far right lanes of the PTEN bands in the upper panels for BxPC-3 cells in Figures 4A and 4B were pasted in. (DIO4915 Image File A, slide 117)

RESPONSE:

Dr. Sarkar wrote in response that in this work by a student "the images were edited from a clean blot where the order of the samples was different from what was needed for the figure. This type of cutting and pasting is not uncommon" (Response Letter-Final-Nov 27th-2012.pdf, p.9). Dr. Sarkar did not submit original images and none were found. Duplicate images from experiments that "... were repeated (western blot) multiple times with similar results" were submitted. Dr. Sarkar claims "there is no mistake here and the overall findings and conclusion remains the same. Therefore, no further action would be required" (p.9). Dr. Sarkar wrote similarly in February, 2014 that "this work was done by summer students in summer of 2011. The western blots were repeated multiple times and got similar results" ("Shadan-Response.docx," p.1).

ANALYSIS:

See DIO4915 Image File A, slides 116-118.
Visual evaluation of the bands shows a cut mark to the right of lane 4 in the PTEN band in the BxPC-3 panels in Figure 4 (DIO4915 Image File A, slide 117). Dr. Sarkar attributed the work to an unnamed student author, but Dr. Sarkar is senior and corresponding author. Dr. Sarkar admitted that there was cutting and pasting to rearrange lanes in Figure 4 and that he did not write that in the published text or caption in Paper 7. The blots submitted in response by Dr. Sarkar from a repeat experiment had lanes that were not rearranged but rather ordered as in the publication (DIO4915 Image File A, slide 118). The films or location and file names of scans the films were not provided and they could not be located to verify the experiments performed. No relevant lab notebook was found and none submitted. Investigation of the computers and lab notebooks of others did not yield the results presented. No explanation was given why files with original images used in the publication were not submitted or referenced. Those files were not found.

CONCLUSION:

The Committee finds, in **Allegation 15**, that there was intentional cutting and pasting in the BxPC-3 panels of **Figure 4** of **Paper 7** which may have been to simply re-order lanes, but the lack of original data and purportedly "repeated" experiments with lanes ordered as in the publication raise doubts about their

authenticity. The Committee finds that this fits a common pattern of image manipulation in Dr. Sarkar's laboratory, and that it seem that this was more that a "cosmetic" manipulation to re-order lanes. However, there is insufficient evidence, in this instance, to conclude that there was research misconduct by Dr. Sarkar or any other identifiable person.

Allegation 15a: In Figures 4A and 4B, in the middle panels (MIAPaCa-2 cells), both PTEN for B-DIM (Figure 4A) and CDF (Figure 4B) show signs of cut and paste. The CDF lanes for MT1-MMP are highly cut and pasted.

RESPONSE:

Dr. Sarkar wrote in response that in this work by a student "the images were edited from a clean blot where the order of the samples was different from what was needed for the figure. This type of cutting and pasting is not uncommon" (Response Letter-Final-Nov 27th-2012.pdf, p.9). Dr. Sarkar submitted images from "repeated (western blot) ... and some of the original blots" (DIO4915 Image File A, slide 120). Dr. Sarkar claims "there is no mistake here and the overall findings and conclusion remains the same." Similar to Allegation 15, Dr. Sarkar responded similarly that "this work was done by summer students in summer of 2011. The western blots were repeated multiple times and got similar results." Dr. Sarkar submitted images purported as "the original and duplicate autoradiograms..." ("Shadan-Response.docx," p.1).

ANALYSIS:

See DIO4915 Image File A, slides 119-120.
Visual evaluation of the bands shows that there are streaks and shadows in the PTEN bands in the MIAaCa-2 panels in Figure 4A and 4B, but there is no clear indication that these are signs of cutting and pasting (DIO Image File A, slide 119). The MT1-MMP band in Figure 4B following treatment with CDF appears to show cut marks to the right of lane 1 and around lane 4 (DIO Image File A, slide 119). Dr. Sarkar admitted to cutting and pasting to rearrange lanes in Figure 4, which he did not mention in the published text or caption in Paper 7. Dr. Sarkar admitted such "... cutting and pasting is not uncommon" (Response Letter-Final-Nov 27th-2012.pdf, p.9). Dr. Sarkar attributed the work to an unnamed student author, but Dr. Sarkar is senior and corresponding author. (Ms. Ali's name is on files Dr. Sarkar submitted in response but the role in unknown.) The blots submitted in response by Dr. Sarkar for the PTEN bands for the MIAPaCa-2 panels appear to be originals as published in Paper 7. As Dr. Sarkar noted, the blots submitted for the MT1-MMP bands are not the originals as published in Paper 7, but were from "duplicate" experiments with lanes in the published order, in contrast to an order requiring cutting and pasting. The films or location and file names of scans the films were not provided and they could not be located to verify the experiments performed. No relevant lab notebook entry was found and none submitted. Investigation of the computers and lab notebooks of others did not yield the results presented. No explanation was given why files with original images used for the MIAPaCa-2 panel in Paper 7 were not submitted or referenced.

CONCLUSION:

The Committee finds, in **Allegation 15a**, that while cutting and pasting was admitted by Dr. Sarkar for **Figure 4** of **Paper 7**, purportedly to re-order lanes, the evidence is uncertain for the MIAPaCa-2 panels. The lack of identified original data remains a concern, particularly for this relatively recent publication and is further evidence of a common pattern of poor lab records keeping that makes validation of the research impossible in this case. Nevertheless, the Committee concludes that while the issues with the MIAPaCa

panels fit a pattern of data manipulation on Dr. Sarkar's part, there is insufficient evidence, in this instance, to conclude that Dr. Sarkar engaged in research misconduct.

Allegation 16: Figure 5D is composed of multiple cut and pasted squares, and the left-hand "Control miRNA" band for PTEN appears to be the same as the left-hand band for PTEN in Figure 6D (DIO4915 Image File A, slide 121).

RESPONSE:

Dr. Sarkar wrote in February, 2014 that "this work was done by summer students..." and apologized "... for this inadvertent mistake of using the same control for both figure 5D and figure 6D for PTEN" (file: "Shadan-Response.docx," p.1). Dr. Sarkar responded that "this experiment was repeated in duplicate and the other original blots are enclosed" (DIO4915 Image File A, slide 122) and that "the overall findings and conclusion remains same." He submitted what he called "the corrected figure" (labeled "Amended Figure"; cf, DIO4915 Image File A, slide 123) that might be sent to the journal as an erratum.

ANALYSIS:

See DIO4915 Image File A, slides 121-123.
Visual evaluation of the bands shows clear cut marks in the PTEN band of Figure 5D between all lanes (DIO4915 Image File A, slide 121) and that the "Control miRNA" blot (lane 1) in Figure 5D matched exactly the "Control miRNA" lane in Figure 6D, including a small spot at the lower margin of the blot. While treatments of MIAPaCa-2 cells are different in Figures 5D and 6D (i.e., miR-200c transfection plus BR-DIM or CDF in Figure 5 *versus* ASO-miR-200c transfection plus BR-DIM or CDF in Figure 6), using the same control blot was not noted in text or captions. Dr. Sarkar attributed the work to an unnamed student author, but Dr. Sarkar is senior and corresponding author. In admitting to a "mistake," Dr. Sarkar acknowledges that it was improper to re-use the same "Control miRNA" blot image in Figures 5D and 6D. No lab notebook references were found and none were offered. Original films were not submitted. Investigation of the computers and lab notebooks of others did not yield the results presented.

Dr. Sarkar did not explain how the "mistake" happened. The same "mistake" also appears in the photomicrographs of plated cells in the panels labeled "Control miRNA" from the same experiments, for the invasion assays in Figures 5C and 6C, and in the colony formation assays in Figures 5E and 6E in Paper 7. The "Control miRNA" panels are identical in Figures 5C and 6C and in Figures 5E and 6E (DIO4915 Image File A, slide 124). The fact that Dr. Sarkar re-used identical images from "Control miRNA" conditions in three different assays in Figures 5 and 6 indicates his claiming it was "an inadvertent mistake" is not credible.

CONCLUSION:

The Committee finds in **Allegation 16** that the "Control miRNA" blots in **Figures 5** and **6** are the same and that claims that this was an "inadvertent mistake" by a student are not credible. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar engaged in research misconduct by recklessly publishing fabricated and/or falsified data as defined in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Paper 8 (Reference #241) Li, Y., Wang, Z., Kong, D., Murthy, S., Dou, Q.P., Sheng, S., Reddy, G.P.V., Sarkar, F.H. Regulation of FOXO3a/β-catenin/GSK-3β signaling by 3,3'-diindolylmethane contributes to inhibition of cell proliferation and induction of apoptosis in prostate cancer cells. *J Biol Chem*, **282**, 21542-21550, (2007)

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NIH Funding: 5R01CA108535 (PI: F.H. Sarkar)
Other Funding: DOD Prostate Cancer Research Program DAMD17-03-1-0042 (PI: F.H. Sarkar); Puschelberg Foundation

Allegation 17: In Figure 3C, the four bands shown to represent data obtained from the two distinct cellular fractions (cytoplasmic and nuclear) are obviously identical."

RESPONSE:

Dr. Sarkar wrote that "in Figure 3C, the image of nuclear protein IP Western blot is incorrect. This error has taken place in assembling the final Figure 3C from the original gel images" (Response Letter-Final-Nov 27th-2012A. p.10). A "corrected" figure was submitted. Dr. Sarkar concludes that "... this minor error has no impact on the overall findings and the conclusions reported in the original publication" (Response Letter-Final-Nov 27th-2012A. p.10). An erratum was submitted to and printed by the journal (DIO4915 Image File A, slide 127-128). Dr. Li testified that the images are the same (Li Transcript, V.1, p.81, ll.15-16) and explained that in generating the figure "... if some data is not available at that time, I put other data there as placeholder" and then later replace it with correct data. "For this one, I think I didn't replace the correct data" (Li Transcript, V.1, p.82, ll.2-7). Dr. Li said it was a mistake not to change the placeholder and that "... this kind of mistake happened twice" (Li Transcript, V.1, p.83, ll.4-7).

ANALYSIS:

See DIO4915 Image File A, slides 125-128.
Simple visual comparison shows clearly, as admitted by Dr. Sarkar and Dr. Li, that the two panels with different labels ("Cytosol" and "Nuclear") are the same image (DIO4915 Image File A, slide 126). The source of the corrected figure was not provided. An erratum was submitted to the journal by Dr. Sarkar.

CONCLUSION:

The Committee finds, in **Allegation 17** regarding **Figure 3C** in **Paper 8**, that the explanation is plausible. The Committee concludes this was a mistake, in this instance, and there is no evidence of research misconduct in Allegation 17.

Paper 9 (Reference #077) Ali, S., Ahmad, A., Aboukameel, A., Bao, B., Padhye, S., Philip, P.A., Sarkar, F.H. Increased Ras GTPase activity is regulated by miRNAs that can be attenuated by CDF treatment in pancreatic cancer cells. *Cancer Lett*, 319, 173-181, (2012)

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Other Funding: Puschelberg Foundation; Guido Foundations (PI: F.H. Sarkar)

Allegation 18: Figures 1A and 3: "...various bands have been utilized multiply between/among different figures and panels within the Figures."

RESPONSE:

Dr. Sarkar wrote he was aware of the duplication of the control blots from Figures 3A, 3B and 3C into Figure 1A, but this was done "to highlight ... the difference in basal levels between the cell lines ... so that the readers do not miss this important point..." (Response Letter-Final-Nov 27th-2012.pdf, p.10). Dr. Sarkar did "... concede that the actin control should have also been copied..." and he also pointed out that the cutting and pasting involved not only the "K-Ras" bands, but also the "Ras GTPase Activity" bands (DIO4915 Image File A, Slide 130).

Ms. Ali (first author) testified that Figure 1A was a composite of separate films to directly compare relative expression among cell types and that a different β-actin band was used in Figure 1A (Ali Transcript, V.1, p.69, ll.16 to p.88, ll.17). Ms. Ali did not answer direct questions about where or which cells the β-actin bands published in Figure 1A came from. Dr. Sarkar testified both that Figure 1A control bands were composed first and then copied into Figure 3, and the other way around (Sarkar Transcript V.1, p.128, ll.14 to p.142, ll.7). Dr. Sarkar also claims that the images in Figure 3 were "...not coming from three separate autoradiograms ... This is off one radiogram..." (Sarkar Transcript V.1, p.135, ll.6-10) which contradicts other testimony by him and by Ms. Ali, as well as the evidence of cutting and pasting. Dr. Sarkar also said that the β-actin band in Figure 1A was "representative".

ANALYSIS:

See DIO4915 Image File A, slides 129-137.
Dr. Sarkar explained that certain blots from Figures 3A, 3B and 3C were duplicated into Figure 1A to emphasize relative differences among the cell lines in K-Ras expression and Ras GTPase activity in the control miRNA condition (DIO Image File A, slides 130-131). Failure to copy the respective control β-actin blots from Figure 3 was also admitted, however, Dr. Sarkar did not explain why he published an entirely different β-actin band, or where the β-actin bands in Figure 1A came from. The use of a different single β-actin band in Figure 1A (DIO Image File A, slide 132), the captions for Figures 1A and 3, and the text describing Figure 1A (p.175, ¶3.1), none of which mention the duplication, all give the impression that the blots in Figure 1A were from the same experiment and separate from the experiment depicted in Figure 3. Testimonies by Dr. Sarkar and Ms. Ali contradict themselves and each other, as well as the evidence of cutting and pasting. The notebooks provide no clarification.

Dr. Sarkar's testimony was confusing because he said that Figure 1A was constructed by duplicating control lanes from control conditions in Figures 3A, 3B and 3C but not by cutting and pasting. The Committee finds that the point of Figure 1A, to make direct visual comparisons of baseline conditions across different cell types, seems reasonable. However, Figure 1A misrepresented the results by duplicating the control blots from Figure 3 without indicating the images in Figure 1A were from different Western blots and by using a single β-actin band to give the impression that the control bands spanned different cell lines in a single Western blot (DIO4915 Image File A, slide 133). The Committee found no evidence that the β-actin band that Dr. Sarkar and Ms. Ali used in Figure 1A was related in any way to the experiment. Finally, the manner in which the results were characterized in text and captions misrepresented the results by portraying Figure 1A and Figure 3 as though they were separate experiments.

CONCLUSION:

The Committee finds, in **Allegation 18**, several misrepresentations in **Paper 9** in describing the relationship between **Figure 1A** and Figure 3. The Committee concludes that Dr. Sarkar knowingly and intentionally misrepresented the results by fabricating and/or falsifying the data in Figure 1A, by failing to report copying lanes from Figure 3 in Figure 1A, and by using a β-actin control band unrelated to the other protein bands. By a preponderance of the evidence, the Committee concludes that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 19: In Figure 5B, the "... right-most band representing Ras GTPase activity appears to have been overlaid/pasted to represent data in two different experimental conditions."

Allegation 20: In Figure 6B, "The cut and pasting of the 'RAS GTPase Activity' band in the right column ("Pre-let-7i + CDF" condition) similar to the original allegation for Figure 5B in this paper."

Allegation 20a: The Inquiry Committee was not convinced there was manipulation in Figure 4. However, Dr. Sarkar wrote that the far right blot in the top "RAS GTPase Activity" row was pasted in, similar to Figures 5B and 6B (Response Letter-Final-Nov 27th-2012.pdf). Therefore, Figure 4B will be considered together with Allegation 20.

RESPONSE:

Dr. Sarkar wrote that original blots show the published data are accurate. He wrote that because "... with 1 minute exposure, the lane with pre-miR-143+CDF (third lane), the expression was extremely low, or invisible..." the blot "... was taken from 5 minute exposure blot to show that the band is there but very faint..." (Response Letter-Final-Nov 27th-2012.pdf, p.11). Dr. Sarkar testified that mixing images from different exposures "... should not be the practice ... because for all practical purposes one has to have similar exposure time ..." (Sarkar Transcript, V.1, p.57, ll.11-12 & p.58, ll.6-9). Ms. Ali also admitted to pasting single lanes from 5-minute exposure bands into the 1-minute exposure bands (Ali Transcript, V.1, p.156, ll.23 to p.157, ll.10).

Dr. Sarkar testified that cutting and pasting in Western blots was a common practice and that he judged it "... is not a good practice to do..." (Sarkar Transcript, V.1, p.45, ll.19-25). Dr. Sarkar's testimony was contradictory as to whether or not he knew the people in his lab were cutting and pasting images, sometimes saying he did not know (e.g., Sarkar Transcript, V.1, p.46, ll.15-16; p.260, ll.1-4;), at others he did (e.g., Sarkar Transcript, V.1, p.50, ll.7*ff*; '.100, ll.3-6), and at another that he "... was not fully aware" (Sarkar Transcript, V.1, p.45, ll.20). Dr. Sarkar also gave reasons why cutting and pasting would be done in his lab, beyond re-arranging lanes (e.g., Sarkar Transcript, V.1, p.145, ll.6-12).

ANALYSIS:

See DIO40915 Image File A, slides 134-137.
Dr. Sarkar's response is relevant for Allegations 19, 20 and 20a. Dr. Sarkar claims that the allegation "...that Fig-5 has been manipulated ... is not accurate" but he admits to pasting blots from 5-minute exposures into the 1-minute exposure rows for Figures 4B, 5B and 6B (DIO4915 Image File A, slides 134-137). Dr. Sarkar and Ms. Ali illustrated how they replaced the far left top row blot in the faint (column labeled "CDF 1") or irregularly shaped (column labeled "CDF 4") 1-minute scans in Figure 4B with a 5-minute exposure blot (DIO4915 Image File A, slides 136-137). Dr. Sarkar also stated that the fact that the

1-minute "CDF 4" blot was "frowning ... would have been one of the reasons why we had to take a five-minute exposure" and that there was "no scientific rationale" for doing so (Sarkar Transcript, V.1, p.145, ll.7-16). Finally, contrary to the point Dr. Sarkar made about cutting and pasting being "not uncommon," doing so without comment misrepresents the data.

CONCLUSION:

The Committee finds, in **Allegations 19, 20** and **20a,** that the "overlaid/pasted" lanes in the combined treatment condition for the Ras GTPase activity bands in **Figures 4B, 5B** and **6B** in **Paper 9** are from the same experiment but that images from a 5-minute exposure are pasted onto bands from 1-minute exposures. The Committee concludes that Dr. Sarkar, knew about and accepted cutting and pasting in this instance and as common practice in his lab, and that Ms. Ali did the cutting and pasting in this instance. The Committee notes that these misrepresentations are ironic since substituting the 5-minute exposure image actually under-estimated the predicted impact of CDF on Ras GTPase activity. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified results in Figures 4B, 5B and 6B in Paper 9, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 10 (Reference #079): Ali, S., Banerjee, S., Logna, F., Bao, B., Philip, P.A., Korc, M., Sarkar, F.H. Inactivation of Ink4a/Arf leads to deregulated expression of miRNAs in K-Ras transgenic mouse model of pancreatic cancer. *J Cell Physiol*, **227**, 3373-3380, (2012)

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NIH Funding: 5R01CA131151, 3R01CA131151-02S109 & 1R01CA132794 (PI: F.H. Sarkar)
Other Funding: Puschelberg Foundation; Guido Foundation

Allegations 21 and ***21a:*** In Figure 5A, "bands ... appear to have been overlaid/pasted into the EGFR and K-Ras data sections." Figure 5A shows evidence of cut and pasted blots in several other rows and columns. Overall, the right and left halves appear to be from different gels. Further, these bands do not appear to be matched in the β-actin bands (DIO4915 Image File A, slides 139-140).

RESPONSE:

Dr. Sarkar wrote regarding lanes 3-6 of the EGFR row in Figure 5A that "... the four central lanes were merged together and were difficult to separate the bands, hence a second blot was run with same amount of protein showing the difference between pdx1-Cre (normal) and K-Ras + Pdx1-Cre (tumorigenic)" (Response Letter-Final-Nov 27th-2012, p.11; DIO4915 Image File A, slide 141). Dr. Sarkar concluded that "the overall results and conclusion remains the same. The original figure of K-RAS in one autoradiogram was only edited to eliminate the curvature seen in the blot" (Response Letter-Final-Nov 27th-2012, p.11).

Regarding the K-Ras row, Dr. Sarkar and Ms. Ali wrote that "the original figure of K-Ras in one autoradiogram was only edited to eliminate the curvature seen in the blot" (Response Letter-Final-Nov 27th-2012, p.11). Ms. Ali, however, provided an "amended figure" for Figure 5A using different EGFR, K-Ras, and MT1-MMP bands from duplicate blots (Response Letter (2nd)-Feb. 4th-2014.docx, p.12). Ms. Ali also wrote "as can be seen from the original autoradiogram, no cut and paste was done. It is from the same film. The gel run was not ideal (see the smiley face) and therefore lanes were cut and re-pasted to make the bands more linear..." (E:\DataSubmittedWithFSInquiry\Shadan Correction\Shadan (Wayne State)-11-02.docx, p.7).

ANALYSES:

See DIO40915 Image File A, slides 138-158.
Ms. Ali did the Western blots and composed Figure 5A. Simple inspection of Figure 5A shows clear evidence of cutting and pasting (DIO4915 Image File A, slides 139-140). Comparison of the published images with source files found on Dr. Sarkar's sequestered computer drives makes clear the extensive re-arrangement of lanes, manipulation of bands, and confusion in labeling the lanes with the correct mouse strains in the EGFR and K-Ras rows.

EGFR rows are found in directory E:\OriginalData\12\[NTFS]\Documents and Settings\alis\My Documents\KRAS\KRAS(Transgenic mouse)\ in three files names "egfr.jpg" (9:09 am); "egfr(western).jpg" (9:15 am); and "comp(western).jpg" (1:12 pm), which is the final version with all the rows complied. Ms. Ali testified that she use these files to compose Figure 5A (Ali Transcript, V.2, p.176, ll.1-4) but said she did "not recall" doing manipulations or re-arranging lane or who else might have (pp.180 & 182-3). Original films for the EGRF bands are in files: "Paper 10 – Image 1 – Exhibit 66.jpg" and "Paper 10 – Image 2 – Exhibit 66.jpg" (DIO4915 Image File A, slides 141-142; and E:\DataSubmittedWithFSInquiry\Shadan Correction\Shadan (Wayne State)-11-02).docx, p.11). Original films for the K-Ras bands are in files: "Paper 10 – Image 3 – Exhibit 66.jpg" and "Paper 10 – Extra Image – Exhibit 66.jpg" (DIO4915 Image File A, slides 142-144 and "Shadan (Wayne State)-11-02).docx," p.11). The analysis shows considerable re-arrangement of lanes in the EGFR and K-Ras rows, and extensive "photoshopping" in the EGFR row to eliminate/minimize cut and crop marks and stray spots in the blots, and to smooth shadows and thereby altering appearance of bands. A direct comparison of Film 2 is provided (DIO4915 Image File A, slides 145-147).

The experiment assessed protein expression in mouse strains with various combinations of gene "knockouts" (i.e., "K", "P", "I", "K+P", etc.; DIO4915 Image File A, slides 148-151). The labeling of the EGFR row is uncertain because of conflicting labels in different files and the re-arrangements of lanes. It is possible that one earlier file (egfr.jpg; 9:09am) used an image captured from the reverse side of the file (DIO4915 Image File A, slide 147). The bottom line is that there are three possible labeling schemes (DIO4915 Image File A, slides 151). Dr. Sarkar did not know the correct labelling and assumed it was a mistake by Ms. Ali (Sarkar Transcript, V.1, pp.263-271). Ms. Ali was not certain which lanes were which during the discussion of labeling in Figure 5A (Ali Transcript, V.2, pp.188-194).

The **K-Ras row** is obviously manipulated to remove a curve in the bands (see DIO4915 Image File A, slides 152-153). The response by Dr. Sarkar and Ms. Ali regarding the K-Ras bands is self-contradictory, declaring (twice) that "no cut and paste was done" but then immediately admitting that "...lanes were cut and re-pasted to make the bands more linear..." and straighten out a "smiley face" (Shadan (Wayne State)-11-02.docx, p.7). In fact, lanes 2-4 and lane 1 were each cut from the original K-Ras blot and re-positioned to give the false impression that the blot was of higher quality and the bands straight, not suffering from the "smiley face" curve (DIO4915 Image File A, slides 153 to 155 [upper panels]). In addition, the 4 rightmost K-Ras bands (lanes 5 to 8) are also manipulated, most directly by cutting them away from and/or masking the dark overlapping bands that are clearly evident in the original film (DIO4915 Image File A, slides 154-156). Lanes 5 to 7 in the published K-Ras bands were composed by being cropped and – judging by white spots evident in the middle of both original and, faintly, original lanes – flipped vertically and horizontally, and rotated 3^0 counterclockwise. The corresponding file Ms. Ali used to compose the K-Ras row is found on Ms. Ali's desktop computer

(E:\OriginalData\12\[NTFS]\Documents and Settings\alis\My Documents\ KRAS\KRAS(Transgenic mouse)\K-Ras(western).jpg)

and also reveals the white spots when the image contrast is reduced 70% (DIO4915 Image File A, slides 155-156), indicating Ms. Ali did the manipulations. Lane 8 in the published figure was also pasted in, but the source of that blot is not known. Similar to the EGFR row, re-arranging lanes 5 to 8 altered the labels so that what was published did not correspond to the source image files (DIO4915 Image File A, slide 157).

The **MT1-MMP** and **β-actin rows** do not show sufficient evidence of manipulation although MMP lanes 1-4 appear higher than lanes 5 -8 and the β-actin rows does not show cut marks seen in the EGFR and K-Ras rows ("E:\OriginalData\12\[NTFS]\Documents and Settings\alis\My Documents\KRAS\KRAS(Transgenic mouse)\MT1-MMP.jpg" and "actin(western).jpg" files). See DIO4915 Image File A, slide 140).

CONCLUSION:

The Committee finds, in **Allegations 21** and **21a** regarding **Figures 5A** in **Paper 10**, clear evidence that several blots were cut, re-arranged, manipulated, pasted in the EGFR and K-Ras rows by Ms. Ali. She also re-labeled the lanes and more than one way so that laboratory record does not allow the correct labels to be determined. The Committee finds that Ms. Ali did these manipulations to misrepresent both the quality of the Western blot and the data depicting differences in protein expression among the "knockout" mice. The Committee concludes based on his responses (above) that Dr. Sarkar was aware this was being done. Therefore, the Committee concludes, by a preponderance of the evidence, that Dr. Sarkar knowingly and intentionally published fabricated and/or falsified data in Figure 5A in Paper 10, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 22: In Figure 6B, the β-actin appears to be duplicated and manipulated to blur or eliminate edges, indicating falsification.

Allegation 22a: The β-actin band from Figure 6B in **Paper 10** appears to have been duplicated in Figure 6A in Bao, B., et al., Cancer Prev Res **5**:355-364. (2012) (**Paper 22**/Reference #086)

Allegation 22b: The β-actin band from Figure 6B in **Paper 10** appears to have been duplicated in Figure 5A in Bao, B., et al., Cancer Res **72**:335-345 (2012) (**Paper 23**/Reference #085)

ANALYSES:

Further visual examination of the β-actin bands in Figure 6B do not show sufficient evidence of the manipulations indicated in Allegation 22 (DIO4915 Image File A, slide 158). The duplication, manipulation and re-labeling of these β-actin bands into Papers 22 and Paper 23 in Allegations 22a and 22b are redundant with Allegation 43, where these are addressed.

CONCLUSION:

The Committee finds, in **Allegations 22, 22a** and **22b**, insufficient evidence of manipulation in **Figure 6B** in **Paper 10** and, consistent with the analyses detailed under Allegation 43, finds the responses credible and the laboratory record sufficient to explain the re-use of certain bands in Figure 6A of Paper 22 and Figure 5A of Paper 23. The Committee concludes there was no research misconduct regarding Allegations 22, 22a and 22b.

Paper 11 (Reference #287): Prasad, A., Bao, B., Beck, F.W.J., Kucuk, O., Sarkar, F.H. Antioxidant effect of zinc in humans. Free Rad Biol Med, 37, 1182-1190, (2004)

Publication History: Received: December 22, 2003; Revised: May 13, 2004; Accepted: July 1, 2004
NIH Funding: NIH R01 AI 50698 (PI: A.S. Prasad)
Other Funding: Labcatal Laboratories; George and Pasty Eby Foundation
Note: Ananda S. Prasad is the corresponding author.

Allegation 22c: In Figure 3, the same two β-actin panels obviously were used to represent load controls for different experimental conditions (DIO4915 Image File A, slide 160).

RESPONSE:

Dr. Sarkar wrote that "Figure 3 is correct. The same actin should be used to normalize TNF-α and IL-1β each sample of each subject" (Response Letter-Final-Nov 27th-2012.pdf, p.12) and indicated in the methods and figure caption that "... β-actin of 3 subjects were selected from 10 subject from each group ... to clarify that we did beta-actin as the control for each sample." Dr. Sarkar concludes that "there is no error in this article" and also notes "...that Dr. Prasad is the corresponding senior author."

ANALYSIS:

See DIO4915 Image File A, slides 159-160.
The bands are the same as admitted and explained by Dr. Sarkar. Dr. Sarkar's role is uncertain and there are no records available from this study. Dr. Prasad is PI of the NIH grant that funded it and he is the corresponding author. Finally, the paper was published outside the period under investigation.

CONCLUSION:

The Committee finds no evidence of research misconduct and that Paper 11 was published outside the period under investigation. No further action is recommended.

Paper 12 (Reference #151): Ali S, Ahmad A, Banerjee S, Padhye S, Dominiak K, Schaffert JM, Wang Z, Philip PA, Sarkar FH (2010) Gemcitabine sensitivity can be induced in pancreatic cancer cells through modulation of miR-200 and miR-21 expression by curcumin or its analogue CDF. *Cancer Res* 70: 3606-3617.

Publication History: Received: December 21, 2009; Revised: February 2, 2010; Accepted: February 17, 2010; Epub: April 13, 2010; Published: May 1, 2010.
NIH Funding: 5R01CA131151, 3R01CA131151-02S1, and 5R01CA132794 (PI: F.H. Sarkar)

Allegation 23: In Figure 3A, the apparently blank panels indicated in the rectangular outlines are the same but utilized in four different places to indicate results for quite different protein expression patterns. The putative tropomyosin control bands shown do not match the lane size for the pAkt and other experimental lanes above. Evidence also indicates multiple instances of overlaying/pasting of bands into various images of results in several parts of the figure.

Note: These "multiple instances" involve the PTEN, pAkt and Tropomyosin rows of the MIAPaCa-E panel, and the PTEN and Tropomyosin rows in the MIAPaCa-M panel. Analyses show that blots in the PTEN rows originally labeled as being from MIAPaCa-M or MIAPaCa-E cells were switched reciprocally and re-labeled in the published figure as from MIAPaCa-E and PTEN/MIAPaCa-M cells, respectively. Other "overlaying"

and related "cosmetic changes" were made to the PTEN bands in the BxPC-3 panel and to the Tropomyosin bands in the MIAPaCa-E panel to remove irregularities, smudges and stray spots in the raw scans of the blots. See DIO4914 Image File A, slide 162). See DIO4915 Image File A, slides 162-175.

The multiple instances under Allegation 23 in Figure 3A are organized by type:

1. **Re-use of Gray Bands**. The original complaint noted that the same gray box was re-used four times as data for the pAkt row in the BxPC-3 panel, the COX-2 row in the MIAPaCa-M panel, and the E-cadherin row in both the MIAPaCa-E and MIAPaCa-M panels. Although largely blank, these gray rows show the same pattern of spots and irregularities indicating their identity.
2. **Cutting/Pasting**. There are cut/paste marks within the BxPC-3 panel (E-Cadherin & PTEN bands), the MIAPaCa-E panel (PTEN/, pAkt & Tropomyosin bands), and the MIAPaCa-M panel (PTEN, pAkt & Tropomyosin bands). In some instances, subtle cut/paste marks are evident in the published figure. Others were more clearly identified through comparisons of published images with earlier versions in files found on sequestered laboratory computers.
3. **Overlaying/Masking**. Gray boxes appear to have been added just above some Tropomyosin bands in both the MIAPaCa-E and MIAPaCa-M panels.
4. **Mis-alignment of Gel Bands**. The original allegation noted that the lanes in the Tropomyosin bands from the MIAPaCa-E and MIAPaCa-M composites "do not fit", i.e. the bands in these blots do not align with the lanes defined by the other blotted proteins, implying that the blots were not derived by stripping and re-probing a single membrane.
5. **Cosmetic Changes**. Spots, smudges and blemishes evident in earlier versions of figures were removed from or masked over in the published PTEN bands in the BxPC-3 panel and Tropomyosin bands in the MIAPaCa-E panel.
6. **Relabeling Proteins and Cell Types**. Data originally labeled in earlier files as PTEN in MIAPaCa-M and MIAPaCa-E cells were switched, reciprocally, and the cell types were relabeled in the published figure, as MIAPaCa-**E** and MIAPaCa-**M** cells, respectively.
7. **β-Actin Panel Swap**. Different β-actin bands in the MIAPaCa-E panel were used in the published Figure 3A than were evident in an earlier version of this figure suggesting that the β-actin bands in the MIAPaCa-E panel used in Figure 3A are not the true loading controls.

RESPONSE:

1. **Re-Use of Gray Panels.**

Dr. Sarkar wrote initially that "to further clarify our results, we showed blank lanes" (Response Letter-Final-Nov 27th-2012.pdf, p.12). This is expanded upon in a document prepared by Ms. Ali and used by Dr. Sarkar to prepare his response letter [file: "Shadan (Wayne State).docx"; created 10/29/2012; E:\DataSubmittedWithFSInquiry\Shadan Correction]. Much of Dr. Sarkar's response to this allegation is found verbatim in Ms. Ali's document. Regarding the gray boxes, Ms. Ali wrote that: "Initially, we found that the expression of COX-2 in MIAPaCa-M cells was completely loss, compared to MIAPaCa-E cells and we scanned that film to show the loss of COX-2 expression. We know from previous publication of ours ... and other investigators ... that E-cadherin is not expressed in MIAPaCa cells; hence we used that cropped lane as a negative control to show the loss of E-cadherin expression. Similarly, we used the same cropped lane also to show loss of pAkt in BxPC-3 cells which has also been published earlier."

Ms. Ali testified that she used a single generic blank as a surrogate for data that had not been collected (Ali Tanscript, V.1, p.88-99), indicating that Western blots had not been run for three of the four sample sets. This is very clear regarding the gray box labeled "pAkt" in the BxPC-3 panel when Ms. Ali testified that "the AKT, the one which is showing as a blank, that one is just a negative from one of the films ... we did not do p-Akt, because we know the level of p-Akt is not there" (Ali Transcript, V.1, pp.98, ll.17-18). She

testified that the gray box is representing "... previously known knowledge..." (Ali Transcript, V.1, pp.98, ll.19-20). When asked directly if that means she "... did not then run that p-Akt at all?" Ms. Ali testified "That's true. That is just showing it's a negative" (Ali Transcript, V.1, p.99, ll.2-3).

Dr. Sarkar testified it is improper to provide data for an experiment that was not actually done, although he gave no specifics about his oversight of this experiment (Sarkar Transcript, V.2, pp.469-477). He said, "I don't remember, but I would have. I must have asked her, 'Did you run it or not,' and if I was satisfied at that time that she did ran, now if she is saying now before the Committee she did not ran, I cannot verify that, but I as a person could not have a figure created where it is showing negative and you never ran it" (Sarkar Transcript, V.2, pp.469-477).

Ms. Ali's subsequent testimony contradicted her initial reason for using the gray box. She was initially explicit that three of the four Western blots had not been run. This is consistent with the document Dr. Sarkar submitted stating that a COX-2 blot had been run in MIAPaCa-M cells and that an image of this blank blot had been published not only as COX-2 in MIAPaCa-M cells but also, inappropriately, as pAkt in BxPC-3 cells and as E-cadherin in both MIAPaCa-E and MIAPaCa-M cells (Shadan (Wayne State).docx, pp.8-13). In contradiction, in subsequent testimony and responses, Ms. Ali explained that all four blots had, in fact, been run and were found to be blank (Ali 01 - Exhibit 156 – Shadan Ali response 07 17 14, pp.9-14), and that rather than scan all the non-expressed blank films, for expediency she simply used the one image for all. Ms. Ali wrote that "... it is hard to crop a negative blot because of no visibility of the bands" (Ali 01 - Exhibit 156 - Shadan Ali response 07 17 14, p.7). In her third interview, Ms. Ali testified first that she provided the negative films to the Committee and that she "had definitely ran all of them to see no exposure" (Ali Transcript, V.3, p.300, ll.21-23). Later in the same interview, the Committee addressed her contradictory responses (Ali Transcript, V.3, pp.361-366) and read back relevant portions of her testimony from the first interview where she explicitly stated that at least the "pAkt" box in the BxPC-3 panel blot had not been run. Confronted with her contradictory testimony, she repeated that the blots had, in fact, been done (Ali Transcript, V.3, pp.361-365). When asked directly about changing her testimony, Ali said "maybe I didn't understand the question properly. I'm sorry" (Ali Transcript, V.3, p.365, ll.12-13). When asked "are you changing your testimony now?" (i.e., in the third interview), she testified "I'm not changing testimony. I ran and I showed you the blots. I showed you the negative blots, right, in the second interview when I came in? I submitted those blots" (Ali Transcript, V.3, p.365, ll.21-23).

2. **Cutting/Pasting.**
The responses from Dr. Sarkar (Response Letter-Final-Nov 27th-2012.pdf) and from Ms. Ali (Ali 01 - Exhibit 156 - Shadan Ali response 07 17 14) indicated that cutting and pasting was necessary for the E-cadherin and PTEN rows in the BxPC-3 panel because samples were loaded onto these gels in different orders than that in other gels used for these composite figures. The original film scans for these two panels were provided. Ms. Ali wrote that some of the gels run by students got mixed up and had to be cut and pasted to be consistent ("Shadan (Wayne State).docx"). Cutting/pasting in the pAkt, PTEN and Tropomyosin rows of the MIAPaCa-M panel, and the PTEN and Tropomyosin rows of the MIAPaCa-E panel, were not addressed by either Dr. Sarkar or Ms. Ali.

3. **Overlaying/Masking.**
The putative 'masking' within the Tropomyosin rows in the MIAPaCa-E and MIAPaCa-M panels was addressed indirectly in the responses from both Dr. Sarkar (Response Letter-Final-Nov 27th-2012.pdf) and Ms. Ali (Ali 01 - Exhibit 156 - Shadan Ali response 07 17 14). Neither admits directly to masking, nor were the original film images provided. However, they both offered a rationale for why masking might have been used, that is a commercial antibody used for these blots is very poor, giving "lots of non-specific bands". No relevant testimony was given about overlaying or masking.

4. **Misalignment of Gel Bands.**
No relevant testimony from response letters or interviews.

5. **Cosmetic Changes**
No relevant testimony from response letters or interviews.

6. **Change in Data Identity**
No relevant testimony from response letters or interviews.

7. **Actin Panel Swap**
No relevant testimony from response letters or interviews.

ANALYSES:

See DIO4915 Image File A, slide 161-179.

1. **Re-Use of Gray Boxes.** The four gray boxes published as data in Figure 3A are all clearly re-uses of the same image and cannot all represent original data (DIO4915 Image File A, slide 162-163). Original films for four "negative" blots in Figure 3A were not provided to the Committee and were not found. A single gray box with unique stray marks was re-used in multiple rows (DIO4915 Image File A, slide 163). Contradictory explanations were given by Ms. Ali and Dr. Sarkar for re-use of a single blank gray box to represent Western blot results for pAkt in BxPC-3 cells, COX-2 and E-cadherin in MIAPaCa-E cells, and E-cadherin in MIAPaCa-M cells. Ms. Ali's initial testimony was clear that these blots had not been done and any negative blot was taken (Ali Transcript, V.1, p.99, ll.1-4). Written responses from Dr. Sarkar ("Response Letter-Final-Nov 27th-2012.pdf" & "Shadan (Wayne State).docx") also were that because several proteins were known from previous work in Dr. Sarkar's lab not to be expressed in these cell lines, the negative blot image from the COX-2 bands in MIAPaCa-M cells was re-used to represent the anticipated negative data for the other three cells. This explanation subsequently changed. Ms. Ali indicated (Ali Transcript, V.3, p.361, ll.6) that the films she provided at her second interview (Exhibit 78) were duplicate or repeated experiments done just prior to her second interview to demonstrate for the Committee that these proteins are not expressed in these cells. In her third interview (Ali Transcript, V.3, p.300; pp.361-366), Ms. Ali indicated that all four Western blots had, in fact, been run, were found to be blank, and that a single image had been used to represent this result, just for expediency. Further, she indicated that the original negative films for these four blots had been provided to the Committee. The negative blots were not clear or credible. The Committee concludes that Ms. Ali's second testimony stating that she had done the Western blots is not credible or substantiated.

2. **Cutting/Pasting.** Many precursor images to Figure 3A were found on the sequestered computer drives from Dr. Sarkar's lab (e.g., DIO4915 Image File A, slides 164-175). These included images for individual blot panels, early versions of the composite panels in Figure 3A, and in some raw scans of the Western blot films. Patterns of cutting and pasting were clear in several rows in all three panels in Figure 3A:

In the **BxPC-3 panel**, evaluation of the **E-cadherin** and **PTEN** bands, comparing the published image to copies of the original film scan submitted by Sarkar (Response Letter-Final-Nov 27th-2012.pdf) and found on sequestered hard-drives reveals a complex rearranging of individual gel bands in the published panel (DIO4915 Image File A, slides 163 & 164). In the PTEN bands in the BxPC-3 panel, the positions of the two bands on the far right had been switched. The labels are unclear on the original files.

In the **MIAPaCa-E panel**, an early precursor image for the **PTEN** row in a file named "MIAPaCa-GR(Pten).jpg" was found on the sequestered hard-drives (DIO4915 Image File A, slide 165). Comparison of this file to the published panel reveals a complex rearranging of the gel bands. (In addition, as detailed below under "Re-labeling," note that, the images published in the PTEN row of the MIAPaCa-E panel were initially labeled "MIAPaCa-M" (i.e., "MIAPaCa-GR" in the jpg file name is synonymous with "MIAPaCa-M" cells). For the **pAkt** and **Tropomycin** bands, cut/paste marks are evident in the published figure and (for Tropomycin) in the earlier versions from sequestered hard-drives, as well (DIO4915 Image File A, slide 167-168; 175). There was also "cosmetic" removal of a smudge above the fourth Tropomycin band.

In the **MIAPaCa-M panel**, an early version of the **pAKT bands** was found on sequestered hard-drives ("MIAPaCa-GR(Akt).jpg"; DIO4915 Image File A, slide 163) with two clear two cut/paste marks. However, the original film or scan images were not located so it is unclear how the image was rearranged. In particular, it is not clear if the pasted bands originated from a single or multiple film scans. The dark gray background surrounding the far right band in the precursor image was clearly lightened prior to publication (DIO4915 Image File A, slide 163) and suggests that the manipulations may include splicing together images from different films or exposures. Ms. Ali had testified to using photoshop to make cosmetic changes (Ali Transcript, V.1, p.22; V.2, pp.185-186; V.3, ll.348ff). This lightening serves to disguise the pasting of a more darkly-exposed film and, more importantly, misrepresents the data as if all the bands were from the same film. For the **PTEN bands,** a precursor image in a file named "MIAPaCa(Pten).jpg" was found on the sequestered hard-drives which, compared to the published MIAPaCa-M panel, shows the bands were rearranged in a complex fashion (DIO4915 Image File A, slides 166-168). (In addition, as detailed below under "Re-labeling," note here again the relabeling of images: the precursor image file name "MIAPaCa(Pten)" indicates it is from "MIAPaCa-E" cells but is labeled "MIAPaCa-M" cells.) For the **Tropomyosin bands,** cut/paste marks are evident in the published figure as well as in the earliest version of this panel, identified from sequestered hard-drives (DIO4915 Image File A, slide 169 & 171). Original films or film scans were not located.

For four of these (PTEN & E-Cadherin in BxPC-3 cells; and PTEN in both MIAPaCa-E & MIAPaCa-M cells), original films or scans of original images were located by the Committee or submitted. For each of these, gel bands from a single film scan were re-ordered. The explanation was that the gels loaded in the wrong order, necessitating re-ordering lanes by cutting/pasting. Ms. Ali said these gels were done by "students." She was unable to provide supporting documentation on how lanes were loaded, and none was found in the notebook entry for this experiment (Exhibit 49; p 33-34). For four other bands (pAkt & Tropomycin in MIAPaCa-E & /MIAPaCa-M cells), original films were not made available or found, so how gels were loaded or ordered or manipulated, and whether the published bands came from one or more blots, remains unclear.

Ms. Ali's explanation that the gel bands were re-ordered to correct some mis-loaded gels strains credulity. The Committee judges that the original loading orders, inferred from the subsequent cutting/pasting rearrangement patterns, show at least five different, unique loading sequences (DIO4915 Image File A, slide 174) and imply levels of lab practice disorder and randomness that seem implausible. Further, these gel mis-loadings appear to have been discovered by Ms. Ali very late in the process, months after the gels were run (see "Timeline" below). The early version of Figure 3A, created in July, 2009, presents the PTEN data in its raw form – not rearranged, with re-labeling of cell lines (DIO4915 Image File A, slides 172-173). The rearranged, putatively 'correctly'-ordered lanes appear on Ms. Ali's computer, four months later in November, 2009. Similarly, the rearrangement of PTEN bands and the re-labeling of MIAPaCa-E and MIAPaCa-M data for PTEN bands also became apparent in the computer record in November, 2009.

3. **Overlaying/Masking.** Visual inspection shows that masking gray rectangles are evident in the published Tropomyosin bands in the MIAPaCa-M panel (DIO4915 Image File A, slide 171). Original scans that might reveal what was covered by these rectangles were not identified.

4. **Misalignment of Bands.** This misalignment is obvious for the Tropomyosin bands in the MIAPaCa-E panel. Dr. Sarkar and Ms. Ali did not address this misalignment, nor was any relevant information found in the laboratory notebooks or computers.

5. **Cosmetic Changes.** Alterations were made to individual bands in the PTEN rows in the BxPC-3 (slide 4) and the MIAPaCa-E panels (DIO4915 Image File A, slide 166), as well as in the Tropomyosin row in the MIAPaCa-E panel (DIO4915 Image File A, slide 170).

6. **Re-Labeling Data.** The labels on two PTEN Western blots were switched, with the blot originally labeled "MIAPaCa-GR(PTEN)" (i.e., from MIAPaCa-M cells), being re-labeled the MIAPaCa-E cells (DIO4915 Image File A, slide 169. Likewise, the original MIAPaCa-E image for PTEN was re-labeled and published as "MIAPaCa-M" cells (DIO4915 Image File A, slide 168. (Note that the PTEN bands were also rearranged, as detailed above.)

7. **β-Actin Panel Swap.** The early version of the Figure 3A shows a different β-actin panel associated with the MIAPaCa-E composite than that used in the published figure (DIO4915 Image File A, slide 172). (See Western.jpg; created: 07/24/2009; location: E\12\[NTFS]\Documents and Settings\alis\My Documents\CDF+Cur+Gem). Ms. Ali described the standard Sarkar Lab protocol for experiments (like Figure 3A), for multiple proteins is that all blots for a particular sample set should be derived from a single gel and then, a single membrane blot, which is either sectioned to assess different proteins of substantially different molecular weights, or stripped and re-probed, when molecular weights are closer. Multiple lines of evidence indicate this protocol was not adhered to for Figure 3A. First, many of the gel bands do not align with the proteins of the other blots (most evident for the Tropomyosin bands in the MIAPaCa-E panel). Second, a new β-actin panel was used for the MIAPaCa-E panel, added late in the process. The new β-actin bands image was created on Nov. 2, 2009 (see: E:\[12\[NTFS]\Documents and Settings\alis\Local Settings\Temporary Internet Files\OLK23\MIAPaCa(actin).jpg), is not contemporaneous with the other blots in the panel, and so cannot be a bona fide 'loading control'. Finally, and of most concern, Ms. Ali indicates that many of the gel blots (included all of the PTEN blots) were loaded in an improper order meaning that a single β-actin image cannot be used for multiple blots derive from different gels.

Analysis of the Timeline:

March 23-27, 2009. Ms. Ali's lab notebook indicates these dates for experimental treatment of cells and sample preparation (Exhibit 49, p.33 & 34) for this publication. The final entry for this experiment reads: "Collect cell pellet & make lysate to run western blot analysis." Thus, there is no record of what proteins were blotted for or the order in which gels were loaded. The dates for the gel running and Western blotting are not indicated.

July, 2009. Creation dates for the earliest Western blot images identified from sequestered hard-drives (E:\12\[NTFS]\Documents and Settings\alis\Local Settings\Temporary Internet Files\OLK23). Some of these .jpg images are clearly original film scans; some appear to be cropped from original scans; while others appear to have already undergone substantial image manipulation. Note the masking and cutting/pasting for the MIAPaCa(TPM1).jpg and MIAPaCa-GR(TPM1).jpg (Slides 8 and 9). It is unclear if

these July, 2009 creation dates represent the timing of gel and blot running or, alternatively, when the X-ray film was scanned.

July 6, 2009. The earliest identified versions of the E-cadherin bands in BxPC-3 cells showing evidence of cutting/pasting and re-ordering of lanes were created at this time, prior to the construction of the published panels. No original blot scans were located. Gel bands from the original film scan were found in E:\12\[NTFS]\Documents and Settings\alis\Local Settings\Temporary Internet Files\OLK23\BxPC-3(Ecadh1).jpg; creation: July 6, 2009).

July 16, 2009. This is the creation date for early versions of the three composite panels of Westerns in Figure 3A (i.e., files: MIA-2(composite).jpg, MIA-GR(composite).jpg, BxPC-3(composite).jpg; location: E:\12\[NTFS]\Documents and Settings\alis\My Documents\CDF+Cur+GEM\CDF blots). Many of the Western blot rows comprising these early composites are identical to those published in Figure 3A. However, there are also several significant changes made prior to manuscript submission (slide 11). Specifically, early composites include a Western blot for PANC-1 cells as well as Maspin blots for all four composites; pAkt blot data was not included in the early composites; raw, unmanipulated PTEN images are included; and different β-actin bands are is used for the MIAPaCa-E composite.

July 17-24, 2009. The earliest identified versions of the Tropomyosin bands in MIAPaCa-E and MIAPaCa-M cells showing evidence of masking and cutting/pasting are found around this time, prior to the construction of the published panels. No original blot scans were located.

Oct. 30-Nov. 2, 2009. The three rearranged PTEN bands (i.e., BxPC-3(PTEN).jpg, MIAPaCa(PTEN).jpg; & MIAPaCa-GR(PTEN).jpg; location: E:\12\[NTFS]\Documents and Settings\alis\My Documents\CDF+Cur+GEM\CDF Western), and the reciprocal re-labeling of the PTEN bands cell types, switching MIAPaCa-E and MIAPaCa-M cell type labels occurred at this time. PTEN panels. A new β-actin blot first appears on Nov. 2, 2009 in E:\12\[NTFS]\Documents and Settings\alis\Local Settings\Temporary Internet Files\OLK23\MIAPaCa(actin).jpg).

Dec. 15, 2009. Final figure was created (file: E:\12\[NTFS]\Documents and Settings\alis\My Documents\CDF+Cur+GEM\Figures(jpeg)\Figure.3.jpg).

Dec. 21, 2009. Manuscript submitted.

CONCLUSIONS:

Based upon the analyses detailed above, the Committee finds, in **Allegation 23**, multiple instances of research misconduct for **Figure 3A**. While some, like the cosmetic removal of film blemishes are relatively minor, others are egregious.

Re-use of Blank Gray Panel Blot. The Committee finds that the contradictions within and between Ms. Ali's and Dr. Sarkar's testimonies regarding re-use of the same gray box image mean that their claim that all Western blots were actually run for Figure 3A is not credible. The Committee judges Ms. Ali's first statement that four blots had not been run to be correct. The films provided to the Committee are clearly not original films but of repeated experiments. The Committee concludes that there is insufficient evidence that three blots were run for this experiment.

Cutting/Pasting and **Re-Labeling**. The Committee finds that cutting/pasting and relabeling of bands and cell lines was identified for 8 of the 18 protein rows in the Western blot panels in Figure 3A. The

Committee finds it highly unlikely that all these manipulations and data changes made to Figure 3A were intended to correct mistakes. The incomplete nature of the laboratory record (i.e., absent films or film scans, absent records of gel load order) makes it difficult to exactly map out all the manipulations. The Committee finds it highly unlikely, in the absence of any laboratory record, that months after Westerns were run, Ms. Ali would be able to know what the various loading orders were, let alone detect errors in loading patterns. The Committee concludes that the published Figure 3A was composed to support Dr. Sarkar's hypotheses. The re-ordering and re-labeling of PTEN and pAkt bands, and of MIAPaCa-M and MIAPaCa-E cells yield a result that aligns with hypothesis. With these changes, the strongest up-regulation of PTEN and the most diminished expression of pAkt, are in the combined CDF+gemcitabine treatment group (DIO4915 Image File A, slides 173-175). Compared to the original data, these manipulations present results more strongly supporting the publication's main point that combined treatment may provide a more effective pancreatic cancer treatment. The Committee also finds it highly unlikely that Ms. Ali discovered late in the process that the MIAPaCa-E and MIAPaCa-M Western blots had been mixed up. The Committee concludes that the many changes in PTEN data occurred as the manuscript was being prepared for its submission in December, 2009.

Overlaying/Masking and **"Cosmetic" Changes**. The Committee concludes that gray panels inserted just above the tropomyosin bands in the MIAPaCa-E and MIAPaCa-M panels were intended to cover non-specific, cross-reacting bands. The accepted practice of distinguishing electrophoretic positions of tropomyosin versus non-specific bands with an asterisk or arrowheads was not used. The "cosmetic" covering-up or removal of dots and smudges from original film images, while relatively minor in comparison to other manipulations, give the impression that the Westerns were of a higher quality than actually achieved in Dr. Sarkar's lab. The Committee concludes that the gray boxes put just above the tropomyosin gel bands and "cosmetic" changes were intended to mask non-specific bands and imperfections in blots but there is insufficient evidence that this is research misconduct by Dr. Sarkar.

Gel Band Misalignment and **β-Actin Panel Swap**. The Committee concludes that the evidence of the misaligned lanes and use of different β-actin bands is consistent with the evidence of cutting and pasting and re-ordering lanes and re-labeling data identified above. Ms. Ali's testimony about how she and others run Western blots in Dr. Sarkar's lab does not explain how a single loading control image can be used for multiple sets of bands with different loading orders in different gels. The Committee concludes that the three Figure 3A panels are composites constructed by splicing together Western blot images from different gels.

Summary. The Committee finds that Dr. Sarkar's testimony about providing "data" for an experiment that was not actually done indicates he knew figures were being constructed as described above. The Committee finds it unlikely that Dr. Sarkar would testify that "I must have asked her, 'Did you run it [the experiment] or not,'" (Sarkar Transcript, V.2, p.474, ll.11-17) if he was unaware that data were being fabricated for experiments that were not run. The Committee interprets Dr. Sarkar's testimony to mean that he knew Ms. Ali had not run the negative controls in all experiment (Sarkar Transcript, V.2, pp.469-477).

Therefore, the Committee concludes, by a preponderance of the evidence regarding **Allegation 23** in **Paper 12**, that by re-using a single blank gray image to represent data for Figure 3A from experiments for which there is no evidence they were done, and by cutting and pasting and re-ordering and re-labeling multiple bands throughout Figure 3A, and by composing the published bands for the proteins and the β-actin control from multiple sources, that in each instance Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3A to overstate in Paper 12 support for the potential benefits of combined CDF and gemcitabine drug treatment for pancreatic cancer, and that in each instance this constitutes research

misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 23a – In Figures 3C and 3D, there are indications of cutting and pasting both within the pAKT panel of Figure 3C and within the PTEN panel of Figure 3D.

Note: These "indications" include irregularities in labeling the cell types for Figures 3C and 3D where the PTEN row is identified as MIAPaCa-**E** cells but relevant information in the lab record indicates that MIAPaCa-**M** cells were used.

RESPONSE:

Dr. Sarkar and Ms. Ali both wrote that original films for the pAkt row in Figure 3C and the PTEN row in Figure 3D could not be located – "missing from our record" (Response Letter-Final-Nov 27th-2012.pdf). They provided different 'duplicate' films of repeated experiments. Ms. Ali was asked if cutting/pasting images from separate gels was used to construct the PTEN bands of Figure 3D and she responded "No. It's from the same gel" (Ali Transcript, V.3, p.305, ll.14).

ANALYSIS:

See DIO4915 Image File A, slides 176-179.
Original scan images for the pAkt bands in Figure 3C and the PTEN bands in Figure 3D were found on a sequestered desktop computer hard-drive #12 in a folder that Ms. Ali had indicated in other responses (locations cited on DIO4915 Image File A, slides 177-179) contained many original images. Many precursor images to Figures 3C and 3D Western blots were found on the sequestered hard-drives, with some raw film scans being found in: E:\12\[NTFS]\Documents and Settings\alis\Local Settings\Temporary Internet Files\OLK23. Although the Commimttee did find these files, Dr. Sarkar and Ms. Ali claimed that these files could not be found. As detailed below, evaluation of these scans shows that three rows of data – the PTEN and the pAkt bands in Figure 3C and the PTEN bands in Figure 3D – were taken from either different gel blots and/or from different exposures of the same gel blot (DIO4915 Image File A, slides 177-179). The relevant entry for the experiments producing the results in Figures 3C and 3D, found in Ms. Ali's lab notebook identified as "Exhibit 59" (p.56-58), clearly indicates that these experiments were done with MIAPaCa-M cells and not with MIAPaCa-E cells, as published.

For the **pAkt row in Figure 3C**, images from two different film exposures of the same Western blot are spliced together (DIO4915 Image File A, slide 177). The two left-most lanes of the published bands derive from a dark exposure, while the two rightmost lanes derive from a substantially lighter exposure. Examination of the two raw scan images in files "pAkt(miR21ASO)1.jpg" and "pAkt(miR21ASO).jpg" (slide 177) shows that the pAkt levels were not substantially affected by the experimental treatments (i.e., miR-21 'knockdown'). The key conclusions in the published paper drawn from published Figure 3C are that "the expression of pAkt and NF-κB was further reduced with both the transfection (Fig. 3C and D)" (p.3612), and that "the inactivation of miR-21 led to the reactivation of PTEN, resulting in the inactivation of phosphorylated Akt." (p.3616). The manipulations strengthened their conclusions.

The **PTEN row** in **Figure 3C** was constructed by splicing together images from at least three different Western blots (DIO4915 Image File A, slide 178). Film scans were identified for the two right-most gel bands published in Figure 3C. The source images for the two left-most published bands (lanes 1 & 2) were not found. The third lane from the left in "PTEN(miR21-ASO)b.jpg" file was copied and used as lane 3 of Figure 3C, and the right-most lane in "PTEN(miR21-ASO).jpg" file was copied and published as lane 4 of Figure 3C, essentially cropping one band from a scan with relatively darker exposure in "PTEN(miR21-

ASO).jpg" and pasting together with unknown bands in lanes 1 & 2. Lane 3 in the published Figure 3C also appears to be a manipulated (stretched vertically) version of the source image in lane 3 from file "PTEN(miR21-ASO)b.jpg." The key conclusions in the published paper drawn from Figure 3C are that "the expression of PTEN was enhanced by both transfection studies compared with either untreated cells or cells treated with control vector or oligos, respectively" (p.3612), and that "these findings clearly suggest that CDF and curcumin are capable of reactivating the expression of PTEN, which is normally lost in malignant tumors, and this is mediated by downregulating the expression of miR-21" (p.3612), and that "the inactivation of miR-21 led to the reactivation of PTEN, resulting in the inactivation of phosphorylated Akt" (p.3616).

The caption for Figure 3 states: "The expression of PTEN, pAkt, and NF-κB in MIAPaCa-E cells after transfection with miR-21 antisense oligo (C) and transfection with PTEN cDNA (D), followed by gemcitabine treatment for 48h."

The **PTEN row** in **Figure 3D** was also constructed by splicing together images from three different Western blots (DIO4915 Image File A, slide 179). The three source blot images were found in files "PTEN(cDNA)b.jpg," "PTEN(cDNA)a.jpg," and "PTEN(cDNA).jpg." Simple visual comparison of the bands in these source files to the published bands shows that lanes 1 and 2 in Figure 3D are copied from lanes 1 and 4, respectively, from file "PTEN(cDNA)b.jpg," lane 3 in Figure 3D is copied from lane 3 in file "PTEN(cDNA)a.jpg," and lane 4 in Figure 3D is copied from lane 1 in file "PTEN(cDNA).jpg." The lane labels in file "PTEN(cDNA)a.jpg," the only source image with labels indicating experimental conditions, are, from left-to-right "C" (control), "C ExGen 500" (empty vector control), "PTEN cDNA" (transfected by the PTEN cDNA plasmid) and "PTEN cDNA + Gem" (PTEN cDNA plasmid plus gemcitabine). Even without assuming that all three experiments were loaded in the same order using the same experimental conditions, there is simply a lack of, or at least much smaller, relative difference among lanes – particularly in lane 4 – in all three source files than in the composed published Figure 3D. Indeed, the biggest difference in the source images may be between lanes 1 and 2, i.e. between the untransfected control and the empty vector control, in file "PTEN(cDNA)a.jpg," two control groups which would typically be expected to be more-or-less equivalent. The result of selecting these bands was to have a relatively larger and darker band in the combination of transfection plus gemcitabine than in all other groups.

CONCLUSIONS:

The Committee finds that the lab notebook indicates clearly that MIAPaCa-**M** cells were used for this experiment whereas the text and captions eventually published for Figures 3C and 3D report that MIAPaCa-**E** cells were used. The Committee finds that certain bands in Figures 3C and Figure 3D were clearly selected from different Western blots, or different exposures of the same Western blots, and spliced together in ways that misrepresent the actual results. Specifically, the pAkt and PTEN bands in Figure 3C and the PTEN bands in Figure 3D were constructed from multiple images to exaggerate the effects of miR-21 antisense oligo transfection or PTEN cDNA transfection in combination with gemcitabine treatment on the expression of pAkt and PTEN, whereas the raw data do not show substantially altered protein expressions with those combined treatments. The Committee concludes that splicing together selected PTEN bands in Figure 3D also removed the difference between the untransfected and the "empty vector" control groups that was seen in at least one of the raw scans. The Committee concludes that Ms. Ali's statement that the published bands were run on single Western blot gels is not credible. The Committee concludes that these fabrications presented results that were more consistent with expectations, that is, in support of Dr. Sarkar's hypothesis regarding treatment of pancreatic cancers, than the original data.

Therefore, by a preponderance of the evidence regarding **Allegation 23a** in **Paper 12**, the Committee concludes that by using Figures 3C and 3D selectively constructing from individual bands from multiple sources, Dr. Sarkar recklessly published fabricated and falsified results in Figures 3C and 3D to apparently overstate support for the potential benefits of a combined gemcitabine drug treatment for pancreatic cancer, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 13 (Reference #152): Ahmad, A., Wang, Z., Kong, D., Ali, R., Ali, S., Banerjee, S., Sarkar, F.H. Platelet-derived growth factor-D contributes to aggressiveness of breast cancer cells by up-regulating Notch and NF-κB signaling pathways. Breast Cancer Res Treat, 126, 15-25, (2011)

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NIH Grants: No grant support listed

Allegations 24 & 24a: In Figure 3C, cutting and pasting of lanes is extensive. Most bands in both the Notch-1 and Jagged-1 rows appear to be cut and pasted in. In the Notch-1 bands in the MDA-MB-231 columns, each lane is separate for 'NS' and 'PS' columns. Similarly, the MCF-7 lanes are separate for the 'V' and 'P' columns. In the Jagged-1 band, most lanes are cut and pasted in. The β-actin band shows only a single cut mark between lanes 4 and 5 so it does not appear to be from the same gel(s) as Notch-1 or Jagged-1.

RESPONSE:

Dr. Sarkar wrote in response that "the sequence of cell lines for the final figure presentation warranted a rearrangement of cell lines. The original scans are shown [(DIO4915 Image File B, slides 183-186)], along with how the blots were put together for the final figure" (Response Letter-Final-Nov 27th-2012.pdf, p.13). Dr. Sarkar submitted full scans of autoradiograms purportedly from the experiments and indicated how "... the different cell lines were rearranged from the original autoradiograms, the control and experimental lane for each cell line were always on the same blot right next to each other, as finally published. Moreover, the membrane was re-probed for the second protein and the actin control." Dr. Sarkar also wrote: "We understand the inherent problem associated with the method how the figures were put together; however, there are no errors" (p.14). Note: Additional comments are added below in Dr. Sarkar comments on the Draft Report (file: "Response to Draft Report-August 5th-2015.pdf," Appendix 9, pp.52-55).

ANALYSIS:

See DIO4915 Image File B, slides 181-187.
Inspection of Figure 3C shows clearly the cutting and pasting in the Notch-1 and Jagged-1 bands (DIO4915 Image File B, slide 182). Dr. Sarkar acknowledges he did the cutting and pasting and re-ordering, and the "inherent problem" in doing so, but he does not see it as an "error." Dr. Sarkar submitted scanned images of films (DIO4915 Image File B, slides 183-186) to explain pasting and show where the bands, including β-actin, had come from before being rearranged. The submitted images of Notch-1 blots for MDA-MB-231 and MDA-MB-468 lanes appear to match published Figure 3C. The submitted images of Notch-1 blots for SUM149 and MCF-7 do not match published Figure 3C (DIO4915 Image File B, slide 184). The submitted images for Jagged-1 blots appear to match published Figure 3C. However, there are discrepancies in the lane labels between the scanned films and Figure 3C. Lanes labeled "NS", "PS", "V" and "P" in Figure 3C are labeled "C", "si", "C" and "P", respectively, in the Notch-1 film (DIO4915 Image

File B, slides 183 & 184). There are similar label discrepancies in the Jagged-1 and β-actin bands labels (DIO4915 Image File B, slides 185-187).

Figure 3C shows only one cut mark between lanes 4 and 5 in the β-actin band but not in other places where Dr. Sarkar indicated he did paste β-actin bands (DIO4915 Image File B, slide 182). The lack of a cut mark between lanes 6 and 7 in Figure 3C shows that the 4 lanes are from one film and were not composed as Dr. Sarkar claims. β-actin blots in the film scans do not match the published β-actin band, are highly manipulated (stretched), and have altered backgrounds (DIO4915 Image File B, slides 186-187). The manipulations in the β-actin blots for MDA-MB-231 and MDA-MB-468 lanes make the blots appear to be similar to the other blots in the β-actin band giving the impression that the loadings were equivalent. The β-actin blots in the 4 right lanes of Figure 3C came from the film submitted for Figure 5A (see Allegation 24b). In Figure 3C, the β-actin band lanes labeled 'MDA-MB-468' and 'MCF-7' are images labeled 'MDA-MB-231' and 'SUM149' in the source film. Also, names and locations of files were not provided. Also, images of certain blots (β-actin; Notch-1 for SUM149 & MCF-7 bands) were used, either in the publication or in the response to the allegations, that were not part of this experiment. Note: These ANALYSES are modified below in addressing Dr. Sarkar's comments on the Draft Report.

CONCLUSION:

The Committee finds, in **Allegations 24** and **24a** regarding **Figure 3C** of **Paper 13,** that blots were manipulated amd compiled from separate films and the publication did not indicate this had been done. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data and that this is research misconduct as defined in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Allegation 24b: The 4 right lanes of the β-actin band (lanes 5-8) in Figures 3C are duplicated and manipulated in Figure 5A. In Figure 3C, these 4 lanes are labeled "MDA-MB-468" and "MCF-7" cells, and alternately "V" and "P," whereas in Figure 5A, the 4 lanes are labeled alternately "NS" and "PS" for "MDA-MB-231" and "SUM149" cells (which are the labels on the left side of Figure 3C with a different β-actin).

RESPONSE:

In February 2014, Dr. Sarkar submitted in file "Aamir-Reponse.pptx" (slide 4) that "the Western blots, particularly those for loading controls such as β-actin look very similar. We found the original full autoradiogram with the β-actin in question." A scan of the autoradiogram from "Aamir-Response.pptx" (slide 5) is in DIO4915 Image File B, slide 190.

ANALYSIS:

See DIO4915 Image File B, slides 188-191.
Close inspection of the β-actin bands in Figures 3C and 5A shows substantial similarity consistent with the allegation that the images are manipulated copies of the same source image. The lanes in the photo of a film purported to be the source of the 4 lanes in Figure 5A (DIO4915 Image File B, slide 188) appear quite similar to the published image but there are differences (e.g., shadows) showing that this film is not the source of β-actin in published Figure 5A. However, the image from the film matches precisely the 4 right β-actin lanes in Figure 3C (DIO4915 Image File B, slide 191). The lack of a cut mark between lanes 6 and 7 in Figure 3C also shows that the 4 lanes are from one film and were not composed as Dr. Sarkar claims in his response to Allegations 24 & 24a, so that Figure 3C does not come from the scans Dr. Sarkar submitted

as originals, but from the film purported to be the source of the β-actin band in Figure 5A. The Committee could not determine the source of the β-actin images published in Figure 5A.

CONCLUSION:

The Committee finds, in **Allegation 24b**, that the β-actin bands image used in Figure 3C for the MDA-MB-468 and MCF-7 cell lines was actually from MDA-MB-231 and SUM149 cells, and that another unidentified β-actin band image was used in **Figure 5A** of **Paper 13**. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 5A and that this is research misconduct as defined in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Allegation 25: In Figure 4, the center two EMSA columns in Figure 4A appear to be the same images as the two left columns in Figure 4B.

RESPONSE:

Dr. Sarkar wrote in file "Aamir-Response.pptx" (slide 7) that "EMSA, unlike Western blots, are obtained as jpeg figures and the presented results are the actual raw data obtained from the LICOR instrument in the lab. Although, trend-wise, these two figures might appear to be similar, just a brief critical review will reveal these to be different."

ANALYSES:

See DIO4915 Image File B, slide 192.
Close inspection of enlarged EMSA images in Paper 13 Figure 4 and in file: "Aamir-Response.pptx" (slides 8 & 9) indeed shows they are not the same images (DIO4915 Image File B, slide 192).

CONCLUSION:

The Committee concludes there is no evidence of research misconduct in **Figure 4** in **Paper 13.**

Paper 14 (Reference #122): Ali, S., Almhanna, K., Chen, W., Philip, P.A., Sarkar, F.H. Differentially expressed miRNAs in the plasma may provide a molecular signature for aggressive pancreatic cancer. *Am J Trans Res*, **3**, 28-47 (2011)

Publication History: Received: September 24, 2010; Accepted: September 26, 2010; Epub: September 28, 2010; Published January 1, 2011
NIH Funding: 5R01CA131151; 3R01CA131151-02S1; 5R01CA132794; (PI: F.H. Sarkar)
Other Funding: "Guido and Puschelberg Foundation[s]"

Allegation 26: In Figure 5C, bands have been overlaid/pasted into the E-Cadherin, Vimentin, FEN-1, and PTEN results panels.

Allegation 26a: In Figure 5C, additional cut and pasting of images is seen in many lanes of most proteins; specifically, Vimentin lanes 4, 5 & 6, FEN-1 lane1 & 5, PTEN lane 6, PDCD4 lane 4, and Maspin lanes 1 to 6.

Also, E-Cadherin lanes 4-7, Vimentin lanes 1-3, as well as lane 7 for PTEN, PDCD4, Maspin & TMP-1, all appear to have been blurred out/masked. The β-actin band which is not cut and pasted, therefore, cannot be correct because of all the cut and pasting for other proteins, and also because there are 8 lanes, not 7 as in all other bands.

RESPONSE:

Dr. Sarkar addressed the cutting and pasting in "Response Letter-Final-Nov 27th-2012.pdf" (pp.15-16). He wrote that multiple gels were run for different "sensitive" or "resistant" cell lines and different proteins (E-cadherin, vimentin, Fen-1 & PTEN) assessed. He said he was unable to find all the original autoradiograms used in the publication and instead submitted duplicates that show similar results. Dr. Sarkar noted that they "... understand the inherent problem and questions raised in putting the figures together" by cutting and pasting which he suggested was done to put lanes "... in the correct order" or combine bands from two blots (e.g., for PTEN, p.16), yet he admitted no errors. Dr. Sarkar argued "the main objective" was to compare microRNAs extracted from plasma of cancer patients to plasma from normal controls, so that the experiment in Figure 5C with the different cell types "... has no impact on overall findings and conclusion of the manuscript" (Response Letter-Final-Nov 27th-2012.pdf, p.16). Multiple scans and films purported to be originals or duplicates were submitted (DIO4915 Image File B, slides 196-197; 200; 202; 205).

ANALYSIS:

See DIO4915 Image File B, slides 193-207.
Simple visual evaluations show clear cut marks (DIO4915 Image File B, slides 194-195). Dr. Sarkar acknowledged "inherent problem and questions raised" by cutting and pasting, yet he admitted to cutting and pasting though, in contradiction, admitted to "no error" (Response Letter-Final-Nov 27th-2012.pdf, p.16). Scans of one or more autoradiograms were submitted as either originals or duplicates, and other films were also found (i.e., the 11 Western blot film scans in Exhibit 68 [e.g., "Paper 14 – Image 9 – Exhibit 68.jpg"], and (DIO4915 Image File B, slides 198-199; 201; 203-204; 206-207). Across the films and scans of original or duplicated Westerns from which individual lanes were selected, there were ranges of loadings (i.e., 20µg, 40µg, or 50µg; or not indicated) and exposure times (i.e., 20 sec, 1 min or 2 min; or not indicated). Some of the submitted autoradiograms seem to show bands that match what was published. The repeated images tend to show similar patterns to what was published, usually with the cells ordered as published. Across all proteins and cell types, the bands appear to be selected from a myriad of Western blots with different loadings with no clear relation to the experimental design. There are no references to the experiment found in the laboratory notebooks. The impression to the Committee is that individual bands were pulled together from archived Westerns to provide some basis for interpreting the data from patients. This is evidenced clearly, too, in that the β-actin bands used in this figure have 8 lanes with no cut and paste marks and so cannot correspond to any of the cut and pasted protein rows with 7 lanes. Dr. Sarkar submitted two duplicated β-actin bands films (i.e., Paper 14 – Actin side A – Exhibit 68.jpg & Paper 14 – Actin side B – Exhibit 68.jpg; DIO4915 Image File B, slide 207) with no comment on the lanes and neither of which match the published figure. Although Dr. Sarkar argued that the main point of Paper 14 is a comparison between plasma from patients and normal controls, his conclusions and their implications rely on the effects he reported in various pancreatic cells (see: Paper 14, Abstract, p.28).

CONCLUSION:

The Committee finds, in **Allegations 26** and **26a**, that there is clear evidence of cutting and pasting from Western blots that were run differently from each other, into several rows of data in **Figure 5C** of **Paper 14**, manipulations that were admitted to by Dr. Sarkar and Ms. Ali. The Committee finds that apparently blank lanes in the E-cadherin and vimentin rows were blurred. Contrary to Dr. Sarkar's portrayal, the data

in Figure 5C are relevant to the conclusions of Paper 14, implying the importance of miRNAs as clinical biomarkers of tumor characteristics. Therefore the Committee concludes, by a preponderance of the evidence, that Dr. Sarkar knowingly and intentionally published fabricated and/or falsified results in Figure 5C in Paper 14, and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 15 (Reference #72): Kong, D., Heath, E., Chen, W., Cher, M., Powell, I., Heilbrun, L., Li, Y., Ali, S., Sethi, S., Hassan, O., Hwang, C., Gupta, N., Chitale, D., Sakr, W.A., Menon, M., Sarkar, F.H. (2012) Epigenetic silencing of miR-34a in human prostate cancer cells and tumor tissue specimens can be reversed by BRDIM treatment. *American Journal of Translational Research*, 4:14-23.

Publication History: Received: November 30, 2011; Accepted: December 21, 2011; Epub: January 5, 2012; Published: January 15, 2012

NIH Funding: 5R01CA108535-06; 5R01CA083695-09 (PI: F.H. Sarkar); Cancer Center Grant P30 CA-22453 (PI/PD: Gerold Bepler)

Erratum Published: *American Journal of Translational Research*, 2014; 6(1):102-103 PMID: 24349627; PMC3853430; Received: October 15, 2013; Accepted: October 18, 2013; Published: January 1, 2014.

Allegation 27: The original complaint regarding Figure 4B in Paper 15 stated: "... pasted bands in PSA (center panel) and in GAPDH (two left lanes in lower panel)." (DIO4915 Image File A, slide 209)

RESPONSE:

Dr. Sarkar submitted 3 Western blots with boxes and lines purportedly indicating where bands in Figure 4B had come from (Response Letter-Final-Nov 27th-2012.pdf). Dr. Sarkar concluded "... there are no errors in the final figure." A file Dr. Sarkar submitted on thumb drive "DataSubmittedWithFSInquiry" named "Paper # 15, Figure 4B by Kong.docx" explained how Figure 4B was composed of two panels showing AR, PSA, GAPDH expression in C4-2B and LNCaP cell lines treated with BR-DIM, to be consistent with Figure 4A. See DIO4915 Image File B, slide 210).

Dr. Sarkar testified that "what must have happened..." was that lanes 3 and 4, for B-DIM and control were used and the order reversed (Sarkar Transcript V.1, p.172, ll.12-24).
Dr. Sarkar wrote to the journal editor ("Correction-Figure 4B, Kong, et al.docx," 10/21/2013; file: "Erratum for Paper 15 121011.pdf") requesting an erratum be published with an edited figure "... where the lanes are separated with demarcation shown by a black vertical line..." (DIO4915 Image File B, slide 211). Dr. Sarkar's "Erratum," published January 1, 2014, stated that this was "... a minor concern."

In her testimony, Dr. Kong agreed the published PSA blots do not correctly match the conditions in the raw data images (Kong Transcript, V.1, p.68, ll.19; p.72, ll.5). Dr. Kong explained that it may have been a mistake (Kong Transcript, V.1, p.70, ll.12-13). She also testified that the DIM images were used, not as a mistake, but instead of B-DIM images because DIM and B-DIM have the active components (Kong Transcript, V.1, p.59, ll.17-24). Dr. Kong also said she put two red boxes around the PSA images in the November, 2012 response because she was not sure which of the four bands she had actually published (Kong Transcript, V.2, p.207, ll.25ff), even though there were labels on the bands. Dr. Sarkar also agreed the wrong blots were published (Sarkar Transcript, V.1, p.175ff). Dr. Kong denied that the DIM lanes were selected intentionally to exaggerate the impact of B-DIM (Kong Transcript, V.2, pp.215-218).

ANALYSIS:

See DIO4915 Image File B, slides 208-229.
The Committee found that cutting and pasting are clear in published Figure 4B in the PSA and GAPDH, and AR bands (DIO4915 Image File B, slides 216; 221; 229). Drs. Sarkar and Kong admitted the cutting and pasting in their written responses and testimony, as well as in Dr. Sarkar's published erratum, and that they did so only to re-arrange lanes to be consistent with other figures in the paper. However, as detailed below, analyses of the submitted images and other versions of original Western blots found on Dr. Sarkar's computer drives, show that neither the original nor the revised versions of Figure 4B accurately represent the experimental groups and conditions and proteins indicated in the published text or captions.

Dr. Sarkar submitted images that show Western blots with red boxes indicating the purported source of the PSA, GAPDH as well as AR bands published in Figure 4B (Response Letter-Final-Nov 27th-2012.pdf; see (DIO4915 Image File B, slide 210). The red boxes do not indicate clearly which are the source images for the PSA lanes in C4-2B cells because lanes 1 to 4 are outlined by two red boxes. There is further confusion in the response file Dr. Sarkar submitted named "Kong-paper #15 Raw Data-Fig 4.ppt" which outlines four different lanes, lanes 2 to 5 in the PSA bands, in two green boxes (DIO4915 Image File B, slide 212).

The published data were selected from a larger study of two 2 cell types (LNCaP & C4-2B), 2 different cell culture media ("standard FBS" & "CCS FBS"), 3 time points (24, 48 & 72 hours), 3 drug treatments/doses ("0" & "10μM") of either "D" or "B", for "DIM" or "BR-DIM" (or "B-DIM), respectively, and at least 2 proteins (PSA and AR; DIO4915 Image File B, slides 213-214). Paper 15 reported only data from FBS media at 24 hours after B-DIM treatment from both cell types.

The Committee assessed blot images for **PSA** and AR in C4-2B cells in Figure 4B and labeled as "0" and "10μM BR-DIM" conditions in several relevant images files (pptx, psd, & pss) submitted in the "DataSubmittedWithFSInquiry" thumb drive and/or found on sequestered lab computer and share drives. None of the images of original films for PSA or AR, either by the file name, references in lab notebooks, or markings within the image or on the film, indicate molecular weight of the blots, which cells were used, or what the experimental conditions were for any lane. The physical films were not found. The same blots, apparently at different exposures, appear in multiple files – PSA1.psd, PSA2.pss & PSA4.pss – in the same directory. A cropped version of the PSA bands with labels is found in file "AR and PSA.ppt." The cropped PSA bands images for C4-2B cells in "standard FBS" in file "AR and PSA.ppt" has a different background than seen in "PSA3.pss" (DIO4915 Image File B, slide 215).

Simple visual examination shows that the blots in lanes 1 and 2 of the band labeled "PSA" in file "2005-12-13 16.02.16.psd" match exactly the PSA blots for LNCaP cells in the published Figure 4B (DIO4915 Image File A, slides 215-218). However, the cells and lanes in the image are not labeled, and this PSA image does not appear in "Lab Book – Dejuan Kong #1" (Exhibit 05 – DIO Kong #1.pdf) for the period when these experiments were done.

The relevant files dated from November, 2005 through January 2006, corresponding to Dr. Kong's dated Lab Book #1. Since the manuscript was submitted to the journal 6 years later, on November 30, 2011, all of Dr. Kong's lab books were examined for evidence of images in Figure 4B. Only Lab Book #1 of Dr. Kong includes any films. No Western blot films or images labeled "PSA" or "AR" were found in Dr. Kong's lab notebooks. Assays of PSA were not noted in Dr. Kong's lab books after the winter of 2006 (Exhibit 05 – DIO 4915 Kong #1.pdf & Exhibit 06 – DIO 4915 Kong #2.pdf) until September, 2011 (Exhibit 12 – DIO 4915 Kong #8.pdf; p.14, dated "9/22/11"). No entries in Dr. Kong's lab books identify or locate image files (i.e., ppt, pptx, pss, psd, jpg, tif, etc.). The only image file on Dr. Kong's computer from the fall of 2011 with Western blot images labeled AR and PSA does not match the published blots.

Dr. Sarkar explanation that lanes 3 and 4 for B-DIM and control were used and the order reversed (Sarkar Transcript V1, p.172, ll.12-24) would have used a control blot from the 48-hour condition. In contrast, the blots in lanes 2 and 3 from bands labeled "PSA" and "AR" match exactly the PSA and AR blots for C4-2B cells published in Figure 4B. Original data files are also found in "\4\[NTFS]\Documents and Settings\kongd\My Documents\kdj\Scan\PSA\PSA3.pss" (dated 12/13/2005, 4:02 pm). The same blot at different exposures and cropped appears also in files PSA1.psd, PSA2.pss and PSA4.pss in the same directory.

It is clear that the lanes published for C4-2B cells were not the "0-" and "10μM-doses" of B-DIM but were actually the "10μM-doses" of DIM and B-DIM. For LNCaP cells the blot published as the "10μM-dose" of B-DIM was actually the "10μM-dose" blot for DIM (DIO4915 Image File B, slide 218). Even assuming these images are from the correct experiment, which is not clear given the lack of labeling in most original blot images, this selection of lanes misrepresents the results of that experiment by exaggerating the impact of the B-DIM treatment.

Regarding **GADPH** bands, the allegation is that bands in GAPDH (two left lanes in lower panel) were overlaid/pasted into the results panels, as evidenced by cut, paste and crop marks indicated by red arrows in DIO4915 Image File B, slides 219-222.

Dr. Sarkar's response (Response Letter-Final-Nov 27th-2012.pdf) refers to an image (DIO4915 Image File B, slide 220) identifying the band as "GAPDH," for three different time points ("24hr 48hr 72hr"), for LNCaP and C4-2B cells, as well as "O" and "B" labels that the Committee understands to mean "0" and "B-DIM" treatments. It is significant that this GAPDH bands image does not include the "D" (or "DIM") treatment condition included in the experimental design assaying PSA and AR, and that time point labels do not appear in original files, only on the image submitted with the response.

Dr. Sakar also submitted as original data a file named "GAPDH.tif" (see: DataSubmittedWithFSInquiry\Dr. Kong Original data for paper 15\GAPDH.tif) and dated 10/04/2012, after the allegations were sent to Dr. Sarkar. The sequestered computer drives had 30 other files named "GAPDH.tif" dating from November 8, 2007 to July 18, 2012, none of which, in whole or in part, match the images in the "GAPDH.tif" file, the published GAPDH band, or the image submitted in November, 2012 as original GAPDH data. Dr. Sarkar's share drives had 28 files named "GAPDH.tif" from the same date range. Two copies of the "GAPDH.tif" image submitted in November, 2012 as original data were found on the "P" shared drive: "\P_homes\sarkarf\Published Manuscript Corrections\Nov 2012\Dr. Kong-Original data for paper 15\." The directory name indicates it was created when the response was constructed. The file, per the metadata, was "taken" on October 3, 2013 and "created" on October 4, 2012, 21 or 22 days after the allegations were presented to Dr. Sarkar. The image has no labels marking the band as GAPDH or the lanes for different time points and appears to be either stretched out horizontally and/or squeezed vertically in different files. The Committee concludes that the GAPDH.tif file submitted as original data by Dr. Sarkar and Dr. Kong is highly unlikely to be the source of the published GAPDH images. Dr. Kong testified that the GAPDH file was made while the response was being put together (Kong Transcript, V.1, p.76, ll.11-15). The Committee found the same image in another file named "2012-10-04 13.40.04.tif" and submitted with the November, 2012 response. Finally, no physical film of a Western blot matching this image was found among submitted or sequestered materials. See DIO4915 Image File B, slide 223.

The loading control mentioned in Dr. Kong's lab book when these data were supposed to have been collected is β-actin on 12/15/05 and 12/19/05 regarding "cytoplasmic AR" (see Exhibit 05 - DIO 4915 - Kong #1.pdf, p.24). β-actin is noted in the same lab book associated with PSA (p.84) in early 2006, apparently after the AR and PSA Westerns blots were run. There is no evidence in the research record that GAPDH was a loading control for AR or PSA, or for any experiment about that time. The long time between when these experiments were run in late 2005 and when the manuscript was written in

November, 2011 is significant (Exhibit 12 – DIO 4915 Kong #8.pdf; p.20, dated "11/18/11;" "Writing MiR34a paper"). Dr. Kong admitted that in preparing the response to Allegation 27 with Dr. Sarkar that she did not examine her lab note books (Kong Transcript, V.1, p.86, ll.4 to p.89, ll.15). Dr. Kong said she knew the image was β-actin (Kong Transcript, V.1, p.84, ll. 4-15) and the Committee concludes that she knew it was β-actin when the figure was made and when the November, 2012, response was written. See DIO4915 Image File B, slide 224.

Visual evaluation of the image in the "GAPDH.tif" file from October, 2012 (DIO4915 Image File A, slides 221-222) confirms this image was published as GAPDH in Figure 4B, with paired lanes (1 & 2 and 3 & 4) pasted, respectively, to correspond to the order of LNCaP cells and C4-2B cells for both PSA and AR Western blots in Figure 4B. However, analyses show the image was actually β-actin bands.

Dr. Sarkar also submitted image files "010606actin.tif" (dated: 01/11/06, 12:06 pm) and "2012-10-04 13.40.04.tif" (dated10/3/2012, 2:37 pm) which are exact matches for the bands published as "GAPDH" in Paper 15 (DIO4915 Image File B, slide 223-224). There are multiple copies of this file which matches the published "GAPDH.tif" image (DIO4915 Image File B, slide 223). Another submitted file named "mspin.ppt" is of a figure from a study with a similar design to Paper 15: LNCaP and C4-2B cells treated with "0" or "10μM B-DIM" (DIO4915 Image File A, slide 225). The β-actin bands in "mspin.ppt" is the same image again, this time stretched horizontally. The left four lanes in "β-actin" row in "mspin.ppt", labeled "p28 LNCaP" and "p26 C4-2B," and with treatment conditions "0" and "B" (for "BDIM 10μM"), are the same images as in "GAPDH.tif" and "010606actin.tif", and published as "GAPDH" in Paper 15 (DIO4915 Image File B, slide 226).

The molecular weight marks of the band labeled "GAPDH" correspond best to β-actin (DIO4915 Image File A, slide 227). Dr. Kong testified both that the molecular weights of GAPDH and β-actin are the "same size," and also that there was a typographical error (Kong Transcript, V.1, p.78, ll.19-24). When asked why the image labeled "actin" in 2006 is labelled "GAPDH" in 2012, Dr. Kong replied again that "this not typed correct" and that "...because this, the molecular weight, Beta-actin and GAPDH, these two can serve as loading control..." (Kong Transcript, V.1, p.79, ll.11-17). Whether or not Dr. Kong actually believed that GAPDH and β-actin were inter-changeable, the Committee concludes that she intentionally used an image she knew was β-actin and labeled it "GAPDH" in Figure 4B and that she intentionally renamed the β-actin image file "GAPDH" and that Dr. Sarkar submitted that file to the Committee in response to the allegations.

Regarding the **AR bands**, the November, 2012 response included images of Western blots indicating where the AR bands in Figure 4B had come from (DIO4915 Image File B, slide 228, left side). Photocopies of the original AR films for C4-2B and LNCaP cells were found (slide 228, right side) and are in Lab Book Kong #1 (Exhibit 05 - DIO 4915 - Kong #1.pdf, pp.11 & 12), dated 11/25/05 to 11/28/05. All the source images for AR bands show the same lane selection and labeling problems as PSA in publishing DIM rather B-DIM lanes (DIO4915 Image File B, slides 228-229). The published AR images were also manipulated to change the thickness of the bands, where PSA and control (GAPDH/β-actin) bands were not manipulated similarly. The background for the AR bands was also manipulated to give the impression that AR blots for LNCaP and C4-2B cells were from the same autoradiogram. Dr. Kong admitted that photoshop was used to change backgrounds of images (cf., Kong Transcript, V.1, p.98, ll.16 to p.99, ll.15). Dr. Kong's argument that disproportionate changes in size/shape were an artifact of powerpoint when changing paper sizes (Kong Transcript, V.1, p.92, ll.22 to p.92, ll.23; & p.94, ll. 6-11) is not credible and does not explain why proportions were left uncorrected.

Even when asked by the journal to verify that the published Figure 4B in Paper 15 was correct, and with the opportunity to critically evaluate the images that composed the figure, Dr. Sarkar failed to do so. Dr. Sarkar again misrepresented the data in his communications with the journal editor in preparing the

erratum. The revised figure in the erratum has a vertical black line indicating that Figure 4B is a composite, but the figure still incorrectly represents the experimental conditions, exaggerates the impact of B-DIM, and falsely labels a β-actin loading control band as "GAPDH."

CONCLUSION:

The Committee finds in **Allegation 27** that it cannot be verified from the laboratory research record that the PSA or AR blot images used to compose **Figure 4B** in **Paper 15** were actually from this experiment since there are no labels in the scans, no original films found, and the lab notebooks were not found to provide sufficient information. It is clear from the apparently original Western blots that PSA, AR and GAPDH bands were manipulated for publication by changing the size and proportions of the images and by selecting lanes that did not accurately convey the experimental results and by re-labeling control bands. Some manipulations may have been for "cosmetic" reasons to straighten or orient bands (Kong Transcript, V.1, p.95, ll.23 to p.96, ll.2), or for design considerations in keeping experimental groups and conditions ordered consistently among figures (cf., Kong Transcript: V.1, p.90, ll.24 to p.92, ll.6).

The Committee finds that the C4-2B blots for PSA and AR labeled in the publication as the '0'-dose of BR-DIM are actually the '10 μM'-dose of DIM. The LNCaP blots for PSA and AR labeled in the publication as the '10 μM'-dose of BR-DIM are actually a '10 μM'-dose of DIM. By this selection of DIM images in lanes 1 and 2, Drs. Sarkar and Kong exaggerated the size of the effect of B-DIM on PSA expression in LNCaP cells relative to the correct comparisons between the zero-dose (lane 1) and the B-DIM blots (lane 3).

Even if Dr. Sarkar and Dr. Kong actually believed that DIM and B-DIM were the same substance – and there is sufficient evidence that people in the lab knew the difference between the formulations – the intentional substitution of DIM lanes for B-DIM lanes in Figure 4B constitutes falsification.

The Committee concludes that a β-actin band was intentionally used in Figure 4B and re-labeled as "GAPDH." Drs. Sarkar and Kong claim not to have noticed that the GAPDH images were β-actin, even when Dr. Sarkar was preparing his erratum and his response to the allegation (e.g., Kong Transcript, V.1, p.83, ll.5 to p.84, ll.6). Dr. Kong falsified a file in October, 2012 by re-naming a β-actin image file "GAPDH.tif" which Dr. Sarkar submitted as evidence with his November, 2012 response. The Committee finds Dr. Kong's denial that she changed the name of the GAPDH file for Dr. Sarkar's response (Kong Transcript, V.1, p.85, ll.4 to p.86, ll.3) is not credible.

The Committee concludes that in November 2011 when Paper 15 was being written, Dr. Sarkar and Dr. Kong re-used and modified a β-actin band from another file, likely the image in the January 2006 "mspin.ppt" file, close to the time of the original experiments, re-labeled it and published it as "GAPDH" in Figure 4B in Paper 15. This constitutes falsification of data. The Committee concludes that Dr. Kong generated the GAPDH.tif file for the response to the allegations and that Dr. Sarkar acted recklessly in submitting an image he failed to verify as his original data.

Dr. Sarkar failed to examine his own data when answering allegations and put forth the un-supported claim that the correct images were published. He submitted Western blots that clearly show the published final figure was falsified by using bands from other treatment conditions although he clamed to "show the origin of all questioned lanes in the figures." Dr. Sarkar said "...it was part of my own deficiency that I did not spend a significant amount of time looking into these figures and drawing that up and then trying to see where it came from" (Sarkar Transcript V.1, p.175, ll.24 to p.176, ll.2), and the Committee agrees. Dr. Sarkar perpetuated the publication of DIM images labeled as B-DIM and that exaggerated the impact B-DIM on PSA and AR expression. This constitutes fabrication and/or falsification of results in the publication.

Therefore, by a preponderance of the evidence regarding **Allegation 27**, the Committee concludes that Dr. Sarkar knowingly and intentionally published fabricated and/or falsified data in **Figure 4B** in **Paper 15**, and that this constitutes research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103. Dr. Sarkar also re-submitted falsified data to a journal editor when seeking and then publishing an erratum.

Paper 16 (Reference #130) Banerjee, S., Kong, D., Azmi, A., Wang, Z., Ahmad, A., Sethi, S., and Sarkar, F.H. Restoring sensitivity to oxaliplatin by a novel approach in gemcitabine-resistant pancreatic cancer cells *in vitro* and *in vivo*. *Int. J. Cancer*: **128**, 1240-1250 (2011)

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Allegation 28a: In Figure 2B, one of the panels in the "b" segment [i.e., "caspace-3/cleaved" bands under MiaPaCa-2 cells] has been altered to include an empty space between the upper and lower bands. Further, in the panel indicated by the complainant as number 3 [i.e., "PARP/cleaved" bands under Panc-1 cells], the width of the lower band is not consistent with the width of the upper band in the same lane, suggesting manipulation of the figure.

Allegation 28b: In Figure 2B, the PARP cleaved and Bcl-2 bands under the MiaPaCa-2 panel on the left appear to be pasted in; edges of another background are visible.

Allegation 28c: In Figure 2B, the image used for the ABC-G2 row of bands under the MiaCaPa-2 cells panel on the left is the same image as the Bcl-xL bands under Panc-1 cells panel on the right, but stretched horizontally, squeezed vertically, and labeled differently (i.e., both different cells and different protein).

Allegation 28d: In Figure 2B and Figure 5D, the images labeled Survivin bands under MiaPaCa-2 cells in Figure 2B appear to be the same images used in lanes 1-4 of Survivin in Figure 5D (squeezed horizontally) with different labels. The bands in Figure 2B are labeled as being from the "MiaCaPa-2" cell line, while what appears to be those same images duplicated in Figure 5D are labeled as from "pancreatic tumors at autopsy.

Allegation 28e: In Figure 2B, the labels for the c-IAP (pan), XIAP, Survivin and β-actin bands under Panc-1 cells panel on the right may not match the labels in original images. This is based on comparisons to labels on what appear to be matching images for these bands on original films of Western blots found on the sequestered computers. That is, the XIAP image appears to be the same as a blot labeled "Survivin;" the Survivin blot image appears to be the same as a band labeled "Anti-Puma;" the c-IAP (pan) row appears to be the same as an image labeled "β-actin" in one place and "NOXA" in another. Also, lane 1 in the row labeled "Survivin" in the publication has been cut and rotated, and in the β-actin band under Panc-1 cells, lane 5 appears to be pasted in.

NOTE: Allegations 28a was originally called Allegation 28 during Dr. Banerjee's interview. Allegations 28a through 28e all relate to Figure 2B and to facilitate the report, portions of these *RESPONSES, ANALYSES,* and *CONCLUSIONS* are grouped together.

GENERAL RESPONSE:

The figures in Paper 16 were referenced in Dr. Banerjee's testimony of February 6, 2014 as he discussed his recordkeeping of experiments (Banerjee Transcript, V.1, p.190, l.3 to p.208, l.22; p.290, l.15 to p.295, l.10). During his testimony about Paper 5 in the same interview, Dr. Banerjee said of his recordkeeping in general (Banerjee Transcript, V.1, p, 237, ll.25 to p.243, ll.12), "For my record... it's not like that I just have one film. I have a couple of films. So one I marked it, not that all I marked it. So the one which I scanned it, maybe it may not have it, but the other one does have it" (BanerjeeTranscript, V.1, p.240, ll.11-18). Dr. Banerjee could not find a record of the experiments for Paper 16 in his lab notebooks. Dr. Banerjee agreed that his recordkeeping made it "very difficult to information" although he continued to insist "I don't have the dates written, but the things are here" (Banerjee Transcript, V.1, p.197, ll.1 to p.198, ll.6). He agreed with the image analyses presented by the Committee but could not explain why the images appeared as they did, only that "I will have to go to the lab, look into everything, and then only I can provide a written explanation" (Banerjee Transcript, V.1, p.290, ll.15 to p.291, ll.10). He claimed never to have seen Allegations 28b-28e (Banerjee Transcript, V.1, p.291, ll.11 to p.292, ll.17). Dr. Banerjee said that he was "not aware of so many mistakes in these papers and stated that seeing the image analyses "affects my confidence" in the results of the papers (Banerjee Transcript, V.1, p.293, ll.3 to p.295, ll.10).

The figures in Paper 16 were referenced in Dr. Banerjee's testimony of July 17, 2014 (Banerjee Transcript, V.3, p.666, ll.3 to p.671, l.13). Dr. Banerjee had no answer for the mistakes that occurred between Figure 2B (left panel/MiaCaPa-2) and Figure 2B (right panel/Panc-1) even though they are different experiments. He claims that he did not notice the mistakes in Figure 2B until they were pointed out to him by the Committee (Banerjee Transcript, V.3, p.667, ll.5 to p.668, ll.14.)

Dr. Banerjee's contribution to Dr. Sarkar's response (Response Letter-Final-Nov 27th-2012, p.18) was two scans that he claimed were "original data" concerning the Caspase-3 bands (left panel/MiaCaPa-2 & right panel/Panc-1) and the PARP band (right panel/Panc-1) in Figure 2B. Dr. Sarkar wrote stated "that there are no errors... no further actin will be taken." Neither scan contains a date or file name.

GENERAL ANALYLSIS:

The caption for Figure 2B reads: "(*b*) Western blot depicting alterations in expression of apoptosis-related proteins in whole-cell lysates from MiaPaCa-2 and PANC-1 cells." The lanes of these cell lines were treated as follows: 1) Control, 2) 30μM of genistein for 48 hours, 3) 25μM of oxaliplatin for 24 hours, and 4) 30μM of genistein for 48 hours plus 25μM of oxaliplatin for 24 hours."

The following films were submitted by the Dr. Sarkar and Dr. Banerjee regarding Allegation 28a.

Paper 16 – Image 1 – Exhibit 69.jpg (6/22/2013 9:11 am)
Paper 16 – Image 2 – Exhibit 69.jpg (6/22/2013 9:11 am)

The Committee also found, in these folders, the following relevant scans on the sequestered computer drives that were used in the analysis of Allegations 28a to 28e.

E:\OriginalData\7\[NTFS]\Documents & Settings\banerjes\Desktop\New Folder (2)\Today\
bcl-2 miapaca-2.jpg (dated 4/1/2010, 4:12 pm)
caspase 3 and 9.jpg (dated 3/25/2010, 3:04 pm)
caspase-3.jpg (dated 3/25/2010, 2:54 pm)
(also found a **caspase-3.jpg** image dated 5/4/2010 12:28 am)
survivin.jpg [8-lane] (dated 3/25/2010, 3:37 pm)
survivin film.jpg (dated 3/25/2010, 3:41 pm)

E:\OriginalData\8\[NTFS]\Documents and Settings\banerjes\Desktop\New Folder (9)\New Folder (2)\v2\

panc-1 parp.jpg (dated 8/1/2010, 8:21 pm)

E:\OriginalData\8\[NTFS]\Settings\banerjes\Desktop\New Folder (9)\April2011\Kensington\ Kingston (F)\Genist-OxP\New Folder (2)\

panc-1 parp.jpg (dated 5/4/2010, 2:02 am)
parp.jpg (dated 5/4/2010, 1:34 am)
panc-1 xl.jpg (dated 5/4/2010, 12:34 am)
survinin mice.jpg (dated 5/3/2010, 11:33 pm)

E:\OriginalData\8\[NTFS]\Documents and Settings\banerjee\Desktop\New Folder (9)\New Folder (2)\v2\Panc-1\

survivin and xiap.jpg (dated 8/1/2010, 9:14 pm)
xiap.jpg (dated 8/1/2010, 9:51 pm)
survivin.jpg [4-lane] (dated 8/1/2010, 9:47 pm)
c-iap (pan).jpg, dated 8/1/2010,10:14 pm)
actin-2.jpg (dated 8/1/2010, 10:14 pm)
actin.jpg [whole scan] (dated 8/1/2010, 9:17 pm)

E:\OriginalData\8\[NTFS]\Documents and Settings\banerjee\Desktop\New Folder (9)\New Folder (2)\v2\

parp- panc-1.jpg (dated 8/1/2010, 7:46 pm)

The "whole film" scans are in these files:

parp.jpg
caspase 3 and 9.jpg
survivin film.jpg
actin.jpg
survivin and xiap.jpg
panc-1 parp.jpg

The remaining scans were cropped from larger scans of whole gels. Some were cropped from these whole scans cited above, however, the Committee could not find the gels or their scans for the rest of the cropped scans. None of the scans contained dates. None of them indicated treatments above lanes.

GENERAL CONCLUSION:

The Committee concludes overall regarding Allegations 28a through 28e in Paper 16, that the films submitted by Dr. Sarkar and Dr. Banerjee that they claimed to be original films are not the sources of the published images.

The Committee finds, in Allegations 28b through 28e, that multiple bands published in Figure 2B have been manipulated, re-used, and mis-labeled, not only between the *in vitro* experiments with MiaCaPa-2 and Panc-1 cells in Figure 2B, but also between Figure 2B and Figure 5D, which was an *in vivo* experiment. Some scans used for the bands in Figure 2B were extracted/cropped from whole films that had been scanned upside down or flipped. The cropped scans were then reproduced in Figure 2B in an incorrect

orientation. None of the original scans, in contrast to the repeated experiments submitted by Dr. Sarkar, contain any information labeling lanes by their various treatments, and only three of the whole scans bear dates. Some scans of films using completely different antibodies and proteins were used for bands in Figure 2B. Several scans/films submitted by Dr. Sarkar and Dr. Banerjee are not originals as claimed, but are repeated experiments presented as original data. There is considerable confusion between and among the published bands, the named files with source images, and the labels on the scans in those files. As the Committee concludes in detail below, these duplications appear to reflect an intent to deceive in publishing re-named and manipulated images, a disregard for which image is used, as well as a systematic failure in Dr. Sarkar's laboratory to keep and maintain accurate laboratory records as required by journals, NIH, and as expected in good laboratory practice. The bottom line is the results cannot be validated and attempts to correct the scientific records are likely to be untrustworthy.

Allegation 28a: In Figure 2B, one of the panels in the "b" segment [i.e., "caspace-3/cleaved" bands under MiaPaCa-2 cells] has been altered to include an empty space between the upper and lower bands. Further, in the panel indicated by the complainant as number 3 [i.e., "PARP/cleaved" bands under Panc-1 cells], the width of the lower band is not consistent with the width of the upper band in the same lane, suggesting manipulation of the figure.

Note: Allegation 28a is about: 1) the Caspase-3 and cleaved band (left panel/MiaCaPa-2); 2) the Caspase-3 and cleaved band (right panel/Panc-1); and 3) PARP cleaved (right panel/Panc-1). See DIO4915, Image File B, slides 231-232; 234.

RESPONSE:

Dr. Sarkar testified about Allegation 28a (Sarkar Transcript, V.2, p.446, ll.11 to p.447, ll.2). Allegation 28a was covered in Dr. Banerjee's testimony of February 6, 2014 (Banerjee Transcript, V.1, p.272, ll.4 to p.274, ll.1). Dr. Banerjee testified that he supplied the films of the gels for Figure 2B. The Committee stated that the films seem to correspond to the labels in the published Figure (Banerjee Transcript, V.1, p.273, ll.23-25).

ANALYSIS:

See DIO4915 Image File B, slides 230-251.

A visual examination of the published images and scans of films of the Western blots (DIO4915 Image File B, slides 233-238) finds that no empty space was inserted between the rows of capase-3 and cleaved caspace in either the MiaCaPa-2 or the Panc-1 panels, nor was the 3rd lane of the cleaved PARP row in the Panc-1 panel altered (DIO4915 Image File B, slides 245-246). Several files (listed above) were found with various cropped sections from the whole scanned film including file "**caspase 3 and 9.jpg**" from which the scan **caspase-3.jpg** was extracted. There are two sections in **caspase-3.jpg**, which, when squeezed and stretched, correspond exactly to the published caspase-3/cleaved bands in Figure 2B (left panel/MiaCaPa-2 cells) and Figure 2B (right panel/Panc-1 cells; DIO4915 Image File B, slides 239-244). In none of the files are there dates or lane labels. File "Paper 16 - Image 1 - Exhibit 69.jpg" has "Gen ± OxP" marked in the upper right corner (DIO4915 Image File B, slide 244). The typeset words"CASPASE-3" at the top and "Caspase-9" at the bottom are the only markings on file "**caspase 3 and 9.jpg**" (DIO4915 Image File B, slides 239-240). Dark blue handwriting on the submitted film "**Paper 16 - Exhibit 1 - Exhibit 69.jpg**" indicates only for cell types and, based on comparison with files the Committee found (e.g., "**caspase 3 and 9.jpg**"), appears to have been added later for the response. (See DIO4915 Image File B, slides 233; 235; 244; 250). Regarding the alleged manipulation of the cleaved PARP row in the Panc-1 panel (DIO4915 Image File B, slides 245-251), visual examination of the published bands and comparison to several films

and scans of the apparent source images confirms the PARP/cleaved bands to be authentic, although labels appear to have been added late during the investigation (DIO4915 Image File B, slide 250).

CONCLUSION:

The Committee concludes, in **Allegation 28a**, that the films submitted by Dr. Sarkar and Dr. Banerjee and claimed to be original films for certain caspase or PARP bands in **Figure 2B** in **Paper 16**, do appear to be originals although the labels appear to have been added only during the investigation. There is, however, no evidence that the caspase-3/cleaved or PARP/cleaved proteins bands were manipulated to add space between rows as alleged, although the bands were manipulated some by being stretched and/or squeezed (and perhaps differentially cropped relative to earlier versions of the PARP bands under Panc-1 cells). The Committee concludes there is insufficient evidence of research misconduct regarding Allegation 28a.

Allegation 28b: In Figure 2B, the PARP cleaved and Bcl-2 bands under the MiaPaCa-2 panel on the left appear to be pasted in; edges of another background are visible.

Note: Allegation 28b focuses on 1) PARP cleaved band (left panel/MiaCaPa-2); and 2) Bcl-2 band (left panel/MiaCaPa-2). See DIO4915, Image File B, slide 252.

ANALYSIS:

See DIO4915 Image File B, slides 252-257.
A visual evaluation shows that lanes 1 and 2 of the cleaved row in the PARP band of Figure 2B in the MiaCaPa-2 panel have been smudged and/or masked or eliminated. The Committee finds that the image that is the source of PARP bands in the MiaPaCa cells is the cropped scan in file **panc-1 parp.jpg**, labeled Panc-1 and not MiaCaPa-2 (DIO4915 Image File B, slide 253). The Committee found the whole scan in file **parp.jpg** to be the source of the cropped scan in file **panc-1 parp.jpg**. This whole scan has no markings that would indicate the treatments or proteins represented in the scan. The cropped scan was squeezed vertical, stretched horizontal, and rotated 1º counter-clockwise so that it appears thinner and longer in the published figure (DIO4915, Image File B, slide 254). Also, the original source image of the published MiaPaCa-2 PARP images in the "parp.jpg" file (DIO4915, Image File B, slide 254) clearly shows another band below the published blots that was covered up or masked in the published version (DIO4915, Image File B, slides 255-256). Thus, a blot labeled from Panc-1 cells was manipulated to disguise expressed bands and re-labeled and published as PARP in MiaPaCa-2 cells.

A visual analysis shows that lane 4 of the Bcl-2 band in the MiaCaPa-2 panel is not the result of cut-and-paste (DIO4915, Image File B, slide 257). The Committee found the cropped scan in file **bcl-2 miapaca-2 cells.jpg** to be the source of the published bands. However, the bands were flipped horizontal to appear as they do in the published figure. Thus, the order and orientation of the lanes was reversed left-to-right and in the absence of labels or a laboratory record, it is not known which lane is the control band and which lanes were treated with genistein and/or oxaliplatin.

CONCLUSION:

The Committee finds, in **Allegation 28a**, there was intentional manipulation of lanes 1 and 2 of the cleaved row in the PARP band in the **MiaPaCa-2 panel** of **Figure 2B** in **Paper 16**. The source image was a file name Panc-1 and bands were smudged, blurred or otherwise eliminated from view. The cropped scan in file

panc-1 parp.jpg was squeezed vertical, stretched horizontal, and rotated 1º counter-clockwise to appear thinner and longer. Either the scan is mis-labeled or it is the wrong scan for the PARP band in the MiaCaPa-2 panel, or both. Because there is no indication of proteins or treatments on the whole scan, **parp.jpg**, there is no way to confirm that either the whole scan or the cropped scan are aaccurately published in Figure 2B. The Committee finds also that lane 4 of the **Bcl-2 band** in the MiaCaPa-2 panel of Figure 2B was not altered and appears to have come from a consistently labeled source file. However, the cropped scan source for the Bcl-2 band had been flipped horizontal. As a result, the control lane has become the lane with the combined genistein and oxaliplation treatment. There is no way to verify the correct order of the lanes in this band. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data to misrepresent the results in the PARP and Bcl-2 bands in the MiaPaCa-2 panel of Figure 2B, and that each of these instances constitute research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 28c: In Figure 2B, the image used for the ABC-G2 row of bands under the MiaCaPa-2 cells panel on the left is the same image as the Bcl-xL bands under Panc-1 cells panel on the right, but stretched horizontally, squeezed vertically, and labeled differently (i.e., both different cells and different protein).

Note: Allegation 28a is about a comparison between the ABC-G2 band (left panel/MiaCaPa-2) and the Bcl-xL band (right panel/Panc-1 cells). See DIO4915, Image File B, slide 258-259.

RESPONSE:

Dr. Sarkar testified that while "there appears to be some similarities [in Fig 2B between the ABC-G2 band (left panel/MiaCaPa-2) and the Bcl-xL band (right panel/Panc-1)]... I don' think it's the same image" (Sarkar Transcript, V.2, p.447, ll.5 to p.449, ll.7).

Allegation 28c was covered in Dr. Banerjee's testimony (Banerjee Transcript, V.1, p.274, ll.2 to p.275, ll.21). Dr. Banerjee testified that he alone created the figures for Paper 16 and does not know how any duplication of images could have happened (Banerjee Transcript, V.1, p.275, ll.1-21). Dr. Banerjee later testified (Banerjee Transcript, V.3, p.668, ll.20 to p.669, ll.9) that he made a mistake, "See, maybe I had two blots. One I had put that this is ABC-G2, and the other one it just got mixed up. It went in the wrong folder while scanning, or when I scanned it to here I'm scanning all the PANC-1 cells, like that" (Banerjee Transcript, V.3, p.669, ll.5-9).

ANALYSIS:

See DIO4915 Image File B, slides 258-264.
In contrast to Dr. Sarkar, Dr. Banerjee admitted that the image for the Bcl-xL band in the Panc-1 panel was wrong, "a mistake" due to careless recordkeeping during the scanning process. He later changed his initial testimony, saying that he did not know how the same image could be both in the MiaCaPa-2 and the Panc-1 panels of Figure 2B. A visual comparison shows that the ABC-G2 band (left panel/MiaCaPa-2) and the Bcl-xL band (right panel/Panc-1) are indeed the same image (DIO4915, Image File B, slides 260-261). The MiaCapPa-2 and Panc-1 panels are by definition different cell lines and, therefore, the same band cannot validly appear in both panels. The Committee found a cropped scan of the same image, **panc-1 xl.jpg** (and another cropped scan of the same image labeled **survivin – panc-1.jpg**) to be the source of both published bands in Figure 2B (DIO4915, Image File B, slide 262). The cropped scan in file **panc-1 xl.jpg** was stretched horizontal and squeezed vertical to make the lanes appear thinner and longer in the published bands. The Committee also found the whole film scan in file "**survivin film.jpg**" that is the source of these cropped scans bands (DIO4915, Image File B, slide 263). Additionally, the whole scan

shows lane 1 of section used for ABC-G2/Bcl-xL to be lane 5 of the 5-lane survivin band that appears in Figure 5D (DIO4915, Image File B, slides 263-264), covered next in Allegation 28d.

While the labeling of the bands indicates different proteins, the image in the bands is the same. To add further confusion, two cropped scan source files with this image are labeled with different names: **panc-1 xl.jpg** and **survivin – panc-1.jpg**. There is no way to know which scan was used for the figure. No source file has a name labeled "ABC-G2." Because there is no indication of proteins or treatments on the whole scan, **survivin flim.jpg**, there is no way to confirm that either the whole scan or the cropped scan(s), or any of the files for that matter, are correctly labeled. Thus there is no way to confirm Dr. Banerjee's claim that the ABC-G2 band is the correct one. This confusion about labels is another instance of a persistent pattern of careless recordkeeping in Dr. Sarkar's laboratory, inattention to detail by Dr. Banerjee in producing figures, and reckless disregard for detail by Dr. Sarkar in responding to allegations.

CONCLUSION:

The Committee finds, in **Allegation 28c**, that there was clear duplication, manipulation and re-labeling of the same image published as bands labeled both ABC-G2 (left panel/MiaCaPa-2 cells) and Bcl-xL proteins (right panel/Panc-1). By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data to misrepresent the results in these bands of **Figure 2B** in **Paper 16**, and that in each instance these constitute research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 28d: In Figure 2B and Figure 5D, the images labeled Survivin bands under MiaPaCa-2 cells in Figure 2B appear to be the same images used in lanes 1-4 of Survivin in Figure 5D (squeezed horizontally) with different labels. The bands in Figure 2B are labeled as being from the "MiaCaPa-2" cell line, while what appears to be those same images duplicated in Figure 5D are labeled as from "Pancreatic tumors at autopsy."

Note: Allegation 28a is focused on a comparison of Survivin bands (left panel/MiaCaPa-2) in Figure 2B and in Figure 5D (right panel). Figure 2B is an *in vitro* experiment; Figure 5D is an *in vivo* experiment (DIO4915, Image File B, slide 265).

RESPONSE:

Dr. Sarkar testified (Sarkar Transcript, V.2, p.449, ll.8 to p.452, ll.11) that he acknowledged Figure 2B and Figure 5D were different experiments "one is a cell line [Figure 2B]. One is animal [Figure 5D]." When asked if the duplication of the survivin band was "to make the claim that an observation in a cell line was in fact also observed in a live animal," Dr. Sarkar that "this is the rationale. That is the hypothesis to be tested... but if you are using the same lane for both purposes, that would be wrong" (Sarkar Transcript, V.2, p.449, ll.23 to p.251, ll.6).

Dr. Banerjee also testified about Allegation 28d (Banerjee Transcript, V.1, p.275, ll.22 to p.277, ll.22; p.288, ll.8 to p.289, ll.24). When asked how the same survivin band could be used for both cell lines and animal tumors, Dr. Banerjee replied "Once I see my original blot, then only I can comment" (Banerjee Transcript, V.1, p.277, ll.3-12). Dr. Banerjee could not explain how a cropped scan in a file named "c-iap.jpg" matches the lanes in a scan of a whole gel in a file named "actin.jpg" (Banerjee Transcript, V.1, p.288, ll.8 to p.289, l.17). Dr. Banerjee testified about Allegation 28D regarding Figure 2B (Banerjee Transcript, V.3, p.669, ll.10 to p.671, ll.13) and stated that the 4-lane survivin row for the cell culture (left panel/MiaCaPa-2 cells) is correct (not the 5-lane survivin row in Figure 5D, for animal tumor), yet he could not explain where the "extra" lane came from in Figure 5D if it was a copy of Figure 2B. When asked again, Dr. Banerjee

admitted that he did not know if the opposite was true or not – that the survivin bands in Figure 5D were correct and the bands in Figure 2B wrong (Banerjee Transcript, V.3, p.669, ll.10 to p.671, ll.13).

ANALYSIS:

See DIO4915 Image File B, slides 264-269.
A visual comparison of the images shows that the 4-lane survivin band in the MiaCaPa-2 panel in figure 2B is identical to lanes 1-4 of the 5-lane survivin band in Figure 5D (right panel; DIO4915, Image File B, slide 266). The Committee found two files – **survivin.jpg** and **survivin mice.jpg** with cropped scans of two exposures of the same Western blot image. The **survivin.jpg** is the source for the **survivin mice.jpg** file (DIO4915, Image File B, slides 267-268). The film in **survivin.jpg** and the various image files derived from it, are the source(s) for one image that were published as the survivin bands in both Figure 2B and Figure 5D (DIO4915, Image File B, slide 269). The file with the whole scan image, **survivin.jpg**, has only the word "SURVIVIN" typeset on it, with no date or lane labels (DIO4915, Image File B, slide 267).

The text of Paper 16 states "here we report for the first time, the superiority of genistein in sensitizing PC [pancreatic cancer] cells *in vitro* and PC tumors *in vivo* to lower concentrations of OxP. From these results, we conclude that ... our *in vitro* findings together with our *in vivo* results provide confidence in support of further development of genistein (a nontoxic natural agent) as an adjunct to conventional therapeutics in future clinical trial for improving the treatment outcome of patients diagnosed with PC" (*Int. J. Cancer*: **128**, p. 1241). And further: "It is noteworthy that our *in vitro* findings... are consistent with our molecular studies *in vitro*, which clearly provide strong evidence in support of our hypothesis ..." (*Int. J. Cancer*: **128**, p. 1248). These conclusions and stated implications of the reported finding demonstrate that the concordance between the *in vitro* and *in vivo* experiments was central to Paper 16. Thus, using the same bands for both *in vitro* and *in vivo* experiments clearly and unduly influenced the conclusions by exaggerating this concordance.

CONCLUSION:

The Committee finds, in **Allegation 28d**, that there was clear duplication and re-labeling of the 4-lane **survivin bands** in the MiaCaPa-2 panel in **Figure 2B** and the 5-lane survivin bands in **Figure 5D** (right panel). The Committee concludes that images of the same bands were re-used and re-labeled in Figures 2B and 5D to represent results from different experimental models to exaggerate support for Dr. Sarkar's hypothesis in **Paper 16**. The Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figures 2B and 5D and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. Further, this is another example of the common practice in Dr. Sarkar's laboratory or re-using and re-labeling images for other purposes.

Allegation 28e: In Figure 2B, the labels for the c-IAP (pan), XIAP, Survivin and β-actin bands under the Panc-1 cells on the right may not match the labels in original images. This is based on comparisons to labels on files with what appear to be matching images for original Western blots found on Dr. Sarkar's sequestered computer drives. That is, the XIAP image appears to be the same as a blot labeled "Survivin;" the Survivin blot image appears to be the same as a blot labeled "Anti-Puma;" the c-IAP (pan) row appears to be the same as an image labeled "β-actin" in one place and "NOXA" in another. Also, lane 1 in the row labeled "Survivin" in the publication has been cut and rotated, and in the β-actin band under Panc-1 cells, lane 5 appears to be pasted in.

Note: Allegation 28e focuses on the labeling of the c-IAP (pan), XIAP, Survivin, and β-actin bands in the Panc-1 panel (DIO4915, Image File B, slides 270-271).

RESPONSE:

Dr. Sarkar addressed Allegation 28e in his testimony (Sarkar Transcript, V.2, p.452, ll.12 to p.466, ll.18). Dr. Sarkar testified that "if you have an image which is running at an angle, you can straighten it a couple of degrees" but that he would not "expect ... cutting out a band and then straightening it out and then splice it back" (Sarkar Transcript, V.2, p.454, ll. 25 to p. 455, ll.8). He testified he was not familiar with any experiments done in his lab with a Puma antibody and said, "I don't have any of my papers with puma" (Sarkar Transcript, V.2, p.456, ll.18). When presented with the scans found by the Committee showing the re-labeling or mislabeling of bands, he stated that "he had no way of knowing" when any manipulation might have occurred to the scans submitted (Sarkar Transcript, V.2, p.459, ll.20-21). When told that Dr. Banerjee was unable to find the "data entry in the lab notebooks" for thee scans (Sarkar Transcript, V.2, p.460, ll.13-21), Dr. Sarkar said that he did not "remember in my lab" anyone doing experiments with anti-puma, but that "some antibody testing to see if there is an effect or not, you know, as a curious experiment, pilot experiment ... without my knowledge, that could happen" as a kind of after thought after all the main testing of a hypothesis was done (Sarkar Transcript, V.2, p.461, ll.1 to p.462, ll.20). When confronted with the discrepancies among the bands' labels in Paper 16 and in source files, Dr. Sarkar said "it would be almost impossible for me to answer" (Sarkar Transcript, V.2, p.466, ll.15-16).

Dr. Banerjee addressed Allegation 28e (Banerjee Transcript, V.1, p.277, ll.23 to p.291, ll.10). Dr. Banerjee had identified a cropped scan presented by the Committee as survivin consistent with what was published in Figure 2B (Panc-1 panel), but when shown the whole source scan that was labeled "anti-puma," Dr. Banerjee testified, "I have to look into it." Dr. Banerjee said that he did not how this could have happened (Banerjee Transcript, V.1, p.284, ll.17 to p.287, ll.18). He also identified his handwriting on the scan labeled "anti-puma," but that "this was a mistake." He could not explain the numbers on the gel, that the information about the numbers "might be in my notebook, but I have to critically go through it" (Banerjee Transcript, V.1, p.283, ll.4 to p.284, ll.6). When shown a scan in a file named **survivin.jpg** that was derived from the gel on which "'anti-puma" was written, Dr. Banerjee maintained the cropped scan was survivin until confronted with the fact that the gel does not show the molecular weight for survivin; he had no explanation for this, only that he has "to look into it" (Banerjee Transcript, V.1, p.284, ll.9 to p.286, ll.7). Dr. Banerjee testified that he did not know what "anti-puma" was and denied that he had "ever published a paper with puma in it" nor did he know of "anyone in Dr. Sarkar's lab use that protein" (Banerjee Transcript, V.1, p.282, ll. 21 to p.283, ll.19; p.286, ll.18 to p.287, ll.10). He could not explain how the c-iap.jpg scan could have been derived from a scan for other proteins that included NOXA, nor could he account for the cutting-and-pasting of the image used for the β-actin bands in the Panc-1 panel of Figure 2B (Banerjee Transcript, V.1, p.288, ll.4 to p.291, ll.6). Dr. Banerjee did agree with the Committee's analysis of the images showing the mis-labeling or re-labeling of these bands (Banerjee Transcript, V.1, p.291, ll.7-10). In later testimony (Banerjee Transcript, V.3, p.671, ll.14 to p.673, ll.12), Dr. Banerjee stated that he could not find the scans for these published proteins and so re-ran the experiments (Banerjee Transcript, V.3, p.673, lll.9-12).

ANALYSIS:

See DIO4915 Image File B, slides 270-288.

XIAP and Survivin (DIO4915, Image File B, slide 271): A visual comparison shows that the bands published as XIAP and survivin in the Panc-1 panel of Figure 2B in Paper 16 come from two films scans in one file labeled **survivin and xiap.jpg.** These scans and cropped scans derived from them, in files **xiap.jpg** and **survivin.jpg** found by the Committee, are the source for the images labeled "XIAP" and "Survivin"

(DIO4915, Image File B, slide 272). The top film in **survivin and xiap.jpg** is the scan of a whole gel that is the source for the cropped scan in the film named "xiap.jpg" and the bottom film is the scan of a whole gel that is source for the cropped scan in the file named "survivin.jpg" (DIO4915, Image File B, slides 273-274). When the top gel/scan is rotated 90º counter-clockwise, one can see that the last 4 lanes of the top band form the cropped image in the file named "scan xiap.jpg" thereby re-labeling as "xiap" what is apparently the source "survivin" (DIO4915, Image File B, slide 275). The cropped scan in **xiap.jpg** has been squeezed horizontal so that the lanes appear thinner in the published XIAP band in Figure 2B in the Panc-1 panel (DIO4915, Image File B, slides 275-276). However, the scan in the top film in **survivin and xiap.jpg** also has Dr. Banerjee's blue handwriting on the reverse that, when flipped horizontal, readily reads "survivin" with an arrow pointing at what is now labeling the lower band and molecular weight marks on the right side of the blot correspond to survivin's molecular weight of 16.5-18.5 kDa (DIO4915, Image File B, slide 277). The lane order and orientation for the cropped scan xiap.jpg are also thus reversed. There are no indications of treatments for any of the lanes on the whole gel/scan.

The bottom portion of **survivin and xiap.jpg** is the scan of a whole film that is source for the cropped scan labeled **survivin.jpg** (DIO4915, Image File B, slide 278). The first 4 lanes of the lowest band form the cropped scan in the file named **survivin.jpg**. Lane 1 curves dramatically upwards was cut, rotated, and repositioned to "straighten" it to align with the other lanes, and photoshopped to mask cut marks and saved in the file named **survivin.jpg** (DIO4915 Image File B, slide 279). This cropped scan was then copied, squeezed vertically and published as the survivin band in Figure 2B in the Panc-1 panel (DIO4915, Image File B, slide 280). However, Dr. Banerjee's handwriting on the original film scan reads clearly that the Western blot stained for a different protein, puma, not for survivin: the scan reads "anti-puma" in blue marker (DIO4915, Image File B, slide 281). In addition, the molecular weight marks labels had been changed and it appears, based upon the different color of the blue marker, that the labels were changed at a different time (DIO4915, Image File B, slide 281).

The "anti-puma" label on a scan submitted by Dr. Sarkar and Dr. Banerjee is inconsistent with Dr. Sarkar's testimony that he did not "remember in my lab" anyone using anti-puma, unless it happened without his knowledge (Sarkar Transcript, V.2, p.461, ll.1 to p.462, ll.20). The fact that Dr. Banerjee wrote "anti-puma" on this film is also inconsistent with his testimony that that he did not know what "anti-puma" is, or that he did not know of "anyone in Dr. Sarkar's lab use that protein" (Banerjee Transcript, V.1, p.282, ll. 21 to p.283, ll.19; p.286, ll.18 to p.287, ll.10). The denials by both Dr. Sarkar (Sarkar Transcript, V.2, p.456, ll.18) and Dr. Banerjee (Banerjee Transcript, V.1, p.286, ll.21-23) that they ever worked with or published a paper with puma are contradicted by a 2010 publication using puma (cf., Figures 3A & 3B) where both Drs. Sarkar and Banerjee (as well as Dr. Z. Wang) are co-authors:
Azmi, A.S., Philip, P.A., Wang, Z., Banerjee, J., Zafar, S.F., Goustin, A.-S., Almhanna, K., Yang, D., Wang, S., Sarkar, F.H., and Mohammad, R.M. (2010) Reactivation of p53 by novel MDM2 inhibitors: Implications for pancreatic cancer therapy. *Curr Cancer Drug Targets*. 10(3):319-331.

c-iap (pan) and β-actin (DIO4915, Image File B, slide 282): A visual comparison shows that the scan of a whole film in file **actin.jpg** (when rotated 2º clockwise) is the source of the cropped scan in the file named **c-iap (pan).jpg** (DIO4915, Image File B slides 283-284). These scans were both found by the Committee. The cropped scan in **c-iap (pan).jpg** (when squeezed vertical) is the same image published "c-IAP" band in Figure 2B in the Panc-1 panel (DIO4915, Image File B, slides 284-285), made clear by stray dots in common. However, again, Dr. Banerjee's blue handwriting on the reverse (when flipped horizontally) reads clearly to record antibodies not for c-iap or β-actin, but for MDM2, p21, and NOXA; and molecular weight marks at the right side of the scan correspond to these proteins (DIO4915, Image File B slide 286). Thus, the scan in the file named **actin.jpg** is reliably neither "c-IAP" nor "β-actin." Dr. Banerjee was unable to find the original films of the experiments for these bands at all.

A visual analysis shows that the cropped scan in the file named **actin-2.jpg** is the source of the image for the β-actin band in Figure 2B in the Panc-1 panel (DIO4915, Image File B, slide 287). The Committee found this file but could not find the source for the scan. Further cut marks around lane 4 of the image in actin-2.jpg show lane 4 to be manipulated and/or realigned but it is not known if the band is from the same blot or from another source that has been pasted into that position, and there is also evidence of masking under lanes 1-3 (DIO4915, Image File B, slide 288).

CONCLUSION:

The Committee finds, in **Allegation 28e**, that there is clear duplication and manipulation and re-labeling of images, where bands published in **Figure 2B** of **Paper 16** as c-IAP(pan), XIAP, survivin and β-actin are in fact copied from images in files with different protein names, and the images within those files are derived from films bearing still different names. Scans from various experiments of unknown origin are indiscriminately re-used and re-labeled by Dr. Sarkar with no apparent regard for the order, orientation, labels, or sources of the blots, and a complete disregard even for the labels of films and the names of files they submitted in response to this investigation. The Committee concludes that Dr. Sarkar's denial of any knowledge of how Figure 2 was constructed as it was, or of puma to be disingenuous. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and falsified results in the c-IAP(pan), XIAP, survivin and β-actin bands in the Panc-1 panel of Figure 2B in Paper 16, and thereby intentionally misrepresented the scientific record by deliberate manipulation of submitted files and that these acts constitute research misconduct by Dr. Sarkar, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. Further, the duplicating, cutting and pasting and manipulating and re-labeling images, as well as the very poor recordkeeping, and what appears to be a disregard for the data, are consistent with patterns of practice by in Dr. Sarkar's laboratory and reflect a lack of oversight by Dr. Sarkar.

Allegation 29: In Figure 3A, it is alleged that the same Rb image has been used as control in two different experimental contexts (DIO4915, Image File B, slide 290).

RESPONSE:

Dr. Sarkar submitted images purported to be original data and wrote "... that there are no errors and since there are no errors, no further action will be taken (Response Letter-Final-Nov 27th-2012, p.18). Dr. Banerjee contributed to this response letter. They conclude that "this was an accidental duplication of the Rb picture, but here we show the correct RB for MiaPaCa-2, with the same result" (Response Letter-Final-Nov 27th-2012, p.18). The scan submitted contains no date or file name. Dr. Sarkar submitted a film as original data (**Paper 16 – Image 3 – Exhibit 69.jpg** - 6/22/2013 9:12 am).

Allegation 29 was covered in Dr. Banerjee's testimony (Banerjee Transcript, V.2, p.272, ll.4 to p.274, ll.1; & V.3, p.673, ll.13 to p.676, ll.4). Dr. Banerjee admitted to duplicating the Rb bands and said it was a mistake during "compiling" the figure and said "it's too many mistakes, but one mistake, it does happen" (Banerjee Transcript, V.3, p.675, ll.20-23).

ANALYSIS:

See DIO4915 Image File B, slides 289-296.
A visual comparison confirms that the Rb bands are the same for each of the two panels in Figure 3A of Paper 16 (DIO4915, Image File B, slides 290-291). Dr. Banerjee admitted to re-using the Rb bands in Figure

3A. The response by Drs. Sarkar and Banerjee claims to have submitted "the original WB blot of MiaPaCa cell line ... with the correct RB..." (Response Letter-Final-Nov 27th-2012, p.18). Dr. Banerjee also testified he was repeating the experiments, although not always successfully (Banerjee Transcript, V.3, p.674, ll.1-13). No evidence is presented to support the claim that the Rb bands under the Panc-1 panel are the correct ones.

The file with the scan for Figure 3A **Paper 16 – Image 3 – Exhibit 69.jpg** submitted by Drs. Sarkar and Banerjee as original data does not match the published Rb bands (DIO4915, Image File B, slides 292-296). The "Corrected Rb" image does not match the scan submitted as the scan source for the "Corrected Rb." Instead lanes 1 and 2 of the "Corrected Rb" are lanes 3 and 4 of the published Rb band of Fig. 3A, flipped vertical and stretched vertical. But they also wrote that the submitted film shows "a similar result" so it is unclear from this text if the scan is really original or from one of Dr. Banerjee's repeated experiments (Response Letter-Final-Nov 27th-2012, p.18). The scan has no date.

CONCLUSION:

The Committee finds, in **Allegation 29**, that there is clearly duplication of the Rb bands, as admitted by Dr. Banerjee, published in **Figure 3A** of **Paper 16**. The Committee concludes there was intentional re-use of the Rb bands in both panels with different cell types because original films, likely in contrast to the response submitted by Dr. Sarkar, were not submitted or found. Additionally, the "Corrected Rb" submitted by Dr. Sarkar appears to be an altered version of the bands published Rb for Figure 3A and the scan cited as the source for the "Corrected Rb" does not match. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar intentionally and knowingly published falsified results in Figure 3A and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 17 (Reference #162): Ali, S., Banerjee, S., Schaffert, J.M., El-Rayes, B.F., Philip, P.A., Sarkar, F.H. Concurrent inhibition of NF-κB, cyclooxygenase-2, and epidermal growth factor receptor leads to greater anti-tumor activity in pancreatic cancer. *J Cellul Biochem*, **110**, 171-181, (2010)

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NIH Funding: R01CA131151 & R01CA132794 (PI: F.H. Sarkar)
Other Funding: Guido Foundation; Puschelberg Foundation
Note: Associated with Karmanos Clinical Trial listing "2007-128, Phase II, Therapeutic" (Clinical Trials, June 2012, Vol 1, Issue 4)

Allegation 30: In Figure 2A, lanes appear to have been overlaid or pasted onto the data set for the COX-2 and EGFR bands (DIO4915 Image File B, slide 298).

RESPONSE:

Dr. Sarkar wrote that "multiple gels were run ranging from panel of 6-9 pancreatic cancer cell lines with different antibodies" (Response Letter-Final-Nov 27th-2012, p.19). Autoradiograms were submitted purported to show a "COX-2 gel ... run with panel of 8 pancreatic cancer cell lines, and EGFR with panel of 9 pancreatic cancer cell lines" (DIO4915 Image File B, slide 299). Scans of "duplicate" Western blots were submitted that Dr. Sarkar wrote showed that "... results are similar in both the autoradiograms of COX-2

and EGFR with the figure in the manuscript with 6 pancreatic cancer cell lines." A second set of images from repeated experiments were submitted by Ms. Ali (file: "Response (Shadan-july 2014).pdf", p.13).

Dr. Sarkar submitted as evidence a "nomogram" created by Ms. Ali "...to show the expression of COX-2, EGFR, and other protein expressions..." (Response Letter, November, 2012, p.19; Image File B, slide 301). Dr. Sarkar wrote that the source nomogram files were "... found in folder C:\My documents\alis with the name (panc cells status)."

Ms. Ali testified that the "nomogram" was used to represent the expected results from different cell lines (Ali Transcript, V.1, p.122) and was "... a panel of eight or nine cell lines, and we ran different genes of expressed interest, and then once those genes were done upon the blots, and then we made a "nomogram" of representing whether it's a COX-2 expression or EGFR or Her-3, other stuff. You can see in AsPC-1 the level of COX-2 is nothing, so we just put--from the blot itself, so we put it as a cropped one with the background. That's it, but you can see the lanes are empty" (Ali Transcript, V.1, p.122, ll.1-10).

ANALYSIS:

See DIO4915 Image File B, slides 297-301.
Inspection of the top panel of Figure 2A shows clear cut and paste lines among several lanes in the COX-2, EGFR and p-EGFR bands but not the β-actin band (DIO4915 Image File B, slide 298). Dr. Sarkar and Ms. Ali admitted that cutting and pasting was done, including using the nomogram as a source. A series of .xls and .pdf files named "Panc cells status ..." found on sequestered computer "E:\OriginalData\12\[[NTFS]\Documents and Settings\alis\My documents\" (with copies on the drive labeled "21 KCl") are the source for the "nomogram" but contain no information showing the relevance of the "nomogram" to Figure 2A in Paper 17. The blots and labels on the duplicate scans Dr. Sarkar submitted in his response of November, 2012 for COX-2 and EGFR are unreadable. Scans of "duplicate" images from repeated experiments in file "Response(Shadan-july 2014).pdf" do not address the allegation (DIO4915 Image File B, slide 300). The β-actin bands show none of the cutting and pasting. The Committee cannot tell where these β-actin bands came from and concludes the image cannot be related to the other protein bands in Figure 2A.

Based on the evidence of cut and paste lines in Figure 2A, Dr. Sarkar's response, and Ms. Ali's testimony that Figure 2A was composed from blots derived from multiple Westerns, including several images of blots from the "nomogram" file, it is clear Figure 2A was composed from blots as well as historical "empty" bands. This composition was not indicated in the published figure, caption or text and so gives the false impression that the bands were from the same Western blots. The AsPC-1 and PANC-1 lanes of the COX-2 band, and the MiaPaCa and L.3pl lanes of the EGFR band are blank gray boxes pasted in from the "nomogram" or other sources and presented as data. The MiaPaCa and L.3pl lanes of the p-EGFR band were similarly pasted-in gray boxes, though p-EGFR is not among the proteins in the "nomogram." The fact that Dr. Sarkar submitted the "nomogram" as part of his response to the allegation means he knew that the "nomogram" and other source of images are used in published figures.

CONCLUSION:

The Committee finds, in **Allegation 30**, that **Figure 2A** in **Paper 17** is a composite of images from the "nomogram" and other unidentified sources unrelated to the experiment, including the β-actin bands, pasted into Figure 2A as data. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar knowingly published fabricated and/or falsified data in Figure 2A and that this is research

misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Allegation 31: In Figure 6A, the same data images were used to represent results from different experimental conditions. Specifically lanes 3 and 9 and lanes 4 and 8 are identical images though the lanes have different labels. See DIO4915 Image File B, slides 302-303.

RESPONSE:

Dr. Sarkar wrote in his November 2012 response letter (p.20) that "... This experiment was repeated a number of times and since there are 17 lanes it was impossible to run all in one gel" and that "... lane 4 and 8 are not the same as can be seen from the figure that appears in the manuscript ... The results would not have changed by changing the lanes or superimposing them, it's an honest mistake." Dr. Sarkar wrote that the original figure is "... in computer folder C:\My Documents\BDIM+Erl+Gem\NFkB(L3.6pl)" (DIO4915 Image File B, slide 304). Dr. Sarkar provides no information showing where the images in this file came from, and wrote that "while making the final figure somehow it got changed" (Response Letter, November, 2012, p.20). Dr. Sarkar also wrote that the "... band intensity data further shows that the duplication of the lanes was unintentional and that the original blots have different intensities showing the correct data."

ANALYSIS:

See DIO4915 Image File B, slides 302-306.
Dr. Sarkar admitted that Figure 6A is a composite. His lab may not have equipment to run a 17-lane EMSA assay, but he failed to note in the paper that Figure 6A was a composite of multiple assays. Based upon multiple unique patterns of extraneous spots, streaks, shadows, and lines within and at the margins of the blots, the images in lanes 3 and 9 and in lanes 4 and 8 are the same (DIO4915 Image File B, slides 305-306). The images in lanes 8 and 9 are re-labeled and blurred versions of lane 3 and 4, respectively, and these manipulations make the NF-κB bands in lanes 8 and 9 appear relatively wider. This evidence from the analysis contradicts Dr. Sarkar's claim that "lane 4 and 8 are not the same as can be seen from the figure that appears in the manuscript."

In the "original figure" in file: E:\\OriginalData\12\[NTFS]\Documents and Settings\alis\My Documents\BDIM+Erl+Gem\NFkB(L3.6pl).jpg (DIO4915 Image File B, slide 303 & 306), lane 4 does differ from the image published in lanes 4 and 8. Lanes 3 and 9 in file "NFkB(L3.6pl).jpg" are identical to each other and to lanes 3 and 9 published in Figure 6A. The fact that a different image was in lane 4 in file "NFkB(L3.6pl).jpg," an unpublished version of Figure 6A, does not explain the manipulation.

By copying, blurring and re-labeling lanes 3 and 4 to lanes 8 and 9, Dr. Sarkar misrepresents the data to show higher "over-expression" of NF-κB in pancreatic cells after gemcitabine treatment alone and thereby presented an artificially high baseline for assessing, in lanes 10 through 17, the "... combinatorial approach using novel agents" for treating human pancreatic cancer, as was predicted for this experiment (Paper 17, p.172). Also, Dr. Sarkar admits to drawing relative quantitative comparisons between groups run across different EMSA assay gels and presented in the histogram in Figure 6A.

CONCLUSION:

The Committee finds, in **Allegation 31**, that data in **Figure 6A** in **Paper 17** are a copied, manipulated (blurred) and re-labeled composite of images that misrepresented the results, and were used to draw

conclusions across multiple gels that effectively exaggerated the effects of drug combinations compared to the gemcitabine-alone group. Therefore, the Committee concludes, by a preponderance of the evidence, that Dr. Sarkar knowingly published fabricated and/or falsified results in Figure 6A and that this is research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Allegation 32: In Figure 6C, bands have been overlaid/pasted into the data sets for EGFR and pEGFR. Further, the band widths in some instances are not congruent among the data panels.

RESPONSE:

Dr. Sarkar wrote that "the proteins were extracted from mice tissue of different groups. The bands from cell lines extracts are quite clean but unfortunately it is not easier to get cleaner bands from tissue samples. We repeated with EGFR and pEGFR tissue extracts several times and got similar results" (Response Letter-Final-Nov 27th-2012, p.20). Dr. Sarkar wrote that "these original blots and duplicates for repeat experiments show clearly that the data from these blots are correct, repeatable, and that the conclusions in this paper is correct based on correct data sets" (Response Letter-Final-Nov 27th-2012, p.21). Ms. Ali repeated this response and provided autoradiograms she wrote were from repeated experiments ("Response(Shadan-july 2014).pdf, p.16).

Ms. Ali testified that Figure 6C was "from one gel" (Ali Transcript, V.3, p.319, ll. 9) and the cutting and pasting in the EFGR band was because she "...must have moved the bands around ... because the gel was not run from--in the same order" (Ali Transcript, V.3, p.319, ll. 15-20). Ms. Ali testified she did not cut and paste and move bands around in the β-actin band because "if they [i.e., the lanes in the band] ... are very much similar" she does not re-order the lanes ("I don't do it"; Ali Transcript, V.3, p.320, ll. 15-20).

ANALYSIS:

See DIO4915 Image File B, slides 307-309.
Evaluation of the published image shows clear cropping of all bands, and cut and paste marks in the EGFR band between lanes 5 and 6 and in the pEGFR band between lanes 2 and 3, and 4 and 5 (DIO4915 Image File B, slide 307). The image submitted as original in the November 2012 response is blank for EGFR and unreadable for p-EGFR (DIO4915 Image File B, slide 308). The images submitted as original in file "Response (Shadan-july 2014).pdf (p.16) in July 2014 for EGFR do not match the published images (DIO4915 Image File B, slide 309) and are considered to be from repeated experiments that do not address the allegation. The images submitted as original in file "Response (Shadan-july 2014).pdf (p.16) in July 2014 for p-EGFR bands match lanes 1 to 3 only although they are highly cropped and masked (DIO4915 Image File B, slide 309). No references to the film or image scan files were given and potential source files do not match (DIO4915 Image File B, slide 307, bottom color panel). Ms. Ali's testimony is consistent with others in Dr. Sarkar's laboratory in describing as common practice using loading control bands interchangeably because they "... are very much similar."

CONCLUSION:

The Committee finds, in **Allegation 32**, in **Figure 6C** in **Paper 17**, that the images for lanes 1 to 3 in the p-EGFR bands are originals, although highly cropped and masked, but there is insufficient evidence that the manipulations in these particular bands rise to the level of research micsoncdct. The Committee also finds, in **Allegation 32** that the bands in lane 4 for the p-EGFR row and in lanes 1 to 5 for the EGFR row are composed by cutting and pasting and rearranging lanes in multiple Western blots without indicating the

sources, or noting that this was done in the text, and using control bands that did not match the experiment. No original scans or laboratory records supporting the research were provided or found. Therefore, the Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 6C and that this is research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Allegation 33: In Figure 4 there is cutting and pasting and blurring out of images throughout all rows in all 3 panels in Figure 4, but most obviously in the 4 right lanes, and in the COX-2 and NF-κB rows, suggesting data manipulation (DIO4915 Image File B, slide 310).

RESPONSE:

Dr. Sarkar submitted that "the order of gel run was different than the compiled figure; hence the cut and paste of lanes were done to be consistent throughout the figure" (Shadan-Response, p.8). Dr. Sarkar wrote that "... both the original and duplicate autoradiograms are scanned and enclosed" and that "the overall conclusion remains same." Regarding Paper 17, Ms. Ali testified that it is common practice to cut and paste images from multiple scans in making figures for papers (Ali Transcript, V.1, pp.121-133). Ms. Ali also testified that cutting and pasting was used to re-order lanes, but that for β-actin, which does not show cut marks, she could use a "duplicate, or sometimes if the actin for all looks similar, I don't move it around" (Ali Transcript, V.3, pp.321-322).

ANALYSIS:

See DIO4915 Image File B, slides 310-311.
Dr. Sarkar admitted that cutting and pasting was done and this was not indicated in his published figure caption or text. Dr. Sarkar wrote that the duplicate autoradiograms "show similar results" but original autoradiograms were not "enclosed" as claimed. No images matching the published blots, in any order, were submitted or found. Ms. Ali admitted to using β-actin bands in ways that do not match the experiment, instead utilizing duplicates that look similar. Duplicate autoradiograms (DIO4915 Image File B, slide 306) do not address the allegation and there are sufficient differences between the purported repeated experiment and the published figures to doubt the published conclusion would remain the same. It is unlikely that the research in Figure 4 was conducted as described in Paper 17.

CONCLUSION:

The Committee concludes, in **Allegation 33**, by a preponderance of the evidence that Dr. Sarkar engaged in research misconduct, as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103, by publishing fabricated data in **Figure 4** in **Paper 17**. Specifically, Dr. Sarkar knowingly published Figure 4 which was composed by cutting and pasting images from multiple Western blots without indicating this was done and by using control bands that did not match the experiment. He failed to produce the original scans or laboratory records supporting the research.

Paper 18 (Reference #188) Banerjee, S., Wang, Z., Kong, D., Sarkar, F.H. 3,3'-Diindolylmethane enhances chemosensitivity of multiple chemotherapeutic agents in pancreatic cancer. Cancer Res, 69, 5592-5600, (2009)

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NIH Funding: R01 CA101870 (PI: F.H. Sarkar)

Allegation 34: In Figure 2B, an image of the same field of cells appears to have been used to represent the results of two different drug treatment results, namely gemcitabine and cisplatin. See DIO4915 Image File B, slide 313.

Allegation 34a: Figure 4C (right panel) is presented as one gel but the lanes appear to be cut and pasted or spliced together to give the impression the blots are from one gel. See DIO4915 Image File B, slide 322).

Note: See also Allegation 106 where Figure 4C from Paper 18 is also used as Figure 10C in PROGRESS REPORT: 5R01CA131151-2 (File: 2009, 04 10 - Sarkar Proposal 09071199.pdf)

RESPONSE:

For Allegation 34, Dr. Sarkar wrote that this image duplication "... was an honest mistake..." (Response Letter-Final-Nov 27th-2012, p.21), that "the microphotograph picture showing Cisplatin is correct one..." and argued that the mistake was a "minor error" due to an inadvertent mix-up of images taken on the same afternoon. Dr. Sarkar submitted a photo purported to be "the corrected picture for gemcitabine" (DIO4915 Image File B, slide 314).

In "DataSubmittedWithFSInquiry", Dr. Sarkar provides the images taken on January 28, 2008 in the "Dr. Banerjee\DIM folder." These images have names that correspond to the treatments in Figure 2B (e.g. Cisplatin, Cisp, Gemcit, etc.). Consistent with Dr. Sarkar's explanation, the duplicated image from Figure 2B is named "Cisplatin.jpg" and the image Dr. Sarkar identified as the correct image for the gemcitabine treatment is labeled "Gemcit.jpg". The other six image files comprising this composite are also in this folder with names that correspond to labels in the published figure.

Dr. Banerjee wrote also that "...this was a mistake during compilation of figure" ("Banerjee 02 - Exhibit 155Ab - Allegation-Response"), and similarly testified that "it was a mistake" (Banerjee Transcript, V.2, p.410, ll.7-8).

For Allegation 34a, Dr. Sarkar and Dr. Banerjee explained that the Western blot images were "...spliced and presented as a composite picture..." because "...it is impossible to run the presented 7 proteins together as single gel" ("Banerjee- Response.ppt" dated 02/05/14, slide 4). Dr. Sarkar noted that "this expt was done in 2004". Dr. Banerjee testified that he constructed Figure 4C and that he should have indicated with demarcating lines that this figure was a composite of multiple separate blots (Banerjee Transcript, V.2, p.434).

ANALYSIS:

See DIO4915 Image File B, slides 312-321.
For **Allegation 34**, the images labeled for "cisplatin" and "gemcitabine" treatment are clearly the same image, as admitted by Dr. Sarkar and Dr. Banerjee. A different image purported to be the correct image for the gemcitabine treatment was provided.

The 19 .jpg images submitted to the Committee in response were also found in files on the sequestered computer hard-drives [E:\8\[NTFS]\Documents and Settings\banerjes\My Documents\April2009\Desktop data\Kingston-2\DIM]. However, unlike the submitted images, these image files lacked descriptive names and instead have generic names (e.g., "untitled014", "untitled0005", etc.; DIO4915 Image File B, slide 315). Dr. Banerjee testified that these were the original microscope-generated file names, not yet labeled with their descriptive names (Banerjee Transcript, V.3, p.679, ll.14 to p.681, ll.8). He further explained

that the order of image acquisition was recorded on a note pad while he was at the microscope and that this order was subsequently used to give the descriptive names to the 'untitled' .jpg files. Finally, Dr. Banerjee presented a page from a pad that he said he used as lab notebook and where he said he wrote the labels for the pictures in order (Banerjee note pad, Exhibit #119, p.11; DIO4915 Image File B, slide 316).

To analyze these image files and names, the Committee first chronologically ordered by their time stamps the 'untitled' images by their auto-generated file names (e.g. "untitled006.jpg" then "untitled007.jpg", etc.), which Dr. Banerjee testified was the proper order (Banerjee Transcript, V.3, pp.685-696). These 'untitled' files were then assigned descriptive names by matching images themselves to the identical named images in the submitted files. Next, this order was compared to the list in the note pad record (DIO4915 Image File B, slide 317). This analysis shows a lack of concordance between the descriptive file names associated with the submitted images and the note pad record, where Dr. Banerjee said he recorded the file names he assigned (Banerjee Transcript, V.3, p.688, ll.5-12). When this lack of concordance was pointed out to Dr. Banerjee, he insisted the assigned names were correct. Yet he was unable to explain discrepancies and missing names and question marks on his note pad (Banerjee Transcript, V.3, pp.695-698). The Committee concludes that there is insufficient evidence that the note pad record was used to assign descriptive names, or that it corresponds reliably to the image files, or to the published images, or to the experimental conditions. Instead, the files appear to have been named arbitrarily, without regard to their true identities.

Dr. Sarkar also submitted with his response in thumb drive "DataSubmittedWithFSInquiry," together with the 19 descriptively named .jpg image files, a file named "Morphology.ppt" that is a composite image which appears to be a preliminary version of the 8-lane figure published in Figure 2B. Another set of the 19 images again with the "Morphology.ppt" file were found on the sequestered hard-drive E:\8\[NTFS]\Documents and Settings\banerjes\My Documents\ April2009\Desktop data\Kingston-2\DIM), but with 'untitled' file names. While this preliminary figure in "Morphology.ppt" (DIO4915 Image File B, slide 318) has no labels, the component images were matched to named, submitted images. However, only five of the eight treatments conditions are represented, three conditions are duplicated, and three conditions are omitted (DIO4915 Image File B, slides 319-321). The Committee concludes that it is likely Dr. Banerjee composed this preliminary figure as the images were acquired and was intended to include all eight conditions. However, an extensive search of sequestered hard-drives identifies only the 'untitled' image files and no files with descriptive names indicating that file names were changed after the September 12, 2012 computer sequestration and prior to the November, 2012 submission of Dr. Sarkar's response to the Committee. Dr. Banerjee denied that the descriptive names were added to these files only at the time of the November, 2012 formulation of the Sarkar Response Letter (Banerjee Transcript, V.3, p.689, ll.13-16). Based on this analysis the Committee concludes that the descriptive names given to the 19 .jpg files used to generate published Figure 2B are post-hoc, arbitrary, and therefore the published images are unable to be corrected reliably from the research record.

Regarding **Allegation 34a**, Drs. Sarkar and Banerjee admitted that the image was a composite, due to the limits of Western blotting. Simple visual examination shows cut marks where blots pasted in (DIO4915 Image File B, slide 322).

CONCLUSION:

For **Allegation 34**, the Committee finds that some panels in **Figure 2B** in **Paper 18** were labeled arbitrarily in apparent disregard for the integrity of the data, selecting and re-purposing images so as to best support the hypothesized result. Dr. Banerjee is most directly responsible for this. While Dr. Sarkar may not have

been aware of this fabrication and/or falsification at the time of manuscript submission in March, 2009, he was certainly aware when he submitted the re-named files as part of his written response (Response Letter-Final-Nov 27th-2012, p.21). Further, Dr. Sarkar is the laboratory head and both senior and corresponding author of Paper 18 and so also responsible for this data fabrication. Therefore, the Committee concludes, by a preponderance of the evidence that Dr. Sarkar engaged in research misconduct, as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103, by recklessly publishing fabricated and/or falsified data in **Figure 2B** of **Paper 18**, and by submitting falsified files as part of a response to this investigation. The Committee concludes that there is no way to reliably correct the scientific record with respect to Figure 2B.

For **Allegation 34a**, the right hand panel of Figure 4C appears to be derived by inappropriately splicing together different film images without demarcation. Technically, while this is improper, the Committee finds that there was no intent to deceive in this instance because any reader familiar with Western blots would readily recognize that this panel is a composite of separate film images. Rather, the lack of demarcations here may be characterized an aesthetically poor choice. The Committee concludes there is insufficient evidence of research misconduct in this instance.

Paper 19 (Reference #236): Wang, Z., Banerjee, S., Kong, D., Ll, Y., Sarkar, F.H. Down-regulation of Forkhead Box M1 transcription factor leads to the inhibition of invasion and angiogenesis of pancreatic cancer cells. Cancer Res, 67, 8293-8300, (2007a)

Publication History: Received April 5, 2007; Revised May 10, 2007; Accepted June 6, 2007
NIH Funding: 5R01CA101870-05 (PI: Dr. Sarkar)
Other Funding: Puschelberg Foundation

Allegation 35: In Figures 1D, there is the possibility of multiple alterations to the figure. In several areas of the figure, the complainant indicates bands that appear to have been overlaid/pasted onto the various data sets.

CONCLUSION:

There was no response regarding Allegation 35 for Figure 1D. The original allegation was not specific about which bands were pasted or overlaid. More specific allegations regarding Figure 1D are addressed in Allegation 37. Therefore, the Committee concludes there is no evidence of research misconduct regarding Allegation 35.

Allegation 35a: In Figure 4C, blots are cut and pasted for the cell types for most rows, and do not match up with the β-actin band which is not cut/pasted. The CDK2 blots are cut and pasted for the cell types for most rows (DIO4915 Image File B, slide 325).

RESPONSE:

Dr. Sarkar wrote: "We did western blotting using three cell lines treated with control siRNA and FoxM1 siRNA transfections. To excluded the off target due to siRNA we did multiple control siRNA and multiple FoxM1 siRNA transfections, therefore, we ran gels using multiple samples together. Then in order to make only six lanes with CS and FS in three cell lines we copied and pasted the right bands together sometimes. You can find that several bands were copied and pasted together but the original data stands and this was only to put in the figure. After adjusted Brightness/contrast and stretched shortened, we got this panel" (Response Letter-Final-Nov 27th-2012.pdf, p.21).

In "Wang-Response 1.ppt" Dr. Sarkar and Dr. Wang wrote: "We have answered the allegations for survivin, p27, cyclin B. We found the film for CDK2. No errors were found for expression of these proteins. Thus, no further action would be required (slide 4)."

ANALYSES:

See DIO4915 Image File B, slides 323-340.
Dr. Sarkar admitted to copying and pasting lanes from individual bands to present the six experimental groups in the design in the same order. He also admitted to manipulating the size (squeezing and/or stretching in one direction or the other), brightness and contrast in the images. Several images purported to be scans of the source films, with some labels indicating cell types and treatment ("CS" versus "FS") were submitted (DIO4915 Image File B, slides 326-327). Visual comparisons of these images appear to match only some blots in the published figure, and file names and locations for the submitted scans were not provided so how the figures were prepared could not be substantiated. Also, manipulations included changing the shapes (cropping) and orientations by either flipping whole bands vertically and/or by rotating certain lanes (DIO4915 Image File B, slides 328-340).

The survivin bands from the scans provided appear to match lanes 1, 2, 5 & 6 in Figure 4C, but not lanes 3 and 4. Lanes 5 and 6 were further manipulated by rotating them ~5° counterclockwise (DIO4915 Image File B, slides 329-334). The p27 band was also cut and pasted but lanes 1 and 3 in the published figure do not match the submitted image. It may be that the lane labeled "BxPC-3 CS" in the scan was used for the HPAC CS lane, but that is unclear (DIO4915 Image File B, slides 335-336). The CyclinD1 band uses lanes 1, 2, 5, 6 and 7 from the scan for lanes 1 through 5, respectively, cropped, stretched, flipped and with background adjusted for brightness. It is not clear where lane 6 for Cyclin D1 in Figure 4C came from (DIO4915 Image File B, slides 337-338). Closer evaluation of the CyclinB band does not show clear indications of cutting and pasting. The scan of the p21 band appears to match the published band but the labels were added to the scan for the response. The CDK-2 band in the scan does not match the published band (DIO4915 Image File B, slide 339). The β-actin bands in the submitted scan does not match the published bands which shows no evidence of cut and paste marks and so cannot be an appropriate control for this figure (DIO4915 Image File B, slide 340).

CONCLUSION:

The Committee finds, in **Allegation 35a**, that the source images provided for the protein bands in **Figure 4C** of **Paper 19** do account for the majority of published lanes and that the admitted cutting and pasting of lanes was to re-order and simplify presentation in the publication. However, the Committee also finds that there are multiple instances where scans of the published blots are not provided, and/or the images are manipulated to change the results, and/or where images for individual blots submitted by Dr. Sarkar are not the source of the bands published in Figure 4C. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 4C and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 36: In Figure 6C, again, identical images have been used to represent experimental results given by different cell types. (DIO4915 Image File B, slide 341).

RESPONSE:

Dr. Sarkar wrote: "Dr. Wang did the tube formation for 6 hours in BxPC-3 and HPAC cells ... and took many pictures for this assay. All the Jpg files were created on March 22, 2007. Before BxPC-3 CS tube formation is taken from DSC03384 (BxPC-3 CS), while HPAC CS tube formation is taken from DSC03385 (BxPC-3 CS). We had a mistake because DSC03384 and DSC03385 are from the same picture with different area. In fact, these both figures were for BxPC-3 CS tube formation." The response also names files with original images. Dr. Sarkar concluded that this "... is a minor error in this figure..." that "... has no impact on the overall data or the final conclusion" (Response Letter-Final-Nov 27th-2012.pdf, p.22).

Dr. Sarkar testified that: "I obviously see your point, that compression and other thing has been done..." but he felt that an identical image was used to create the figure (Sarkar Transcript, V.1, p.229, ll.13 to p.231, ll.11). Dr. Sarkar testified that "Dr. Wang took these photographs," and that he [Dr. Sarkar] did not talk to Dr. Wang about the figure (Sarkar Transcript, V.1, p.229, ll.22 to p.230, ll.5). Dr. Sarkar did not know what happened but guessed that "... there are multiple pictures taken and then there might have been a confusion, and then inadvertently probably the same image was put together and juxtaposed to have the same figure" (Sarkar Transcript, V.1, p.230, ll.8-11). Dr. Sarkar testified that Dr. Wang never told him he changed the proportion of images and re-used images in different papers with different labels (Sarkar Transcript, V.1, p.230, ll.17-21).

Dr. Wang testified that these are the same images from the same photograph (Wang Transcript, V.1, p.111, ll.11-15) and that "...this is a mistake" in that "... we took the picture and took the multiple pictures and then saved this one and marked the wrong one" (Wang Transcript, V.1, p.113, ll.6-11). Dr. Wang had no explanation for how the proportions of the photos changed (Wang Transcript, V.1, p.114, ll.2 to p.115, ll.19).

ANALYSIS:

See DIO4915 Image File B, slides 341-349.
Dr. Sarkar and Dr. Wang admit to an error and claim it is minor. This type of "error" is seen over and over in other papers, i.e., that two different fields of the same culture or two different areas of the same photograph are labeled as different things. In this case, the labels are "CS" for two different cells lines. An examination of the raw data shows that in many cases .jpg files saved on the computer are done so without informative names and with no labels within the image. The data, therefore, can be accessed or verified only by the dates the photos were taken.

Simple visual evaluation appears to show the images for the tube formation assays in BxPC-3 and HPAC cells in Figure 6C are the same (DIO4915 Image Files B, slides 344-347). This is not contested by Dr. Sarkar or Dr. Wang. The claim that they made a mistake in selecting the right photo from among many taken on the same day may not be credible given that one image appears disproportionately manipulated compared to the other (DIO4915 Image Files B, slides 346-347). Dr. Sarkar's response of November 2012 lists a range of file names that are supposed to be the "correct" source files for Figure 6C (e.g., DSC03384 to DSC03394 & DSC03441 to DSC03447). The file names used in Dr. Sarkar's lab are not informative (DIO4915 Image File B, slides 342-343). The directory names may be relevant to Paper 19 (i.e., E:\OriginalData\20 Jerry Wang HP USB\Wang FoxM1 paper\ & E:\OriginalData\20 Jerry Wang HP USB\Wang FoxM1 paper\BxPC-3 CS\). The Committee finds that two original photos – DSC03384 and DSC03385 – match the cropping of the published images so the published images could be either the same photo cropped differently or different photos of the same tube assay (DIO4915 Image File B, slides 348-349). But since the photos have different and asymmetric dimensions, the evidence suggests that the

disproportionate relationship between the two published images is due to differences in the original files, reformed to make them the same size within Figure 6C. This would be consistent with Dr. Wang's claim that a mistake was made. However, all photos in the original directories were green except for the two gray photos that were published: no duplicates of the gray photo tube formation patterns were found among any of the green photos. The two original gray photos also have a difference in brightness that is not seen in the published photos. All these features are inconsistent with a simple mistake in selecting the wrong photo.

CONCLUSION:

The Committee finds, in **Allegation 36**, that the tube formation assay images in **Figure 6C in Paper 19** are clearly the same. The Committee concludes, however, that there is insufficient evidence that this photomicrograph was intentionally or knowingly or recklessly duplicated and manipulated when it was published. However, in any case, this is another instance consistent with the pattern of image duplication, manipulation and re-labeling, and poor record keeping, common in Dr. Sarkar's lab and for which he bears responsibility.

Allegation 37: In Figure 1D, for BxPC-3/HPAC/PANC-1, lanes 2, 4 & 6 from the left (FoxM1), labeled "FS", are blurred out, indicating falsification, and PANC-1 CP in FoxM1 is pasted in, indicating falsification and/or fabrication.

RESPONSE:

Dr. Sarkar submitted this response: "We were unable to locate the original FoxM1 autoradiogram that was scanned for publication; however we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Thus, no further action would be required (Wang-Response-1.ppt, slide 5; DIO4915 Image File B, slide 351).

ANALYSIS:

See DIO4915 Image File B, slides 350-351.
Simple visual evaluation of the bands in Figure 1D shows evidence of cutting and pasting into the "PANC-1 / FS" lane in the top Fox-M1 band and into the "Colo-357 / CP" lane in the bottom Fox-M1 band (DIO4915 Image File B, slide 350). The submitted scans of Western blots are not originals, do not contain information linking them to the design of Figure 1, and poorly match the pattern in the published bands. The failure to maintain and produce research records is evidence of research misconduct.

Note: The 6-lane β-actin band in the top panel of Figure 1D is a re-used and manipulated copy of another image (see: Allegation 93c). The 6-lane band labeled "β-actin" in the bottom panel of Figure 1D is a re-used and manipulated copy of a band that is labeled "Rb" in Paper 3 (see: Allegation 82b) and elsewhere.

CONCLUSION:

The Committee finds, in **Allegation 37**, evidence of manipulation of the lanes in **Figure 1D** of **Paper 19** and that that bands on submitted scans do not match the published images. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the results in Figure 1D and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 38: In Figure 5B, the 'FS' columns appear blurred out or pasted over for the MMP-9 and uPAR rows. Again, matching cuts/pastes are not seen in β-actin bands ... for all figures, the 'cuts' are not seen in the β-actin bands indicating that they are not the loading controls for these proteins (DIO4915 Image File B, slide 352).

RESPONSE:

Dr. Sarkar wrote: "We found the film for MMP-9 expression, showing no error in MMP-9 ... We were unable to locate the original uPAR autoradiogram that was scanned for publication; however we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Thus, no further action would be required" (Wang-Response-1.ppt, slide 6; DIO4915 Image File B, slide 353).

ANALYSIS:

See DIO4915 Image File B, slides 352-354.
Visual evaluation of the MMP-9 bands in Figure 5B appears to show blurring in the BxPC-3/FS lane, probable pasting in HPAC/FS lane, and a clear cut mark in the PANC-1/FS lane (DIO4915 Image File B, slide 352). Pasting seems clear in the HPAC/FS lane and the PANC-1/FS lane of the uPAR band. The two MMP-9 bands on the submitted scan, which only partially label cell types – and only one indicates treatment conditions – do not match the published bands. As admitted, the submitted uPAR band is not original and does not match the patter or magnitude of effects in the published uPAR band (DIO4915 Image File B, slide 354). The failure to maintain and produce research records is evidence of research misconduct.

CONCLUSION:

The Committee finds, in **Allegation 38**, that the MMP-9 and uPAR bands in **Figure 5B** in **Paper 19** contain cut and pasted and manipulated lanes whose source(s) are unsubstantiated. Given that the images Dr. Sarkar submitted are neither original (MMP-9) nor a faithful replication (uPAR), as claimed, the Committee concludes that Dr. Sarkar knowingly published fabricated and/or falsified the results in Figure 5B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 38a: In Figure 5B, the image in the uPAR row, with column headings "CS" and "FS", is duplicated in Figure 5 in **Reference #277** but re-labeled Cyclin-D1 with different column headings ("CS" and "NS"). See DIO4915 Image File B, slide 355.

RESPONSE:

Dr. Sarkar wrote in response: "Figure 5B, uPAR has a minor mistake but no errors on Cyclin D1. We found a duplicate autoradiogram from the same set of replicate experiments showing uPAR expression for Fig 5B and although this minor error has no impact on the results and the conclusion; however, if the committee insist then an erratum request could be send to the journal" (Wang-Response-1.ppt, slide 7). And, "Cyclin D1 was inadvertently labeled as uPAR in Fig 5B (paper 19)." See DIO4915 Image File B, slide 356.

ANALYSIS:

See DIO4915 Image File B, slides 355-357.
Simple visual evaluation shows clearly that the uPAR band in Figure 5B of Paper 19 is identical to the Cyclin-D1 band published a year earlier in Figure 5 of Reference #277 (DIO4915 Image File B, slide 355). As

admitted, the submitted uPAR band is not original, is the same uPAR band submitted in response to Allegation 38, and does not match the published uPAR band. The assumption that the Cyclin-D1 band in Reference #277 is correct is supported by no evidence. The Committee disagrees that copying a whole band and relabeling is as another protein in another publication is a "minor error."

CONCLUSION:

The Committee finds, in **Allegation 38a**, that the uPAR bands in **Figure 5B** in **Paper 19** was copied and re-labeled from the Cyclin-D1 bands in Figure 5 in Reference #277. (This is also addressed in Allegation 74.) The Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the results in Figure 5B of Paper 19 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Note: For Paper 19, see also Allegations 82b, 91b, 93c, 93d, 93g and 94a.

Paper 20 (Reference #097): Li, Y., Kong, D., Wang, A., Ahmad, A., Bao, B., Padhye, S., Sarkar, F.H. Inactivation of AR/TMPRSS2-ERG/Wnt signaling networks attenuates the aggressive behavior of prostate cancer cells. Cancer Prev Res, 4, 1495-1506, (2011)

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Other Funding: Puschelberg Foundation; Guido Foundation

Allegation 39: In Figures 3A & 3C,"... the indicated images are identical but are used to represent different experimental conditions" (DIO4915 Image File C, slide 360).

RESPONSE:

Dr. Sarkar wrote acknowledging that in Figure 3 of Paper 20 "...two identical images appear," and explained that "this mistake is that they were mislabeled and the same image was saved in two different files when Dr. Li took the fluorescent photos... the same image was recorded as both LNCaP BR-DIM and VCaP siERG+BR-DIM" (Response Letter-Final-Nov 27th-2012, p.23). Supporting scans of notes ("Invasion note.pdf") and original images were submitted "Yiwei Li\3rd data\ERG grant\Invasion ERG\Image15Q.jpg" and "Yiwei Li\3rd data\ERG grant\Invasion ERG\Image27Q.jpg"; DIO4915 Image File C, slide 364-365). Dr. Sarkar submitted two other files ("Image26Q" & "Image28Q") purported to have the correct data for the LNCaP BR-DIM and VCaP siERG+BR-DIM conditions, respectively (DIO4915 Image File C, slide 363). Dr. Sarkar concluded that they "regret these errors but this minor mistake has no impact on the overall data and the conclusion of this published paper" (Response Letter-Final-Nov 27th-2012, p.23). Dr. Li contributed to the response Dr. Sarkar submitted.

Dr. Li testified that the mistake happened in the darkroom with an old computer that required him to write down file names and he did not save files or "close down" correctly (Li Transcript, V.2, p.166, ll.13 to p.167, ll.20.) Dr. Li also explained that the apparent differences in resolution and blurring between Figures 3A and 3C was because of the autofocus function on the microscope (Li Transcript, V.2, p.166, ll.13 to p.167, ll.20.)

ANALYSIS:

See DIO4915 Image File C, slides 359-365.
Simple visual comparison confirms, as acknowledged by Dr. Sarkar and Dr. Li, that the panels in question are photos of the same cell culture in Figures 3A and 3C (DIO4915 Image File C, slide 362). Dr. Li offered a plausible explanation for how the mistake of taking two photos of the same cells happened, consistent with lab notes, and for how differences in focus and/or contrast arose. The Committee finds that it is probably coorect that the mistake happened because of a combination of using an older computer, working in the dark, simple error by the investigator, and poor records keeping practices (i.e., using pads or loose sheets of paper to record file names and not recording information in a permanent lab notebook), and because of inadequate proofing of manuscript figures.

CONCLUSION:

The Committee finds, in **Allegation 39,** regarding **Figure 3** in **Paper 20** that there are reasonable explanations for how this mistake occurred in generating and recording image data subsequently used in Figures 3A and 3C. While a significant contributor to this error was poor laboratory practices, there is no evidence that this use of duplicate copies of the same cells was intentional, or that Dr. Sarkar or Dr. Li knew this had happened before publishing Paper 20. The Committee concludes that there is no research misconduct by Dr. Sarkar regarding Allegation 39. However, the Committee also finds that this is another example of a consistent pattern of poor record keeping practices in Dr. Sarkar's laboratory.

Allegation 136: In Figure 6A, the PSA band in Figure 6A for VCaP cells has evidence of cutting and pasting seen in "... vertical changes in background between lanes 1 and 2, 3 and 4, and between lanes 5 and 6. No vertical changes in background in the other 4 panels." Cutting and pasting of lanes 1, 2, 3, 4 & 5, and 6 is clear. This manipulation in one row band and not the control GAPDH bands indicates fabrication and/or falsification of data (DIO4915 Image File C, slide 366).

RESPONSE:

Dr. Sarkar submitted a file stating, in part that "the blot of PSA was regrouped according to the sample sequence of other proteins and GAPDH. Due to the limitation of figure size, we could only show one GAPDH blot in the figure" (file: "Li Response\Allegation 136.docx," p.1). Dr. Sarkar also submitted figures described as "... two repeated experiments and original scans showing similar results" (DIO4915 Image File C, slide 367). The "...original files for PSA and GAPDH..." are purportedly named: "1. VC CDF D1 D2 PSA.jpg; 2. VC CDF D1 D2 GA.jpg; 3. VC CDF 1 2-5 D1-3 PSA.jpg; 4. VC CDF 1 2-5 D1-3 GA.jpg."

ANALYSIS:

See DIO4915 Image File C, slides 366-369.
Examination of the PSA bands in Figure 6A show lighter areas between bands with margins that are not straight as would be seen in a cut mark suggesting these are idiosyncrasies of the blot itself, or due to copying the image. Yet the responses admit to re-arranging lanes to correspond to the sequences in other proteins. Files were found at E:\25 KCl Dec 2013\P_homes\liyi\Yiwei Li\Corrections\For Correction\old scan\" with names similar to those indicated in the response (e.g., "VC CDF D1 D2 PSA 1.jpg" etc.; DIO4915 Image File C, slide 368). Other files named to explain Figure 6A were not submitted nor were they found (i.e., files named VC CDF 1 2-5 D1-3 PSA.jpg & VC CDF 1 2-5 D1-3 GA.jpg). The bands in the images that were submitted, and in the found files that seemed relevant, do not match the published bands (DIO4915 Image File C, slide 369). The Committee determined that the submitted images are not "original" (as in

sources of published blots) but rather "repeated" experiments. The explanation that GAPDH control bands were run for each protein but only one was shown for space considerations seems plausible.

CONCLUSION:

The Committee finds, in **Allegation 136,** regarding **Figure 6A** in **Paper 20,** based on the responses, that lanes in the PSA row were rearranged. The Committee concludes, despite inconsistencies in the response from Dr. Sarkar, that the rearrangements were made to present consistent sequences among proteins. The Committee concludes that although this is another example of cutting and pasting of bands common in the work from Dr. Sarkar's laboratory, there is insufficient evidence, in this instance, of intent to deceive or of research misconduct by Dr. Sarkar.

Paper 21 (Reference #106): Bao, B., Wang, Z., Ali, S., Kong, D., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Miele, L., Sarkar, F.H. Over-expression of FoxM1 leads to epithelial–mesenchymal transition and cancer stem cell phenotype in pancreatic cancer cells. J Cellul Biochem, 112, 2296-2306 (2011)

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Other Funding: Puschelberg Foundation; Guido Foundation

Allegation 40: In Figure 1C, *"... the Vimentin band has been overlaid/pasted into the Figure."* (DIO4915 Image File C, slide 371).

RESPONSE:

Dr. Sarkar wrote that the vimentin bands in Figure 1C were regrouped (pasted) from the bands in Figure 4C "in order to present the baseline data of control cells vs FoxM1 vector cells (without any treatment)..." (Response Letter-Final-Nov 27th-2012.pdf, pp.23-24). Dr. Sarkar testified that his objective in Figure 1C was to show what the FoxM1 vector alone did to the expression of various proteins (Sarkar Transcript, V.2, p.331, ll.6-9), and that the two "zero-dose" columns from Figure 4C should be the same blots presented in Figure 1C (Sarkar Transcript, V.2, p.333, ll,18-21; DIO4915 Image File C, slide 372). Dr. Sarkar wrote that the "baseline data of control cells vs FoxM1 vector cells" for all the proteins were meant to be portrayed in Figure 1C, and indicated that it was done to "comprehensively" emphasize differences between proteins due to the Fox-M1 expression vector alone before genistein treatment. On follow-up, when asked if it is "...necessary that it be the same images used in both of the figures" Dr. Sarkar said "it could be a possibility. That's all I can tell you" (Sarkar Transcript, V.2, p.336, ll.23 to p.337, ll.3).

Dr. Bao (first author) testified that only the Vimentin blot was copied between Figures 1C and 4C and that all the others "... are different blots ... only except that that one, the Vimentin" (Bao Transcript, p.85, ll.17 to p.86, ll.6). Dr. Bao testified that he was responsible for the data in Paper 21, including Figure 1C, but that he did not overlay the Vimentin blot. Dr. Bao testified he found the Vimentin blot added to Figure 1C when the manuscript came back from Dr. Wang during writing (Bao Transcript, p.85, ll.17 to p.86, ll.6). However, Dr. Bao also testified: "actually I didn't pay attention. I didn't expect that this kind of thing happen ... I didn't look at it [the figure] either" after Dr. Wang sent the manuscript back to him (Bao Transcript, p.97, ll.9-12). Dr. Wang said his only role in Paper 21 was to review the manuscript and submit to the journal the final version that Dr. Sarkar sent back to him (Wang Transcript, p.298, ll.3-23). When asked if he had added the Vimentin band to Figure 1C, Dr. Wang said "I don't think so, yeah" (Wang Transcript, V.1, p.295, ll.22-23).

ANALYSIS:

See DIO4915 Image File C, slides 370-374.
The allegation that the Vimentin blot in the Fox-M1 vector column of Figure 1C was pasted fits with testimony although there are inconsistencies among Dr. Bao (first author), Dr. Wang and Dr. Sarkar about whether or not all "zero-dose" bands in Figure 4C were, or were supposed to be, copied from Figure 4C into Figure 1C. The text and caption in Paper 21 related to Figure 1C are consistent with Dr. Sarkar's intention to portray baseline effects of the FoxM1 vector on relative protein expression in AsPC-1 cells (Paper 21, p.2299). Dr. Sarkar and Dr. Bao each reported the Vimentin blot was pasted or added, but Dr. Bao and Dr. Wang contradict each other about who did it. Dr. Wang said both that he did nothing but review and submit the manuscript (Wang Transcript, p.294, ll.12), and also, inconsistently, that he did not know if he had added the band (Wang Transcript, p.295, ll.24). Dr. Bao indicated that the images in Figure 1C were not, and were not supposed to be, copies from Figure 4C although Dr. Sarkar testified they were. Dr. Bao's testimony makes more sense to the Committee given the lack of correspondence between the proteins shown in the two figures (DIO4915 Image File C, slides 371-372).

Several source files with figures and partial figures for Paper 21 (and Paper 43/Reference #107) are found on the drive named: "E:\OriginalData\12\[NTFS]\Documents and Settings\alis\My Documents\FoxM1\". Source .jpg images for Figure 4C in Paper 21 are also found on the "P" share drive: "P_homes/boab/Bin_FOLDER/bin/from computer/Western_scanning/A1_A4_11_10_2010/" (DIO4915 Image File C, slide 379).

Other than the images copied from Figure 4C, no information regarding where the images published in Figure 1C actually came from was provided by Dr. Sarkar or Dr. Bao, or was found by the Committee. Notebook #2 (Exhibit 02 – DIO 4915 Lab Book – Bin Bao #2, pp.16-18) appears to be relevant to Paper 21 but had no information on the ordering of lanes in Figures 1C or 4C. In addition, the β-actin bands in Figure 1C show no separation between lanes as in all other bands, raising doubts that this β-actin is related to blots yielding any of the other bands in the figure (DIO4915 Image File C, slide 373).

Visual examination shows the "FoxM1 vector" Vimentin lane in Figure 1C was pasted in, as evidenced by the cut mark, and is the same image as the "zero-dose" Vimentin lane in Figure 4C (DIO4915 Image File C, slide 371). Also, both Snail2 lanes in Figure 1C are also copies of the two "zero-dose" Snail2 images in Figure 4C, stretched and blurred (DIO4915 Image File C, slide 374). There is significant mis-match between the two figures in the proteins shown and their order (DIO4915 Image File C, slide 372), indicating that except for the one Vimentin lane and Snail2 lanes Figure 1C was not a duplication of "zero-dose" lanes from Figure 4C.

Dr. Sarkar wrote that "In the future, we will be more cognizant of running a gel in the correct order for the figure to avoid having to regroup bands" (Response Letter-Final-Nov 27th-2012.pdf, p.23). However, his explanation was not that gels were run with bands out of order or with different orders for Figure 4C and Figure 1C. Rather, Dr. Sarkar had testified that what was shown in Figure 1C was his intentional re-presentation of parts of Figure 4C to emphasize "zero-dose" baseline effects.

CONCLUSION

The Committee concludes, in **Allegation 40**, that Dr. Sarkar intended that **Figure 1C** in **Paper 20** be a duplication of parts of Figure 4C, and he thought that it was, although, except for the vimentin band, it was not. The Committee finds that the evidence shows that Dr. Sarkar likely did not know how Figure 1C was constructed. The Committee finds that Dr. Wang's denial of pasting in the vimentin band to Figure 1C

is not credible and concludes that he very likely did cut and paste that band. Dr. Bao knew it had been done at the time and accepted the change without question. Given Dr. Sarkar's intent, what is suspicious about Figure 1C in Paper 20 is that only the vimentin (and maybe the Snail2) lanes were copied and not all the control images from Figure 4C; that the sources of bands in Figure 1C, including the β-actin, are not known; and that Dr. Sarkar, Dr. Wang, and Dr. Bao had conflicting stories about how the work was done.

The Committee finds that as first author, Dr. Bao shares responsibility, but there is insufficient evidence that Dr. Bao engaged in research misconduct in this instance. Dr. Sarkar was negligent in his responsibilities as lab leader and as corresponding author in not exercising due diligence to know how Figure 1C was prepared, including not finding out what happened when the allegations arose. Despite this, there is insufficient evidence that Dr. Sarkar engaged in research misconduct in this instance.

Allegations 41 and 42

These two allegations are that some or all of bands in Figure 4C from Paper 21 are duplicated in another paper (Allegation 41), and that certain of those bands in Figure 4C are also duplicated and re-labeled within the same figure (Allegation 42).

Allegation 41: In Figure 4C, most of the bands in Figure 4C of **Paper 21** with lanes 4-6 labeled "Fox-M1" are duplicated as Figure 3C in Paper 43 (**Reference #107**) but with columns 4-6 labeled "Notch-1". Only the top half of the CD44 band in Figure 4C from **Paper 21** is copied to Figure 3C in **Reference #107** (DIO4915 Image File C, slide 375).

Allegation 42: Also in Figure 4C, "... the five bands from the right in the Cyclin D1 and p65 panels are identical and all EpCAM bands are identical to the p65 bands but with lighter exposure." Several bands appear to be cut and pasted from different lanes, or at least show separation between lanes, but the lanes in the β-actin band in Figure 4C do not show the cuts or lane separation" (DIO4915 Image File C, slide 376).

RESPONSE

Dr. Sarkar's response to Allegation 41 was submitted in file "Bao-Response-2.docx" which Dr. Bao testified he helped prepare (Bao Transcript, p.74, ll.19-20). They wrote that: "I ran these two different experiments (FoxM1 and Notch-1) in one Western blot (please see the Lab Note# 2, page 17). All the data were from the original blot. There are no any [sic] cut and paste at all in Figure 4C and Figure 3C." This response also listed the names of several source .jpg files located in a drive named as: "p/Bin_FOLDER/bin/from computer/Western_scanning/A1_A4_11_10_2010/". The images from those files are included in file "Bao-Response-2.docx" and are shown in (DIO4915 Image File C, slides 377-378). Dr. Bao also testified that two experiments were run on a single Western gel, consistent with the Lab Book #2 (Bao Transcript, p.68, ll.8 to p.71, ll.25). Lab notebook Bao #2 appears to show a format for a Western blot of AsPC1 cells treated with genistein consistent with the published experiments in the two publications (Exhibit 02 DIO4915 Bao #2, p.9 & p.17; DIO4915 Image File C, slides 375-287).

Regarding Allegation 42, Dr. Sarkar wrote that "all the bands of Cyclin D1, p65, and EpCAM in Figure 4C were present as the original bands after scanning of the film (no re-grouping, pasting, or manipulation done). Some of the bands look like similar; but they are different as shown in the original pictures" (Response Letter-Final-Nov 27th-2012.pdf, p.24). The February, 2014 response, where Dr. Sarkar wrote that Dr. Bao ran two different experiments assaying effects of FoxM1 and Notch-1 in one Western blot, also addresses the allegation of band re-use and relabeling. Images submitted in response to Allegation 42 are shown in DIO4915 Image File C, slide 378. Partial information about these allegations was also

submitted in the "DataSubmittedWithFSInquiry" drive, specifically the "Bin Bao-Response 10-30-2012\bin Bao-response_supplement_slides.ppt" file.

Dr. Bao testified that he used powerpoint to manipulate the size of bands to make bands similar in the figure (Bao Transcript, p.115, ll.2-25). Dr. Bao said that the β-actin bands image was "from the different scan, but in order to show good picture, I just maybe just squash" the image (Bao Transcript, p.115, ll.22-25).

Dr. Sarkar concluded that "the data in figure 1C and 4C is correct, but we understand the inherent concern with the actin loading controls when putting together figures in this way... For Figure 4C, one could see clearly how the gels were put together to create the final figure without any manipulation. Since there is no error or mistakes, no further action would be required" (Response Letter-Final-Nov 27th-2012.pdf, p.24).

ANALYSIS:

See DIO4915 Image File C, slides 375-387.
Regarding Allegation 41, close visual examination of the images in Figure 4C (Paper 21) and 3C (Reference #107) showed substantial similarities (DIO4915 Image File C, slide 375), but the figures are judged not to be identical. The images provided by Dr. Sarkar in "Bao-Response-2.docx" are purported to show the original images from 12-lane Western blots (DIO4915 Image File C, slides 377-378). Source images are actually from the "P" share drive named:
"P_homes/boab/Bin_FOLDER/bin/from computer/Western_scanning/A1_A4_11_10_2010/" (see DIO4915 Image File C, slides 380-381). Close side-by-side comparisons of the images in those files and the published bands substantiate Dr. Sarkar's claim that the Notch and FoxM1 proteins were assayed on this single Western blot (see DIO4915 Image File C, slides 381-384). However, for some bands the images were manipulated. In Paper 21, the CD44, p65 and β-actin band images in Figure 4C were squeezed, and the p65 image was also rotated clockwise 1.5°. In Reference #107, the ZEB2, p65, CD44 and EpCAM images in Figure 3C were differentially squeezed vertically, and the β-actin band image was stretched horizontally. None of the original gels or scans of whole gels were found.

Lab notebook Bao #2 shows a study for a Western blot of AsPC1 cells treated with genistein (Exhibit 02 DIO4915 Bao #2, p.9 & p.17; DIO4915 Image File C, slides 385-386). Dr. Sarkar's response also referred to "pages 16-18, 25, 28, 29" (DIO4915 Image File C, slide 387). These lab book pages, purported to be the record of that experiment, were consistent with a design where single Westerns were used for both experiments, though there was insufficient information on those or adjoining pages to be convincing. Yet the pages referred to in "Lab Note# 2" (i.e., pp.17-18, 25, 28 & 29) in Exhibit 02 - DIO 4915 - Bao #2.pdf, adjacent pages appeared to show a loading key for Western blots that is consistent with Figure 4C in Paper 21 (and Figure 3C in Reference #107).

Regarding Allegation 42, the bands for the Cyclin D1, p65 panels and EpCAM bands in Figure 4C of Paper 21 appear to be substantially similar images, perhaps with different exposures or cropping (DIO4915 Image File C, slide 376). While it is feasible that the Cyclin D1 (top) and EpCAM image (bottom) are copied and cropped from different exposures of the p65 image (middle), the variations in lines, margin and edges evident in the enlarged images are sufficient to raise doubts about their being identical images.

Finally, there is no spacing between lanes in the β-actin bands of Figures 1C and 4C in Paper 21 and Figure 3C in Reference #107 as in other protein bands, and the β-actin band in Figure 3C in Reference #107 is stretched horizontally where the other protein bands are not.

CONCLUSION:

The Committee finds in **Allegations 41** and **42** that the bands in **Figure 4C** in **Paper 21** and **Figure 3C** in **Reference #107** are from different halves of the same Western blot. Most of the proteins assayed in the Notch-1- (Reference #107) and FoxM1 vector-transfected cells look quite similar because they are the same proteins. Some images were inappropriately manipulated to change band shape or orientation and may have mischaracterized the quality of the Western analyses. The differences in the β-actin bands compared to the other protein bands suggest these loading controls were unrelated to the Western blots that produced the other protein bands. Since Dr. Sarkar understands "the inherent concern with the actin loading controls," he essentially admits that the β-actins do not match the Westerns for the other proteins. This re-use of loading control bands images is consistent with a pattern of practice common in Dr. Sarkar's lab and about which Dr. Sarkar is well aware. However, in this instance, the Committee concludes that there is insufficient evidence that the manipulations of these images were meant to deceive or that they rise to the level of research misconduct.

Papers 22 & 23

Paper 22 (Reference #86) Bao, B., Wang, Z., Ali, S., Ahmad, A., Azmi, A.S., Sarkar, S.H., Banerjee, S., Kong, D., Li, Y., Thakur, S., Sarkar, F.H. Metformin inhibits cell proliferation, migration and invasion by attenuating CSC function mediated by deregulating miRNAs in pancreatic cancer cells. Cancer Prev Res, 5, 355-364, (2012)

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NIH Funding: 5R01CA131151, 3R01CA131151-02S1, and 5R01CA132794 (PI: Dr. Sarkar)
Other Funding: Puschelberg Foundation; Guido Foundation

Paper 23 (Reference #85) Bao, B., Ali, S., Banerjee, S., Wang, Z., Logna, F., Azmi, A.S., Kong, D., Ahmad, A., Li, Y., Padhye, S., Sarkar, F.H. Curcumin analogue CDF inhibits pancreatic tumor growth by switching on suppressor microRNAs and attenuating EZH2 expression. Cancer Res, 72, 335-345, (2012)

Publication History: Received June 29, 2011; revised October 12, 2011; accepted October 30, 2011; published online November 22, 2011.
NIH Funding: 5R01CA131151, 3R01CA131151-02S1, 5R01CA132794, and 1R01CA154321-01A1 (PI: Dr. Sarkar).
Other Funding: Puschelberg Foundation; Guido Foundation

Allegation 43: The same data have been utilized in two different papers, in Figure 6A of **Paper 22** and in Figure 5A of **Paper 23**, suggesting recycling of data. The β-actin load control data has been rotated horizontally between the two figures (DIO4915 Image File C, slide 389).

Note: The original allegation listed for Paper 23, Figure 4A instead of Figure 5A, the correct figure in question in Allegation 43. The Respondents addressed the correct figure, Figure 5A.

RESPONSE:

Dr. Sarkar wrote (Response Letter-Final-Nov 27th-2012, p.25) that "these two experiments ... were conducted at the same time (please see Lab note book# 2, pages 94, 95, 99) by sharing one control sample in the center lane of Western blot analysis (the left lane was miR-26 precursor and the right lane was miR-101 precursor) for the preparation of these two manuscripts. In order to keep the control sample in

the left consistent in paper#22, instead of the right side of the chart, so the picture was flipped. This is why the picture looks like upside down by misrepresentation of data. There is no recycling of these data in any other manuscripts; however, we should have clearly indicated this in the figure legend" (DIO4915 Image File C, slide 390). Dr. Sarkar cited "the locations of the files containing these original bands" as: "p/From fash drive 9-2012/from_8G_7_5_2012/from_old-file_5_25_2011/scanned/3_13_2011/scan0003.jpg."
The β-actin bands were referenced to files: "p/From fash drive 9-2012/from_8G_7_5_2012/from_old-file_5_25_2011/scanned/4_11_2011/2011-04 (Apr)/scan0001.jpg "p/From fash drive 9-2012/from_8G_7_5_2012/from_oldfile_5_25_2011/scanned/correction_9_2012/scan0014 EZH2.jpg, scan0004_EpCAM.jpg, and scan0003_actin.jpg."
Dr. Sarkar concluded that "there are no errors made in the two publications and it has been appropriately referenced..."
Similar information about files was submitted in February, 2014 in file "Bao-Response-1.docx."

ANALYSIS:

See DIO4915 Image File C, slides 388-392.
Evaluation of the published data shows that the EZH2 and β-actin bands are copied and flipped between the two publications (DIO4915 Image File C, slides 389 & 391). The responses give a plausible explanation for the duplication of what was the middle lane of a single blot (DIO4915 Image File C, slides 390-391). The cited source files are consistent with the explanation (DIO4915 Image File C, slide 391). The cited lab notebook pages, although difficult to follow, appear to be consistent with two transfections being done at the same time and assessing EZH2 in both experiments (DIO4915 Image File C, slide 392). (These analyses are the ones indicated above in Paper 10 regarding Allegations 22a and 22b.)

CONCLUSION:

The Committee finds, in **Allegation 43**, that the responses are sufficiently credible and the laboratory record sufficient to explain the re-use of certain bands in Figure 6A of **Paper 22** and Figure 5A of **Paper 23**, justifying the "recycling of data." The Committee concludes there is insufficient evidence of research misconduct in this instance.

Note: **Paper 24** is evaluated above together with Paper 1.

Paper 25 (Reference #046): Xia, J., Li, Y. [Youlian], Yang, Q., Mei, C., Chen, Z., Bao, B., Ahmad, A., Miele, L., Sarkar, F.H., Wang, Z. Arsenic trioxide inhibits cell growth and induces apoptosis through inactivation of notch signaling pathway in breast cancer. *Intern. J. Molecular Sci*, 13, 9627-9641 (2012).

Publication history: Received: May 30, 2012; Revised: July 15, 2012; Accepted: July 25, 2012; Published: August 2, 2012
NIH Funding: None
Other Funding: NSFC ("Natural Science Foundation of China:" 81172087); Natural Science Research key Project of Education Office of Anhui Province (KJ2012A196)

Allegation 45: In Figure 5D, lanes 1-4 for the Notch1 and NFkB bands are the same image duplicated, perhaps with slightly different exposures, but labeled for the different proteins. The 3 left lanes for the Notch1 and

NFkB bands (labeled as Control, siRNA Control & Notch1 siRNA) are duplicated and shifted to be the 3 right lanes for the Bcl-2 bands, and labeled "siRNA Control, Notch1 siRNA, and siRNA+As_2O_3", respectively. See DIO4915 Image File C, slide 395.

RESPONSE:

Dr. Sarkar wrote: "I would like to confirm and inform you that I am NOT responsible for the following allegation on Paper 25 ... because I am not the primary or the senior author..." (Response Letter (2nd)-Feb. 4th-2014, p.1).

Dr. Wang testified that about Paper 25 that he is "the senior author, but all experiments is done in China..." and that "... the Chinese university is investigating these papers," meaning "Paper 40 and Paper 25" (Wang Transcript, V.2, p.383, ll.3-13).

ANALYSIS:

See DIO4915 Image File C, slides 394-395.
As this work was apparently done in China, there was no access to original data or notebooks, nor did Dr. Wang provide any relevant materials. Dr. Wang acknowledges that he is the senior and corresponding author. Simple visual comparisons among rows in Figure 5D show clearly that lanes 1-4 for the Notch1 and NFκB bands are the same image, duplicated and re-labeled for the different proteins (DIO4915 Image File C, slide 395). The 3 left lanes for the image used for both the Notch1 and NFκB rows is also copied into the 3 right lanes of the third row where the bands are re-labeled "Bcl-2." In contrast to the 3 left lanes in the Notch1 and NFκB bands, where the lanes are labeled "Control," "siRNA Control" and "Notch1 siRNA", respectively, the same images in the 3 right lanes of the "Bcl-2" row are re-labeled "siRNA Control," "Notch1 siRNA," and "siRNA+As_2O_3," respectively.

CONCLUSION:

The Committee finds in **Allegation 45** that **Figure 5D** in **Paper 25** shows clear evidence of copying, re-arranging, and re-labeling the same data image within the figure. The Committee concludes that Dr. Sarkar, listed as a secondary author on Paper 25, had minimal if any role in this publication, and that he is not responsible for this research misconduct.

Paper 26 (Reference #83): Singh-Gupta V, Banerjee S, Yunker CK, Rakowski JT, Joiner MC, Konski AA, Sarkar FH, Hillman GG (2012) B-DIM impairs radiation-induced survival pathways independently of androgen receptor expression and augments radiation efficacy in prostate cancer. *Cancer Lett* **318**: 86-92.

Publication History: Received: October 10, 2011; Revision submitted: December 2, 2011; Accepted: December 3, 2011; E-pub: December 9, 2011; Published: May 1, 2012
NIH Funding: R01CA108535-06 (PI: F. H. Sarkar).
Other Funding: The Fund for Cancer Research; American Institute for Cancer Research (#10A108) (PI: G. G. Hillman)

Allegation 46: In Figure 3B, the same field of cells is used for two different treatment conditions, namely for the B-DIM and B-DIM+RAD conditions (DIO4915 Image File C, slide 397).

RESPONSE:

Dr. Sarkar wrote that as he is neither the first nor senior author, he is not responsible for the data presented in Paper 26 (Response Letter (2nd)-Feb. 4th-2014). Dr. Sarkar provided no further response. When asked about his collaboration with Dr. Hillman (the senior and corresponding author on Paper 26), Dr. Sarkar said that Dr. Hillman was fully responsible for the data in all papers on which she is the corresponding author and that the research was done entirely in her laboratory. Dr. Sarkar indicated that his contributions were limited to sharing his "scientific knowledge and many times, reagents" (Sarkar Transcript V.1, p.69).

Dr. Hillman testified about the experiment (Hillman Transcript V.1, p.30-39) and indicated all the data were generated in her laboratory. The experiment in Figure 3B was done by her postdoc, Dr. Vinita Singh-Gupta. In a subsequent email correspondence with the WSU RIO, Dr. Cunningham, Dr. Hillman wrote that after reviewing original data, she found that the same image in Figure 3B had been mislabeled as both B-DIM and B-DIM+RAD (email to Dr. Cunningham, 02/28/2013). She provided a .ppt file with 6 original images from this experiment ("AR Staining original Pictures all treatments - 2-28-14.pptx"), three of which are clearly sources of three of the four panels in Figure 3B: the "Con", "Rad" and "B-DIM" panels. In addition, the putatively 'correct' "B-DIM+Rad" image was included also. Dr. Hillman further provided a revised version of Figure 3B, which used a portion of the "B-DIM+Rad" image replacing the duplicated image ("Corrected Fig3. AR staining +WB+PSA for paper8.11.2011-modified 2-14-14.ppt"). She suggested that this could be sent to the journal as a correction.

ANALYSIS:

See DIO4915 Image File C, slides 396-399.
Drs. Sarkar and Banerjee are both co-authors on this paper. The Committee determined that Dr. Banerjee had minimal involvement with this work. This allegation was not addressed in either of Dr. Banerjee's two interviews with the Committee. As Dr. Sarkar and Dr. Hillman insist, this research was done entirely in Dr. Hillman's laboratory. The Committee had no access to original data beyond the images Dr. Hillman provided. Dr. Hillman indicated that the re-use of a same field of cells to represent two distinct conditions was due to a labeling mistake. However, analyses of the two images with the duplicated cells also show differences in their 'green' intensity suggesting a purposeful image manipulation (DIO4915 Image File C, slide 398-399). Differences in green fluorescence reflect intracellular androgen receptor distribution due to "B-DIM" versus "B-DIM+Rad" treatment conditions and so supports the published conclusion about B-DIM's interaction with radiation on AR expression and trafficking (cf., Paper 26, Abstract, p.86). Two different 'green' intensities in the same cells could result from different microscopy acquisition settings with the same field of view being shot twice. However, Dr. Hillman testified that the validity of this comparison requires images be acquired under identical conditions (e.g., equal exposure times; Hillman Transcript, V.1, p.35). Alternatively, the 'green' intensity could have been manipulated in photoshop by brightening the green channel of the acquired RGB image. The analysis is inconclusive.

CONCLUSION:

The Committee finds, in **Allegation 46**, regarding possible duplication and manipulation of images in **Figure 3B** of **Paper 26** that most likely the work was done under Dr. Hillman's oversight in her lab by Dr. Singh-Gupta. The duplication may be a mistake although the difference in green intensity between the copies for different treatment conditions suggests possible fabrication. The Committee concludes there is no evidence that Dr. Sarkar or Dr. Banerjee played a role in generating Figure 3B, or in any of the issues

raised by this allegation, and so there is no evidence of research misconduct by Dr. Sarkar or Dr. Banerjee in this instance.

Paper 27 (Reference #285): Levi, E., Mohammad, R., Kodali, U., Marciniak, D., Reddy, S., Abroukameel, A., Sarkar, F.H., Kucuk, O., Rishi, A.K., Majumdar, A.P.N. EGF-receptor related protein causes cell cycle arrest and induces apoptosis of colon cancer cells *in vitro* and *in vivo*. *Anticancer Research* **24**: 2885-2892 (2004).

Publication history: Received: March 30, 2004; Accepted: June 4, 2004
NIH Funding: NIH R01 AG14343 (PI: A.N. Majumdar)
Other Funding: Department of Veterans Affairs (VA Merit Review)
Note: This was published before the period under investigation.

Allegation 110: In Figure 5B (right side), comparing the 6-hour and the 24-hour alpha-tubulin panels, the images for alpha-tubulin appear to be identical. The same image cannot represent both time points.

RESPONSE:

Dr. Sarkar wrote: "I would like to confirm and inform you that I am NOT responsible for the following allegation on ... Paper 27... because I am not the primary or the senior author..." (Response Letter (2nd)-Feb. 4th-2014, p.1).

Dr. Majumdar, the senior and corresponding author, testified that the work was done a long time ago and that was done primarily in his lab and that Dr. Sarkar had little to do with the work (Majumdar Transcript, pp.22-28).

ANALYSIS:

See DIO4915 Image File C, slides 400-401.
Simple visual comparison appears to show the alpha-tubulin panel images are the same. Since the work was from another lab, there is information about sources (DIO4915 Image File C, slide 401). There is no evidence that Dr. Sarkar played a role in this experiment. Further, this paper was published before the period under investigation.

CONCLUSION:

The Committee finds in **Allegation 110** regarding **Figure 5B** in **Paper 27** that Dr. Sarkar, listed as a secondary author, had minimal if any role in this publication. Paper 27 was published before the period under investigation. The Committee made no determination of research of misconduct in this paper.

Paper 28 (Reference #270): Li Y., Kucuk, O., Hussain, M., Abrams, J., Cher, M.L., Sarkar, F.H. Antitumor and antimetastatic activities of docetaxel are enhanced by genistein through regulation of osteoprotegerin/receptor activator of Nuclear Factor-κB(RANK)/RANK ligand/MMP-9 signaling in prostate cancer. *Cancer Res*. 66(9): 4816-25 (2006)

Publication history: Received: October 17, 2005; Revised: January 9, 2006; Accepted: March 3, 2006.
NIH Funding: 5R01CA101870 & 5R01CA083695 (PI: F.H. Sarkar); 5R01DK067687 (PI: M.L. Cher)
Other Funding: Aventis Pharmaceuticals (PI: F.H. Sarkar)

Allegation 111: In Figure 3C, the left 8 lanes of the OPG bands appears to be assembled from multiple cut and pasted images whereas there is no cutting and pasting between the corresponding β-actin bands, suggesting fabrication of OPG panel or use of a control band not related to the OPG gels (DIO4915 Image File C, slide 403).

RESPONSE:

Dr. Sarkar wrote that "Allegation #111 is addressed under the folder Li" (Response Letter (2nd)-Feb. 4th-2014.docx, p.4). The submitted file stated "the OPG and actin were detected in different gel/blot because the molecular weights of these proteins are very close. The loading sequences of two gels were different. To make the sequences of samples same, the blot of OPG was regrouped according to the sequence of actin. We have similar results from repeated experiments as shown below although the background is high" (Li-Response\Allegation 111, p. 1), and that "The original files for Figure 3C: 1. PC3 Docetaxel Genistein OPG.jpg, 2. PC3 Docetaxel Genistein actin.jpg, 3. PC-3 Doc Gen OPG.jpg, 4. PC-3 Doc Gen actin.jpg" (Li-Response\ Allegation 111, p. 2; DIO4915 Image File C, slide 404).

Dr. Li also testified that the OPG and β-actin bands were run on different gels because the molecular size of OPG "is very close to actin" and: "... I think at that time when I load the sample, some samples switch. Some sample I load wrong ... wrong lane ... so I think maybe I copy/paste in there..." (Li Transcript, V.2, p.197, ll.6-25). Dr. Li testified that his lab notebooks were "sometimes it's not clear. It's not detailed. So later I think I had to write everything there. That's my problem last time" (Li Transcript, V.2, p.198, ll.19-22).

ANALYSIS:

See DIO4915 Image File C, slides 402-405.
The submitted images were reported to be "...similar results from repeated experiments" but the images themselves (DIO4915 Image File C, slides 404-405) were labeled "original scan for OPG" or "actin" and the files names submitted were called "original files." The submitted images do not match what was published and show different results, in particular that OPG lane 4 ("D" condition on Day 3) shows no or only trace staining whereas the published figure shows a clear blot. The Committee finds that whether they are original or repeated experiments done at a different date, the published findings are not verified. The files submitted as "original" were not referenced and were not found by the Committee. The explanation of separate blots because OPG and β-actin are similar molecular weights is uncertain because the reported weight of OPG is quite variable (19 to 120 kDa).

CONCLUSION:

The Committee finds, in **Allegation 111,** that **Figure 3C** in **Paper 28** shows clear evidence of pasting and composing bands, as was admitted in the response, and the white lines in the published figure do acknowledge this figure was a composition. However, there is no evidence that the scans submitted as "original" data are from the same experiment and the scans do not match what was published nor do they show the same results. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3C and that this constitutes research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Paper 29 (Reference #194): Wang, Z., Azmi, A.S., Ahmad, A., Banerjee, S., Wang, S., Sarkar, F.H., Mohammad, R. TW-37, a small-molecule inhibitor of Bcl-2, inhibits cell growth and induces apoptosis in pancreatic cancer: involvement of Notch-1 signaling pathway. *Cancer Res.* **69**(7):2757-65 (2009)

Publication history: Received: August 7, 2008; Revised: December 16, 2008; Accepted: January 8, 2009; Published online: March 24, 2009.
NIH Funding: R01CA109389 (PI: R.M. Mohammad); 5R01CA101870 (PI: F.H. Sarkar); U19CA113317 (PI: S. Wang).

Allegation 112: In the left panel of Figure 3A, there are indications of cutting and pasting in several bands, especially between lanes 3 and 4 for CDK4, CDK6 & Cyclin A, across the top of lanes 2 to 6 in Cyclin B1, and between lanes 4 and 5 of Cyclin E, all suggesting inappropriate manipulation of data. In the right panel of Figure 3A, the images in the β-actin lanes 3 and 6 appear identical which would be falsification since the lanes are of different cell types (DIO4915 Image File C, slides 407-408).

RESPONSE:

Dr. Sarkar wrote that "Allegation #112 and 113 is addressed under the folder Wang" (Response Letter (2nd)-Feb. 4th-2014.docx, p.4). The submitted file stated "We found the original films to show our results. It has no mistake. Beta-actin lanes 3 and 6 are different as can be seen. There are no errors as alleged" (Wang-Response-1.pptx, slide 28; DIO4915 Image File C, slide 409).

ANALYSIS:

See DIO4915 Image File C, slides 406-413.
The submitted images (DIO4915 Image File C, slide 409) reported to be originals appear to match the published blots for the bands labeled CDK4, CDK2, CDK6, Cyclin B1 and Cyclin E. No original scans were submitted for Cyclin A or β-actin. Some of the bands were flipped and re-sized apparently to keep the order and size of blots consistent, but no cutting and pasting was evident (DIO4915 Image File C, slide 410). The row of bands in the original scan just above the blots labeled Cyclin B1 was clearly masked or otherwise manipulated to obscure the blots in the published image (DIO4915 Image File C, slide 411). In the right panel of Figure 3A, close visual comparison reveals no evidence of cut marks around lanes 3 or 6 in the β-actin bands and, while similar, there may be small differences in the blots in lanes 3 and 6 (DIO4915 Image File C, slides 412-413). The response did not address the β-actin bands in the right panel of Figure 3A.

CONCLUSION:

The Committee finds in **Allegation 112** in **Paper 29** no evidence that the rows of bands in the left or right panels of **Figure 3A** had lanes that were cut and pasted as alleged. However, there is clear evidence that the Cyclin B1 Western blot was manipulated to hide by masking another row of bands above the published row. The Committee finds that this masking of bands is consistent with a pattern of practice common in Dr. Sarkar's laboratory and was wholly inappropriate and probably violated journal standards of conduct. However, the Committee determined that this was a so-called "cosmetic" manipulation and concludes, in this instance, that there is insufficient evidence that Dr. Sarkar knowingly or intentionally or recklessly misrepresented the research record.

Allegation 113: In Figure 4A, the Hey-1 band shows evidence of cutting and pasting between lanes 3 and 4 that is not clear in the β-actin band suggestion fabrication of data. Other lanes appear to have been blurred by masking the images (i.e., Notch-1 bands lanes 2, 3 & 6; Jagged-1 bands lane 5; and the top of the β-actin band across all lanes; DIO4915 Image File C, slide 414).

RESPONSE:

Dr. Sarkar wrote that "Allegation #112 and 113 is addressed under the folder Wang" (Response Letter (2nd)-Feb. 4th-2014.docx, p.4). The submitted file stated "We found all the original films to show our results. There are no errors as can be seen from these original images. Thus, no further action would be required" (Wang-Response-1.pptx, slide 29; DIO4915 Image File C, slide 415).

ANALYSIS:

See DIO4915 Image File C, slides 414-418.
The submitted images purported to be originals for Notch-1 and Hey-1 bands appear to match the published blots (DIO4915 Image File C, slide 416). There is no evidence of cutting and pasting in the Hey-1 bands. Close visual comparisons of the submitted and published Notch-1, Jagged-1 and β-actins bands reveals no clear evidence of masking or blurring of the images (DIO4915 Image File C, slide 416). No original scans were submitted for β-actin in Figure 4A. However, the image submitted in response for the Jagged-1 bands was a reversed image that is rotated, cut and pasted so that lanes 1-3 and lanes 4-6 are switched in the publication, apparently to keep the order of blots consistent (DIO4915 Image File C, slide 417). Even though there was cutting and pasting to re-order the lanes, there is no evidence in the published image that it was manipulated (DIO4915 Image File C, slide 418). The fact that the Jagged-1 bands were so composed as to hide cut marks raises concerns about how many other instances of fabrication and/or falsification were missed because of such skillful "photoshopping." The response does not mention the cutting and pasting and does not address the lack of concordance in lane spacing between β-actin and other bands.

CONCLUSION:

The Committee finds in **Allegation 113** in **Figure 4A** in **Paper 29** no evidence that the Notch-1 or Hey-1 lanes were cut and pasted. The Jagged-1 row, however, was extensively manipulated by re-arranging and rotating bands and disguising pasting to produce the published figure. The Committee finds that this manipulation of bands is consistent with a pattern of practice common in Dr. Sarkar's laboratory, probably violated journal standards of conduct, and raises concerns about the degree to which such manipulations may have been disguised here and elsewhere. However, the Committee determined that this was primarily a so-called "cosmetic" manipulation to re-arrange lane order and concludes that, in this instance, there is insufficient evidence that Dr. Sarkar knowingly or intentionally or recklessly misrepresented the research record.

Paper 30 (Reference #286): Ali, S., El-Rayes, B.F., Heilbrun, L.K., Sarkar, F.H., Ensley, J.F., Kucuk, O., Philip, P.A. Cytochrome P450 and glutathione transferase expression in squamous cell cancer. Clin Cancer Res. 10(13):4412-6 (2004)

Publication History: Received January 23, 2004; revised March 15, 2004; accepted April 1, 2004
NIH Funding: Cancer Center Grant P30 CA-22453 (PI/PD: Gerold Bepler)
NOTE: This paper was published before the period under investigation.

Allegation 114: In Figure 2, "vertical, straight changes" are seen indicating cutting and pasting in the p16 panel (between lanes 5 & 6 and 8 & 9) and in the β-actin band (between lanes 7 & 8)." Four p16 lanes – "H&N cells", "97-451 T", "99-237 T" & "99-270 T" – appear to be blurred out or masked. See DIO4915 Image File C, slide 420.

RESPONSE:

In the response of February, 2014, Dr. Sarkar wrote that "Three gels were run each with both positive control (Hela Cells) and negative control (head & neck cells) along with protein isolated from human tumor samples ... the expression of p16 of Hela cells is almost same and so is the negative expression of head & neck cells which itself serve as a control. Since they were run in three gels and instead of showing all three gels just one figure was put together with both positive and negative control. Equal loading of protein was performed to serve as actin control." Original autoradiograms images were included in the response. See DIO4915 Image File C, slide 421.

ANALYSIS:

See DIO4915 Image File C, slides 419-423.
The Committee finds that cutting and pasting are apparent and admitted in Figure 2 in the p16 and β-actin bands. The images in the scans of the 5 autoradiograms submitted as original data appear to be the sources of the published images. Scans of the original blots are also found in Exhibit 95.3 - Ali #1.pdf. See DIO4915 Image File C, slides 422-423. The blots in lanes 6, 7 & 8 were stretched vertically in the published figure. Also the published labels in lanes 6, 7 & 8 ("99-") do not match the original labels ("98-"), which is likely a transcription or typographical error.

The text of Paper 30 stated that "Fig. 2 demonstrates a representative immunoblot of p16 expression" (p.4414). The p16 lanes came from 3 blots (5, 3 & 2 lanes, respectively, left to right) and this accounts for the cut marks. Three lanes from tumors (i.e., "T" lanes) were not published ("535 T", "98-13 T" & "98-385 T") and it is not clear how the "representative" tumor lanes were selected for publication, or why the "neck" lanes ("N" lanes) were not when the "H & N" control blots were.

The labels for each p16 and β-actin lane correspond (after accounting for the typographical error). However, the β-actin lanes came from only 2 blots (7 lanes & 3 lanes, respectively, left to right), so it is unclear how the β-actin can serve as a proper loading control. Since the caption to Figure 2 stated that "β-actin expression was performed to ensure adequate loading of protein loading for quantification" it is also not known how quantification as "... densitometric measurements of protein bands relative to β-actin expression in each sample" (per caption to Table 4, p.4414) can be done when p16 and β-actin are assayed on different Western blots.

When asked if β-actin and p16 lanes should correspond, Ms. Ali testified "Yes. I have to look into the blot. I cannot comment on that" (Ali Transcript, V.2, p.238, ll.15-16), suggesting confusion. Regarding the allegation that some of the lanes appear to be blurred out, Ms. Ali testified "Yeah. It could be from a different blot, but it's--I can look into it and see if I can provide those blots". Ms. Ali's lab notebook from 1998 appears to have records of assays of head and neck tissue for this experiment (Exhibit 41 – DIO4915, Shadan VIII).

CONCLUSION:

Paper 30 was published outside the period under investigation and so there is no determination regarding research misconduct. However, **Allegation 114** was examined because it was made by an external complainant. There is no information about how so-called "representative" lanes were selected for publication. The Committee concludes that there was no blurring of lanes in **Figure 2** of **Reference #286**. The mislabeling of the tumor specimens indicates carelessness. There was some stretching of the images in lanes 6 to 8. There was cutting and pasting of images from multiple Western blots and the use of β-actin controls for loading and quantification from different blots was improper.

Paper 31 (Reference #216): Thakur A, Sun Y, Bollig A, Wu J, Biliran H, Banerjee S, Sarkar FH, Liao DJ. Anti-invasive and antimetastatic activities of ribosomal protein S6 kinase 4 in breast cancer cells. Clin Cancer Res. 2008 Jul 15;14(14):4427-36. DOI:10.1158/1078-0432.CCR-08-0458.

Publication History: Received: February 22, 2008; Accepted: February 23, 2008.
NIH Funding: R01CA100864 (PI: D.J. Liao).
Other Funding: Elsa U. Pardee Foundation (PI: A.Thakur); Susan G. Komen Breast Cancer Foundation grant BCTR02-01648 (PI: D.J. Liao).

Allegations 115: In Figure 1A, in the top panel (7-lane rows labeled RSK4, β-actin & c-Myc top to bottom), lanes 4 and 5 of the RSK4 row, and Lane 4 of the c-Myc row, appear pasted, suggesting fabrication. The top of lanes 1 to 3 of the c-Myc row appear to have been masked with an overlay, indicating fabrication.
In the middle right panel of Figure 1A (4-lane rows labeled RSK4, c-Myc & β-actin, top to bottom), the top of the RSK4 row, esp. lanes 1 and 2, appear masked, indicating fabrication.
In the bottom panel of Figure 1A (8-lane rows of RSK4 and Rb), lanes 1 to 4 for RSK4 appear pasted in (red box), and Rb lanes 1, 3, 5 and 7, the "C" lanes, appear to be masked indicating fabrication and/or falsification" (DIO4915 Image File C, slide 425).

Allegation 116: In Figure 5A, parts of lanes 3 through 6 of the RSK4 bands appear pasted in, and areas between lanes 3 & 4, 4 & 5, and 5 & 6, appear to have been masked. Lanes 5 & 6 for the MycER row also appear to have been masked, suggesting fabrication and/or falsification" (DIO4915 Image File C, slide 426).

RESPONSE:

Dr. Sarkar wrote that he had no responsibility for the allegations in this paper (Response Letter (2nd) – February 4, 2014, pp.1-4).

ANALYSES:

See DIO4915 Image File C, slides 424-426.
Simple visual comparisons within Figures 1A and 5A confirm that the panels in question have been cut and pasted or otherwise manipulated. Drs. Sarkar and Banerjee are listed as authors on this paper, but it is unclear what contribution they made to the publication. The Committee finds no evidence that either Dr. Sarkar or Dr. Banerjee contributed to Figures 1A or 5A. The only copy of the figures found on any of the sequestered lab computer drives was a .pdf file of the final published version of Paper 31.

CONCLUSION:

The Committee finds in **Allegations 115** and **116,** regarding **Figures 1A** and **5A**, respectively, in **Paper 31**, that there is insufficient evidence that Dr. Sarkar or Dr. Banerjee are responsible for either figure or any image manipulation indicated in these allegations. The Committee concludes that there is no research misconduct by Drs. Sarkar and Banerjee regarding Allegations 115 or 116.

Paper 32 (Reference #218): Wang, Z., Song, W., Aboukameel, A., Mohammad, M., Wang, G., Banerjee, S., Kang, D., Wang, S., Sarkar, F.H., Mohammad, R. TW-37, a small-molecule inhibitor of Bcl-2, inhibits cell growth and invasion in pancreatic cancer. Int J Cancer. 123(4):958-66 (2008)

Publication History: Received: July 7, 2007; Accepted after revision: March 11, 2008.
NIH Funding: R01CA-109389 (PI: F.H. Sarkar); 5R01CA101870 (PI: F.H. Sarkar); P30CA22453 (PI: G. Bepler); U19CA11317 (PI: Shaomeng Wang, University of Michigan)
Other Funding: Department of Defense Breast Cancer Program: BC0009140.
Note 1: "Conflict of Interest: University of Michigan has filed a patent on TW-37, which has been licensed by Ascenta Therapeutics Inc. University of Michigan and Dr. Shaomeng Wang own equity in Ascenta. Dr. Shaomeng Wang also serves as a consultant for Ascenta and is the principal investigator on a research contract from Ascenta to University of Michigan." Also, "Shaomeng Wang" (8th author) is not "Zhiwei Wang" (first author).
Note 2: There are also several Rb bands that are duplicated within Paper 3 and between other publications. Refer to Allegations 82 to 86, and 94. Paper 3 is also involved in Allegation 138 which is addressed under Reference #284.

Allegation 117: In Figure 3, in the Cyclin D1 and survivin bands, the right lanes (500μM) appear to be pasted in, suggesting fabrication (DIO4915 Image File C, slide 428).

RESPONSE:

Dr. Sarkar submitted a response to which Dr. Wang contributed. They wrote "We found the original films to show our results. It has no mistake. We have duplicated for Cyclin D1, showing TW37 inhibited Cyclin D1 expression. Thus, no further action would be required" (file: Wang-Response-1.pptx, p.30).

ANALYSIS:

See DIO4915 Image File C, slides 427-430.
A visual examination shows that there are clear cut marks between the 250 nM and 500nM lanes in Figure 3 (DIO4915 Image File C, slide 428). Simple comparison of images shows that lane 3 of the Cyclin D1 and Survivin bands published in Figure 3 of Paper 32 do not match what are purportedly "original films" submitted by Drs. Sarkar and Wang (DIO4915 Image File C, slides 429-430). Not only does lane 3 in each band not match the "original films," none of the other lanes in these bands match the scans submitted. Thus, the images submitted and claimed to be "originals" are not, and the images do not match the labels. There is no way to determine what experiment these bands may represent. None of the published bands match their corresponding lanes in the submitted "original films" (DIO4915 Image File C, slides 429-430). The response did not address the allegation that there was pasting of a band.

CONCLUSION:

The Committee finds, in **Allegation 117**, that lane 3 of the Cyclin D1 and survivin bands published in **Figure 3** of **Paper 32** are pasted in as evidenced by the cut marks. Further, these published Cyclin D1 and survivin bands do not match the "original films" submitted by Dr. Sarkar and Dr. Wang. Given the claims that they had submitted the "original films," the Committee concludes that Dr. Sarkar and Dr. Wang knowingly used images that were not from the experiment as claimed in their response. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar knowingly published fabricated and/or falsified data in Figure 3, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 132: Figure 4 from **Paper 3**, for the "ERRP" condition for the "PANC-1" cells panel (bottom right panel), is the same image rotated 90° counterclockwise as Figure 5B, labeled "Treatment" and captioned as "250 nM TW-37-treated cells," for the invasion assay in (right panel), in **Paper 32**. (DIO4915 Image File C, slide 431).

RESPONSE:

Dr. Sarkar concurred "absolutely" and fully agreed that the rotated image in Figure 4 from Paper 3 and from Figure 5B from Paper 32 are identical (Sarkar Transcript, V.1, p.224, ll.14-23), but he "... cannot explain how it ended up and why somebody would rotate the image ..." (Sarkar Transcript, V.1, p.225, ll.5-7). Dr. Sarkar said that he "...cannot even comprehend that someone will do it, but ... it must have happened ... [and] I need to find out from Wang, if he can find an explanation for it" (Sarkar Transcript, V.1, p.225, ll.13-18).

Dr. Wang testified that he agrees the images in Figure 4 in Paper 3 and Figure 5B in Paper 32 are the same photomicrograph (Wang Transcript, V.1, p.100, ll.3-7). He testified that he used the ERRP image in Paper 3 (from 2006) as "a positive control" for the TW-37 figure in 2008 (Wang Transcript, V.1, p.100, ll.15-22). Then he said it was a mistake that he used the ERRP image (Wang Transcript, V.1, p.101, ll.13). Then he said he used the ERRP image in the TW-37 publication because it had cells the same size (Wang Transcript, V.1, p.102, ll.2-21). Then Dr. Wang testified that he was using the ERRP image as a place holder but did not explain why he used a 2-year-old image when he also testified he had images from the then current, 2008 experiment (Wang Transcript, V.1, p.101, ll.13). Then Dr. Wang repeated that he was using the ERRP image "... in the computer to match the cell size" (Wang Transcript, V.1, p.103, ll.110 to p.104, ll.4). Dr. Wang then testified that he may have rotated the image 90^0 in the 2008 publication "to make easy to see" [sic] (Wang Transcript, V.1, p.104, ll.12 to p.105, ll.3), and then he also testified he "cannot remember" how he composed Figure 5B (Wang Transcript, V.1, p.105, ll.20-22), and then he also testified he "cannot remember" whether he rotated the image 90^0 or not (Wang Transcript, V.1, p.105, ll.23 to p.106, ll.2). Finally, in discussing what the correct original image looked like, Dr. Wang suggested that the camera and/or the magnification used was different than what was needed for the publication (Wang Transcript, V.1, p.107, ll.4 to p.109, ll.1).

Asked how it happened that the same images were re-used and re-labeled in two different publications, Dr. Wang testified it was because files are not labeled correctly and the laboratory record is not kept well, and that this is what happened in this case (Wang Transcript, V.2, p.322, ll.7 to p.323, ll.17). He said that poor recordkeeping was common in the lab, that Dr. Sarkar would at times review his lab notebooks, but not often, and that poor recordkeeping was the reason data were not accurate and mistakes happened (Wang Transcript, V.2, p.323, ll.18 to p.325, ll.17).

Dr. Sarkar and Dr. Wang wrote that "Figure 5B TW-37 is wrong. We found the invasion figure for TW-37 treated cells. This error could be corrected by sending erratum request to the journal" (Wang-Response-1.pptx, slide 33; DIO4915 Image File C, slide 433). There is no information provided to validate that the submitted image is authentic to the experiment in Paper 32.

ANALYSIS:

See DIO4915 Image File C, slides 431-433.
Simple visual comparison makes clear that the ERRP panel for PANC-1 cells in Figure 4 in Paper 3 in 2006 re-used, and manipulated (rotated), and re-labelled for TW-37-treated COLO-357 cells in Paper 32 in 2008 (DIO4915 Image File C, slides 431-432). The submitted image does not indicate where it came from, nor is any information provided with which it can be verified that this new photomicrograph is relevant to Paper 32 or Allegation 132. Dr. Wang clearly did these experiments and made the figures. He later tried to equivocate and said a Wen Song also did experiments in Paper 32, although he did not say what she did (Wang Transcript, V.2, pp.379-380). The repeatedly self-contradictory testimony by Wang makes it clear he has no reasonable explanation for why he did this duplication and manipulation and re-labeling. This is

also another instance of the practice, common in Dr. Sarkar's laboratory, of copying, manipulating and re-purposing images.

CONCLUSION:

The Committee finds, in **Allegation 132**, that there is obvious and admitted duplication and manipulation and re-labeling of Figure 4 from Paper 3 into **Figure 5B** in **Paper 32**. The Committee agrees with the explanation that poor lab records kept by Dr. Wang, and poor oversight of those records by Dr. Sarkar, contributed to the re-use of the image, but that does not excuse or explain the misconduct. The Committee concludes that Dr. Wang intentionally selected an older image that matched characteristics expected in the current results, and that he intentionally rotated the image 90° to disguise the re-use. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 5B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 138: Figure 1C in Wang, et al, Inter. J. Cancer 118, 1930–1936 (2006e) (**Reference #284**) appears to have been copied and progressively manipulated (resized, cropped, stretched and/or squeezed) and re-used repeatedly as Figure 6D in Wang, et al, Molecular Cancer Ther 5(3):483–93, 2006c, (Reference #277), and as Figure 4C in Wang, et al, Cancer 106:2503–13 2006b (Reference #272), and as Figure 1D in Wang, et al, Int J Cancer. 123(4):958-66 2008 (**Paper 32**).

Note: **Allegation 138** involves duplication of the same image in Paper 32 as well as in three other publications and it is addressed under Paper 68 (**Reference #284**).

Paper 33 (Reference #202): Singh-Gupta, V., Zhang, H., Banerjee, S., Kong, D., Raffoul, J.J., Sarkar, F.H., Hillman, G.G. Radiation-induced HIF-1a cell survival pathway is inhibited by soy isoflavones in prostate cancer cells. Int J Cancer. 124(7):1675-84 (2009)

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NIH Funding: 5R01CA108535-05 (PI: F.H. Sarkar)
Other Funding: American Cancer Society ROG-06-097-01 (PI: G.G. Hillman); Department of Defense: DMAD17-03-1-0042 (PI: F.H. Sarkar)

Allegation 118: The APE1/Ref-1 bands in Figures 4B (9 lanes), 4C (right 8 lanes) & 5A (9 lanes) are the same. The Rbs in Figures 4B and 5A are the same but different Rb bands are used in Figure 4C. However, two different Rb bands are used in Figures 4B and 4C, and they cannot both be the control band for APE1-Ref-1; DIO4915 Image File C, slide 435).

RESPONSE:

In a memo of February 4, 2014, Dr. Sarkar wrote that he was "*NOT responsible*" for Paper 33 because he was "not the primary or the senior author..." However, the work was supported by his NIH grant 5R01CA108535-05. When asked if being the PI on a grant that supports the work makes him responsible for the contents of a paper, Dr. Sarkar testified "It does, and it should be ... and if I have not responded well, then that is not fully accurate. So if data which has been used for my manuscripts, that goes in the grant, that means I am responsible for it" (Sarkar Transcript V.2, p.322, pp.15-23). Dr. Sarkar testified about collaborating with Dr. Hillman "... at different levels, intellectual level, scientific discussions, designing experimental strategies, hypothesis generation, and then the data generation which is done in her lab ...". He also said that "... anywhere she is a corresponding author everything is her responsibility,

and she did everything in her laboratory. I shared my scientific knowledge and many times reagents" (Sarkar Transcript, V.1, p.68, ll.21 to p.69, ll.4).

Dr. Gilda Hillman (corresponding author) testified that the results were "split" among the figures because "it was going to be a very large figure, and we split the figure in different figures but put the same control because it was from the same cellular extract that the Western blot were done" (Hillman Transcript, V.1, p.9, ll.20-24). She also testified that the editor of the *International Journal of Cancer* contacted her about the redundant images and was satisfied with the explanation but that they "... should have mentioned that in the figure legend" (Hillman Transcript, V.1, p.10, ll.9). Dr. Hillman said she thought the re-use of the images to be proper because this was the protocol Dr. Banerjee brought to Dr. Hillman's lab (Hillman Transcript, V.1, p.45, ll.11-14), but that the "... we should have mentioned that in the figure legend (Hillman Transcript, V.1, p.43, ll.6-7).

Dr. Singh-Gupta testified that Dr. Banerjee was "being in the lab" (Singh-Gupta Transcript, p.19, ll.8-9), but she also testified that "for Dr. Banerjee I can say he did not do any experiment in this paper" (Singh-Gupta Transcript, p.20, ll.24-25). In fact, Dr. Singh-Gupta stated she had objected to Dr. Banerjee being named an author "... but I was shut down, so I keep quiet" (Singh-Gupta Transcript, p.21, ll.3-5). Her "... objection was that he doesn't have contribution here. He did not do any experiment, so why his name is here. I can understand Dr. Sarkar is her collaborator. They put their grants together, but I did not understand Banerjee's name here..." (Singh-Gupta Transcript, p.21, ll.7-12).

ANALYSIS:

See DIO4915 Image File C, slides 434-435.
The Committee found clear duplication of the APE1/Ref-1 bands in Figures 4B, 4C and 5A, as well as the Rb bands in Figures 4B and 5A (DIO4915 Image File C, slide 435). The figure captions describe them as coming from the same extracts (Paper 33, pp.1681-1682) and in each figure the duplicated bands are used to control for different measures, including HIF-1α activity (Figure 4B), HIF-1α cytosol and HIF-1α nuclear expression (Figure 4C), and NF-κB activity (Figure 5A). However, the Rb bands in Figure 4C are different from the Rb bands in Figures 4B and 5A. Both bands cannot be the correct control band.

Dr. Sarkar's role in this paper is unclear. Dr. Hillman was emphatic that the collaboration, which she valued highly, did not include collecting data or generating figures in Dr. Sarkar's lab. She said that her lab "...learned some of the techniques from his lab, but everything was done in my lab under my supervision. So all the data which are published in my lab are data that the techniques were performed in the lab, the design of the experiment by done by me, and when I put that in figures and publication, I controlled everything. So I can for sure say what we did with the data in my lab. However, the collaboration with Dr. Sarkar was just exchange of ideas" (Hillman Transcript, V.1, p.7, ll.9-19).

Dr. Banerjee appears to have contributed to Dr. Hillman's laboratory, bringing in a new version of the EMSA assay and helping Dr. Singh-Gupta with a machine in Dr. Sarkar's lab, and advising on methods (Singh-Gupta Transcript, p.24, ll.1-25). Drs. Hillman and Singh-Gupta justified the use of the same Rb bands in Figures 4B and 5A because the extracts were the same. However, there was no justification for using a different Rb image in Figure 4C, even though the same APE1/Ref-1 bands were used in Figures 4B and 5A and 4C. Dr. Singh-Gupta testified it was "maybe" a mistake and that the image was actually β-actin and was mis-labeled "Rb": "It can't be the same ... I was having maybe actin here, and it is mis-labelled ... actin band mis-labelled..." (Singh-Gupta Transcript, p.59 ll.16-22).

CONCLUSION:

The Committee concludes, in **Allegation 118**, that the re-use of the APE1/Ref-1 band was probably justified but should have been noted clearly in **Paper 33**. The reasons why the Rb bands were re-used are

not clear and there is confusion over whether or not the Rb bands in Figure 4C were or should have been β-actin. The Committee concludes there was likely much more involvement of Dr. Banerjee, and maybe Dr. Kong, in generating data and figures than Dr. Hillman knows or admits, but it does not appear to be the case with this experiment. From Dr. Singh-Gupta's testimony, Dr. Banerjee seems not to have had a role in generating images and/or figures in Paper 33. There is little evidence that Dr. Sarkar had any role in constructing the figures in Paper 33. Issues of appropriate authorship among Dr. Sarkar's collaborators are evident in Paper 33. There is insufficient evidence to conclude that Dr. Sarkar, Dr. Banerjee, or Dr. Kong engaged in research misconduct in Paper 33.

Paper 34 (Reference #173): Jaiswal AS, Banerjee S, Panda H, Bulkin CD, Izumi T, Sarkar FH, Ostrov DA, Narayan S (2009) A novel inhibitor of DNA polymerase beta enhances the ability of temozolomide to impair the growth of colon cancer cells. *Mol Cancer Res* **7**: 1973-83.

Publication History: Received: July 31, 2009; Revised: October 21, 2009; Accepted: October 29, 2009; E-pub: December 8, 2009
NIH Funding: CA-097031 (PI: S. Narayan) and CA-100247 (PI: S. Narayan).

Allegation 119: At the bottom of Figure 2A, lane 2 and lanes 3 & 4 appear to be pasted in. In Figure 2B, there is a splice between lanes 3 and 4. For both Figures 2A and 2B, lane 1 appears to have been masked with an overlay. These manipulations indicate fabrication and/or falsification.

Allegation 120: The top of lane 1 in Figure 4A appears to be pasted-in and/or partially masked, indicating fabrication or falsification.

RESPONSE:

In his second response letter (Sarkar Response Letter (2nd); 02/04/2014), Dr. Sarkar indicated that he is neither first nor senior author and that he is therefore not responsible for any of the manuscript's data. He submitted no further response to these allegations.

ANALYSIS:

See DIO4915 Image File C, slides 436-438.
Drs. Sarkar and Banerjee are both co-authors on this paper, 2nd and 6th of 8, respectively. None of Dr. Sarkar's grants are noted as supporting the research in this publication, which appears to have been done primarily in the laboratory of a Dr. Narayan (corresponding author) at the University of Florida, Gainesville. The Committee had no access to original data. These allegations were not addressed in interviews with the Committee. A simple visual examination of Figures 2A, 2B and 4A shows what are apparently cut and splicing marks as alleged in the 3 images (DIO4915 Image File C, slides 437 & 438).

CONCLUSION:

The Committee finds, in **Allegations 119** and **120** regarding **Figures 2A, 2B** and **4A** in **Paper 34**, that there appears to be evidence of splicing together images. However, the Committee also finds that Drs. Sarkar and Banerjee likely had only minimal contributions, if any, to this work and that there is insufficient evidence of research misconduct by Dr. Sarkar or Dr. Banerjee in this publication regarding Allegations 119 and 120.

Note: Allegations 121 and **122** are addressed below under Paper 46 **(Reference #139.)**

Paper 35 (Reference #11): Wang, S., Wu, Y., Hou, Y., Guan, X., Castelvetere, M.P., Oblak, J.J., Banerjee, S., Filtz, T.M., Sarkar, F.H., Chen, X., Jena, B.P., Li, C. CXCR2 macromolecular complex in pancreatic cancer: A potential therapeutic target in tumor growth. *Transl Oncol* 6(2):216-225. (2013)

Publication History: Received January 17, 2013; Revised January 28, 2013; Accepted January 29, 2013; Published April, 2013
NIH Funding: None cited.
Note: The first author is Shuo Wang, not to be confused with Dr. Wang.
The corresponding author is Chunying Li, not to be confused with witness Yiwei Li.
Dr. Banerjee and Dr. Sarkar are coauthors.

Allegation 123: In Figure 2B of **Paper 35**, the image has vertical cut lines in background to the left of the last lane ("Input") for all 3 bands. The HPAC band also has a vertical line in background in lane 4. These cut and paste lines indicate that the image has been manipulated/fabricated.

RESPONSE:

Dr. Sarkar wrote that "Allegation #123 ... is NOT my publication" (Response Letter (2nd)-Feb. 4th-2014.doc, p.4).

ANALYSIS:

See DIO4915 Image File C, slides 439-440.
There are clear indications of cut marks in the far right column labeled "input" in all three sets of bands in Figure 2B, plus another cut just to the left of the first cut mark in the row of bands labeled "HPAC" (DIO4915 Image File C, slide 440). No other information is available.

CONCLUSION:

The Committee finds no evidence that Dr. Sarkar or Dr. Banerjee had any role in this publication and insufficient information to determine whether research misconduct occurred.

Paper 36 (Reference #191): Giri, B., Gomes, A., Sengupta, R., Banerjee, S., Nautiyal, Y., Sarkar, F.H., Majumdar, A.P.N. Curcumin synergizes the growth inhibitory properties of Indian toad (bufo melanostictus Schneider) skin-derived factor (BM-ANF1) in HCT-116 colon cancer cells. Anticancer Res 29(1):395-401 (2009)

Publication History: Received: July 10, 2008; Revised: September 1, 2008; Accepted: October 29, 2008
NIH Funding: None cited
Other Funding: Society for Experimental Biology and Medicine 'Young Scientist Mentoring Award 2007' (PI: B. Giri), Department of Veterans Affairs Merit Award (PI: A. Majumdar)

Allegation 124: In the Cyclin B panel of Figure 3A, there are eraser marks between lanes 2 and 3 and there is evidence of masking above lanes 1-3 (DIO4915 Image File C, slide 442).

Allegation 125: In the 'Bad' band of Figure 4, lanes 2-4 are duplicates of the images for lanes 2-4 of the β-actin band (flipped horizontal and squeezed vertical). Lane 2 of 'Bad' is lane 4 of β-actin, lane 3 is lane 3, and lane 4 of 'Bad' is lane 2 of β-actin (DIO4915 Image File C, slide 443).

Allegation 126: In Figure 5, at the top of lane 4 (the '+/+' condition), there is a horizontal cut/paste line and blurring/masking just above NF-κB band (DIO4915 Image File C, slide 444).

RESPONSE:

Paper 36 was among those publications about which Dr. Sarkar wrote he would not respond because he was not the corresponding author (Response Letter (2nd)-Feb. 4th-2014). Dr. Sarkar's grants are not listed as supporting this work. Dr. Majumdar is corresponding author for Paper 36 and Dr. Banerjee was a co-author. There was no response from Dr. Sarkar or Dr. Banerjee specifically regarding this paper. Dr. Majumdar testified that Western blots can come from his or Dr. Sarkar's lab depending on the project, and that papers dealing with colon cancer, came from his own (i.e., Dr. Majumdar's) lab (Majumdar Transcript, p.21, ll.7-14). Regarding what types of data came from Dr. Sarkar's lab during their collaborations, Dr. Majumdar testified that "... some of the methodologies, as I say, as EMSA assay, or supershift or ... gel shift analysis, definitely I would ask his lab to perform ..." (Majumdar Transcript, p.30, ll.19 to p.31, ll.7).

When asked if he worked with Dr. Majumdar, Dr. Banerjee had testified "...sometimes, whatever they had, because I know some of the things which they believe that I do very well, for example, EMSAs" (Banerjee Transcript, V.1, p.8, ll.4-8; see also p.53. ll.5-6). Dr. Banerjee also testified that "...one of the figures which was bothering me, I found it last night, related to Dr. Majumdar's-- ..." (Banerjee Transcript, V.1, p.95, ll.5-7) and that he had submitted a response (on a "flash drive") "... related to Dr. Majumdar's one paper. That was one EMSA ..." (Banerjee Transcript, V.1, p.101, ll.5-9). However, none of the files on the flash drive he submitted on July 17, 2014, pertain to Paper 36.

ANALYSIS:

See DIO4915 Image File C, slides 441-445.

For Figure 3A (Allegation 124), close examination shows that there are variations in pixilation about the outlined sections of the Cyclin B1 band, but there is no evidenced of erasure, masking or other manipulation (DIO4915 Image File C, slide 442). There is no evidence that Dr. Sarkar or anybody in his lab was involved in generating these data or Figure 3A.

For Figure 4 (Allegation 125), visual examination shows that the right 3 lanes of the bands labeled "Bad" and "β-actin" are manipulated duplicates of each other (DIO4915 Image File C, slide 443). There is no evidence that Dr. Sarkar or anybody in his lab was involved in generating these data or Figure 4.

For Figure 5 (Allegation 126), visual examination shows that there is a clear horizontal cut/paste line just above NF-κB band at the top of lane 4 (the '+/+' condition; DIO4915 Image File C, slides 444 & 445). It is unclear if any blurring or masking was done to Figure 5, or if the apparent cut line in lane 4 extends across other lanes, although this is a type of manipulation about which Dr. Sarkar and/or Dr. Banerjee had responded regarding Allegation 107, is done "... to reduce dead space (due to long running of the gel, the bands were moved up, without compromising integrity of the results" (Banerjee-Response.pptx, slide 12, dated: 2/5/2014). While it would be consistent with the testimonies of Dr. Majumdar and Dr. Banerjee to assume that Dr. Banerjee did the EMSA assay, there is insufficient evidence that he or Dr. Sarkar contributed to Figure 5 in Paper 36. No original data (films, images, etc.) were found for Paper 36. Paper 36 used colon cancer cells.

CONCLUSIONS:

The Committee concludes, regarding **Figure 3A** in **Paper 36**, there is insufficient evidence to support **Allegation 124**.

The Committee finds, in **Allegation 125**, that **Figure 4** includes two duplicated, manipulated and re-labeled bands and indicating fabrication and/or falsification of one or both of the "Bad" and "β-actin" bands in Figure 4 in **Paper 36**, however, there is no information indicating that Dr. Sarkar or Dr. Banerjee or anyone else in Dr. Sarkar's laboratory are responsible for research misconduct involving these data or this figure.

The Committee finds, in **Allegation 126**, that **Figure 5** in **Paper 36** was manipulated by cutting and splicing lane in 4, suggesting research misconduct. There is insufficient evidence, however, to conclude that Dr. Sarkar or Dr. Banerjee is responsible for these data or this figure.

Paper 37 (Reference #204): Solomon, L.A., Ali, S., Banerjee, S., Munkarah, A.R., Morris, R.T., Sarkar, F.H. Sensitization of ovarian cancer cells to cisplatin by genistein: the role of NF-kappaB. J Ovarian Res 1(1):9 (2009)

Publication History: Received: October 30, 2008; Accepted: November 24, 2008; Published: November 24, 2008

NIH Funding: None

Note: "Authors' contributions: LAS and SA collected data for the study and prepared the original manuscripts. SB carried out the supershift assay; ARM and RTM supervised the project. FHS directed the research. All authors approved the final manuscript."

Allegation 127: In Figure 3, the Survivin band in the upper A2780 panel, there are cut lines and pasted images in lanes 3 and 8, indicating possible fabrication and/or falsification of data. In both of the PARP bands in the lower C200 panel, all of the lanes appear to be cut, pasted and blurred images (DIO4915 Image File C, slide 447).

RESPONSE

Dr. Sarkar provided no response to Allegation 127.

ANALYSIS

See DIO4915 Image File C, slides 446-452.
Examination of the survivin band in the upper A2780 panel of Figure 3 shows what appear to be sharp edges indicating cut lines of images pasted into lanes 3 and 8 (DIO4915 Image File C, slide 448). The lanes in the PARP bands in the C200 panel do not appear to be pasted in (DIO4915 Image File C, slide 449), although the whole band is substantially blurred. This may be due to the focus of the initial image capture or due to manipulation with photoshop.

A file showing Figure 3 as published and named "Figure.3(western).jpg") is found on E:\Original Date\12\[NTFS]\Documents and Settings\alis\My Documents\leigh\Figures(paper)\Figure(jpegresub)\. See DIO4915 Image File C, slide 452.
Files with what appear to be images of scans of the original films that went into Figure 3 and matching the published bands are found on: E:\Original Date\12\[NTFS]\Documents and Settings\alis\My Documents\leigh. The matching source images with their specific files names are shown on DIO4915 Image File C, slides 450 (as individual bands) and slide 451 (as composites). The files were created from June to September, 2006. No original films or scans of the submitted images were found, nor are there labels on any of the images, so it is not possible to compare these .jpg files with films to determine whether pasting occurred or not.

However, the whole panels for the A2780 cells and the C200 cells were switched in the publication. All the "A2780" bands appear in Figure 3 labeled "C200" cells, and the reverse. Compare DIO4915 Image File

C, slide 447 to slide 452. Images for each cell type are found on E:\Original Date\12\[NTFS]\Documents and Settings\alis\My Documents\leigh, consistent with the original source files (DIO4915 Image File C, slides 450 & 451), but the panels are switched on the final version, file "Figure.3(western).jpg". These images are found in a directory identified as being used by Ms. Ali ("\alis"). Ms. Ali is not an author. A search of all the submitted Western blot film scans labeled for Ms. Ali (Exhibits 95.a through 96.k) found no images that match this experiment. Ms. Ali's lab notebook covering the dates the images were created (Exhibit 48 – DIO 4915 - Shadan XVI.pdf, pp.1-17ff; April to October, 2006) contained no reference to A2780 or C200 cells or this experiment. The record skips from July 3, 2006 (p.17) to November 14, 2006 (p.19). There are no lab books for "Solomon," first author of Paper 37.

According to the abstract of Paper 37, the A2780 cells are platinum-sensitive human epithelial ovarian cancer cells and the C200 cells are a platinum-resistant clone of A2780 cells. In the section of Paper 37 describing the effects of the drug combinations on apoptotic molecules in A2780 and C200 cells shown in Figure 3, the authors wrote that they "...found significantly increased PARP protein cleavage product (85 kDa fragment) after 72 h treatment in A2780 cells (Figure 3) ..." with the drug combinations, whereas "... in contrast, C200 cells treated similarly showed comparatively less intense cleaved PARP with combination treatment only." The panels as published in Figure 3 do not show this effect but the original labeled source images do. The authors wrote that "...expression of Bcl-2, Bcl-xL, survivin, and c-IAP1 proteins were significantly reduced [by the combined drug treatment] ... in both A2780 and C200 cells." This analysis shows that switching the A2780 and C200 panels in Figure 3 was likely a mistake with no intent to deceive.

CONCLUSIONS:

The Committee concludes, in **Allegation 127**, on the basis of available evidence that lanes 3 and 8 in the survivin band in the A2780 panel of **Figure 3** do show sharp edges but this is not clear evidence that the lanes were pasted in. The PARP bands in the C200 panel are blurred so there is no clear-cut evidence of cutting and pasting. There is insufficient evidence to determine if this constitutes research misconduct. However, the Committee finds it odd that the A2780 and C200 panels published in Figure 3 were switched. Since the switched panels show results opposite to the conclusions of the **Paper 37**, it unlikely this switch, which apparently occurred in final production of Figure 3, was intentional. This switching of panels and the failure by all authors to detect the reversal of results when writing the manuscript – when "all authors approved the final manuscript" – reflects a consistent pattern of poor attention to detail by Dr. Sarkar and his co-authors regarding figures. The Committee concludes, however, there is insufficient evidence of research misconduct in Paper 37, although the significant error discovered in the scientific record should be corrected.

Paper 38 (Reference #271): Raffoul, J.J., Wang, Y., Kucuk, O., Forman, J.D., Sarkar, F.H., Hillman, G.G. Genistein inhibits radiation-induced activation of NF-κB in prostate cancer cells promoting apoptosis and G2/M cell cycle arrest. BMC Cancer 26(6):107- (2006)

Publication History: Received: February 2, 2006; Accepted: April 26, 2006; Published: April 26, 2006

NIH Funding: None cited

Other Funding: American Institute for Cancer Research (grant 03B108 to GGH)

Allegation 128: In Figure 5A (top), the blot in lane 3 (Rad) appears to be pasted in, and lane 4 (Gen + Rad) appears to have been masked over. In Figure 5B, all lanes in the cleaved PARP band are constructed of pasted in images, and lane 1 (Con) also appears to have been masked.

RESPONSE:

Dr. Sarkar provided no response for Paper 38 since he was not the corresponding author: "Allegation #128 is NOT my publication" (Response Letter (2nd)-Feb. 4th-2014). Dr. Sarkar's grants are not listed as supporting this work. Dr. Hillman is corresponding author.

When asked about cutting and pasting, Dr. Hillman testified "... it has happened sometimes that some--the loading was not--was done in one direction and they had to reverse it, but you know, usually those were run on one gel, and I don't recall much cutting and pasting, frankly" (Hillman Transcript, V.1, p.89, ll.11-15). She said she thought Dr. Raffoul (first author) may have cut and pasted lanes (Hillman Transcript, V.1, p.88, ll.20 to p.94, ll.1). Dr. Hillman wrote that she discussed Figure 5 with Dr. Raffoul who said "... he had loaded the samples in a different sequence as Control, Genistein, Gen+Rad and Rad. In order to show a better flow of the data, he reorganized the bands in the sequence published ... so he did cut the Rad band and placed it after Genistein" (cf., Raffoul BMC Cancer 2006.docx). Dr. Hillman also testified that the Rb bands were the same in Figures 5A and 5B because they were from the same extract (Hillman Transcript, V.1, p.91, ll.6 to p.92, ll.19).

ANALYSIS:

See DIO4915 Image File C, slides 453-455.
There are cut lines in Figures 5A and 5B which Dr. Hillman admitted was to re-arrange lanes (DIO4915 Image File C, slide 454). Original films that might validate that the cutting was just to reorganize lanes of data from the same gel were not found. The Rb bands are the same in Figure 5A and Figure 5B. There is no evidence Dr. Sarkar had any role in generating the data or figures for Paper 38. There is evidence, in comparing the pixilation across the bands in the cleaved PARP and Rb bands, that the control lane (lane 1) in Figure 5B was altered by blurring to mask or erase and effectively lighten parts of the blot (DIO4915 Image File C, slide 455).

CONCLUSIONS:

There is evidence of cutting and pasting, which may be simply re-arranging lanes or indicate falsification and/or fabrication in Figure 5A. There is evidence of masking the control blot in Figure 5B. However, the Committee concludes that these manipulations appear to have been "cosmetic" and that there is no evidence that Dr. Sarkar contributed to Paper 38 in any substantive manner, although he is an author. There is no evidence that Dr. Sarkar conducted any research misconduct in association with this publication.

Paper 39 (Reference #198): Ali, S., Varghese, L., Pereira, L., Tulunay-Ugur, O.E., Kucuk, O., Carey, T.E., Wolf, G.T., Sarkar, F.H. Sensitization of squamous cell carcinoma to cisplatin induced killing by natural agents. Cancer Letters 278 (2009) 201–209

Publication History: Received: November 5, 2008; Revision received: January 5, 2009; Accepted: January 6, 2009
NIH Funding: None

Allegation 129: In Figure 5, the left 2 and 4 lanes of the lower PARP bands for the ME-180PT and UMSCC-5 panels, respectively, appear to have been masked by an overlay, and the right 2 lanes of the survivin band in

the UMSCC-5 panel are pasted in, indicating data fabrication or falsification. See DIO4915 Image File C, slide 457.

RESPONSE:

In February, 2014, Dr. Sarkar responded in file "Shadan-Response.docx" (p.25) which included images of scanned films (DIO4915 Image File C, slide 458). For the PARP bands, Dr. Sarkar wrote "... there was no expression of protein in the first two lanes of ME-180 PT and in the first 4 lanes of UMSCC-5 which is very common in PARP cleavage product." For the survivin band, Dr. Sarkar wrote that "... the order of gel run in UMSCC-5 was different than the published figure, therefore the bands had to be moved to fit the rest of the figure." Dr. Sarkar and Ms. Ali submitted scans of films from another experiment that was "... done around the same time" (Ali Transcript, V.3, p.360, ll.23; DIO4915 Image File C, slide 458). About the images in file "Shadan-Response.docx" Dr. Sarkar wrote that "... the results are from duplicate autoradiogram."
Ms. Ali testified that the second author, Lalee Varghese, "a visiting person...", "... did most of the Westerns" for Figure 5 (Ali Transcript, V.3, p.358, ll.22 & ll.19), and that both of them composed the final published figure (Ali Transcript, V.3, p.359, ll.2-6). Ms. Ali also testified that the survivin bands were cut and pasted from the same gel to make the order of the lanes the same as other figures, but that the images were not otherwise manipulated (cf, Ali Transcript, V.3, p.360, ll.9-16).

ANALYSIS:

See DIO4915 Image File C, slides 456-465.
Examination of Figure 5 in Paper 39 (Reference #198) shows that for the lower PARP bands in both the ME-180PT and the UMSCC-5 panels, there appear to be differences in pixilation patterns where there are no visible lanes, but it is unclear if this is due to manipulation (DIO4915 Image File C, slides 459-460). The two bands just to the right of each "empty" area appear to be cropped and/or pasted in. No relevant films or files with scans were submitted or found with original data so that confirming the testimony about masking or lane rearrangement is not possible. No references were provided to the images that were submitted. No record of this experiment was found in Ms. Ali's lab notebooks. The results from what are called "duplicate autoradiograms" (DIO4915 Image File C, slides 458 & 461), claimed to show that "the overall conclusion remains same," do not address concerns about how Figure 5 was constructed and from what experiments.

Examination of the survivin bands in the UMSCC-5 panel in Figure 5 confirms the response and testimony that lanes were cut and pasted in (DIO4915 Image File C, slide 461). The purported "duplicate" scan shows considerable similarity between all published lanes and the lanes in the scan, but in a different order and with different labels (DIO4915 Image File C, slides 462-465). In fact, the so-called "duplicate" scan is not from another experiment "... done around the same time" but is indeed the source of the highly manipulated and re-labeled published bands:

The band published as "control" in lane 1 is actually the band submitted in lane 3 and labeled "G25" for "G2535" and which was flipped horizontally, stretched vertically and horizontally, and with contrast enhanced.

The bands in lane 2 in both the published figure and the submitted scan are labeled "Cis." However, the band published as "Cis" in lane 2 is actually the band submitted in lane 1 and labeled "C" for "control" and which was flipped horizontally, stretched vertically and horizontally, and with contrast enhanced.

Direct visual comparison of the published "B-DIM" band in lane 3 and the band labeled "BD" in lane 7 of the submitted scan shows them to be the same image, although the B-DIM band in the scan

is flipped horizontally, stretched vertically and horizontally, and rotated 19º CW to appear in the orientation shown for the B-DIM in the published figure (DIO4915 Image File C, slide 462-463).

Direct visual comparison of lanes 4 and 5 in the submitted scan show that they were flipped left-to-right in the published Figure 5, which reversed the labeling (DIO4915 Image File C, slide 465). The band published as "G2535" in lane 4 is actually the band submitted in lane 2 and labeled "Cis" and which was flipped horizontally, stretched vertically, and with contrast enhanced. The band published as "Cis+G2535" in lane 5 is actually the band submitted in lane 4 and labeled "C+B" for "Cis+B-DIM" and which was flipped horizontally.

The band published as "Cis+B-DIM" in lane 6 is actually the band submitted in lane 5 and labeled "C+G" for "Cis+G2535" and which was flipped horizontally.

Lane 6 from the submitted scan is blank and was excised and not published.

All these re-arrangements, manipulations and re-labelings are summarized here in **TABLE 1:**

Submitted Scan				As Published		
Lane	Label	Condition		Lane	Re-labeled	Manipulation
1	"C"	Control	→	2	"Cis 1μM"	flipped horizontal, stretched vertical & horizontal, contrast enhanced
2	"Cis"	Cis	→	4	"G2535 25μM"	flipped horizontal, stretched vertical, contrast enhanced.
3	"G25"	G2535	→	1	"Control"	flipped horizontal, stretched vertical & horizontal, contrast enhanced
4	"C+B"	Cis+B-DIM	→	5	"Cis+G2535"	flipped horizontal
5	"C+G"	Cis+G2535	→	6	"Cis+B-DIM"	flipped horizontal
6	<blank>					
7	"BD"	B-DIM	→	3	"B-DIM 25μM"	flipped horizontal, stretched vertical & horizontal, rotated 19º CW

This analysis shows clearly that the published bands are derived from the scan submitted by Dr. Sarkar and Ms. Ali as a duplicate, but the published blots bear no meaningful relationship or resemblance to the submitted blots because of the re-labeling and manipulations. In contrast to Dr. Sarkar's and Ms. Ali's responses, the re-arranged bands, and the flipping, stretching and enhancing of blots, and the re-labeling of lanes demonstrates that the published figure is a complete fabrication. While Dr. Sarkar argued that this was an innocuous re-ordering of bands, this is wholly inconsistent with the data and with the response.

CONCLUSIONS

There is insufficient evidence to determine whether or not the published PARP bands were manipulated.

The Committee finds, in **Allegation 129**, that the survivin lanes in the UMSCC-5 panel of **Figure 5** in **Paper 39** (Reference #198) were deliberately cut and pasted and re-arranged and manipulated and re-labeled. The Committee finds that while Dr. Sarkar and Ms. Ali admitted to cutting and pasting to rearrange lanes, the manipulation was not limited to re-ordering of lanes and was not innocuous, as claimed. The Committee finds that the submitted scan was the original source of the images and that by calling the submitted scan a "duplicate autoradiogram" from a similar experiment at the same time, Dr. Sarkar may have been trying to conceal the manipulations and hide the fact that the submitted scan was the source of all the bands in Figure 5. If Dr. Sarkar did not know that scan he submitted as evidence was indeed the data he had published, then this would indicate an extraordinary disregard for the quality of the research and the integrity of his data. In either case, whether a failure to know what he had published or an intentional deception in mis-identifying original data, Dr. Sarkar misrepresented the research in responses

to the Committee. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5, and that in each instance this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 40 (Reference #291): Ma J, Zhang Q, Chen S, Fang B, Yang Q, Chen C, Miele L, Sarkar FH, Xia J, Wang Z (2013) Mitochondrial dysfunction promotes breast cancer cell migration and invasion through HIF1α accumulation via increased production of reactive oxygen species. *PLoS One* 8: e69485.

Publication History: Received 03/15/2013; accepted 06/10/2013; published 07/29/2013
NIH Funding: None
Other Funding: National Natural Science Foundation of China (81172087); Anhui Province College Excellent Young Talents Fund (2011SQRL084); Natural Science Research key Project of Education Office of Anhui Province (KJ2012A196). The PI is not indicated.

Allegation 130: "In Figure 5B, lane 1 of the β-actin bands (labeled "4T1 cells") is the same image used in Figure 6B for lane 1 of the β-actin bands (re-labeled "A clone"). Lane 2 of the β-actin bands in Figure 5B (labeled "C clone") is the same image as lane 2 of the β-actin band in Figure 6B (re-labeled "A clone shRNA). Lane 5 of the β-actin band in Figure 5B (labeled "D clone +NAC") is the same image as lane 1 of the HIF-1 band in Figure 6B (re-labeled "A clone). These duplications and re-labelings indicate data falsification. In Figure 5B, there is also a cut mark between lanes 1 and 2 in the Hypoxic HIF-1α band indicating pasting."

Allegation 135: "In Figure 2A, the panel labeled "A Clone+NAC" is a stretched re-use of the image in the Figure 6D panel labeled "A Clone". In Figure 4C, the panel labeled "Mito-TEMPO" is a smaller re-use of the image in Figure 6D panel labeled "A Clone shRNA". In Figure 4D, the panel labeled "Control" is a differently cropped and smaller version of part of the same image re-used in the Figure 6C panel labeled "A Clone". These duplications and re-labelings indicate plagiarism and data fabrication and/or falsification."

RESPONSE:

Dr. Sarkar wrote (Response Letter (2nd)-Feb. 4th-2014.docx) that since he is "... not the primary or the senior author" that he is "... NOT responsible" for the data in Paper 40. He provides no response to these two allegations.

Dr. Wang testified that this work was done in China and that he played only a peripheral role, indicating that he "just wrote the paper" and that "the first author from China [Jia Ma] did all the experiments and figures" (Wang Transcript V.2, pp.318-320; pp.383-385). Further, he indicated that the alleged instances of misconduct likely represented mistakes, incurred during the rush to publish. While Dr. Wang claims only a peripheral role, he acknowledged that he is the corresponding author.

ANALYSIS:

See DIO4915 Image File C, slides 466-470.
As this work was done in China, there was no access to original data or notebooks, nor did Dr. Wang provide any relevant materials. As corresponding author, Dr. Wang does bear substantial responsibility. Nonetheless, a simple visual examination of the published figures shows clear evidence of re-used, manipulation and re-labeling of data in Figures 2A, 5B and 6B of Paper 40.

Allegation 130: Simple visual comparison shows that the 2 bands in the β-actin row in Figure 6B are identical to lanes 1 and 2 in the 5-lane β-actin bands image in Figure 5B (DIO4915 Image File C, slides 467-468). There is no legitimate reason to duplicate these images since the figures depict different experiments, originating from different cells and different treatment conditions. In contrast to lanes 1 and 2 of Figure 5B, which compare basal expression of proteins in 4T1 breast cancer cells with expression in the 4T1-derived, rotenone-resistant C clone, Figure 6B compares HIF-1α expression with or without HIF-1α shRNA treatment in the SKBR3-derived, rotenone-resistant A clone (DIO4915 Image File C, slide 468).

Allegation 135: Simple visual comparison shows three instances where images in different figures show identical or overlapping fields of cells reused, manipulated and re-labeled to represent different treatment conditions in different experiments (DIO4915 Image File C, slide 469).

In the first instance, the same field of cells is re-used for the "A Clone + NAC" condition in Figure 2A and for the "A clone" condition of Figure 6D (DIO4915 Image File C, slide 470, left side). The image in Figure 2A image is stretched horizontally to Figure 6D. In contrast to Figure 2A which is presented as the results of N-acetyl cysteine treatment on cell *migration*, in Figure 6D, the identical image is re-used as the untreated control in a cell *invasion* assay: different assay (migration vs. invasion) and different (untreated vs. N-acetyl cysteine treated).

In the second instance, another field of cells in Figure 4C labeled "Mito-TEMPO" is copied and re-labeled "A clone shRNA" in Figure 6D (DIO4915 Image File C, slide 470, middle). In contrast to Figure 4C where the image is presented as a cell *migration*, assay, the re-use in Figure 6D is presented as effects of HIF-1α shRNA pretreatment on cell *invasion*: again different assays and different treatments.

In the third instance, another pair of clearly overlapping images of the same field of cells are used to represent both a "control" image, in Figure 4D, and the "A clone" image in Figure 6C (DIO4915 Image File C, slide 470, right side). In contrast to Figure 4D, which is presented as the results of an invasion assay, the image in Figure 4D is presented as a migration assay.

CONCLUSION:

The Committee finds in **Allegation 130** and **Allegation 135** in **Paper 40** clear evidence of copying, re-cropping, re-sizing and re-labeling data images between **Figures 5B and 6B, Figures 2A and 6D, Figures 4C and 4D,** and **Figures 4D and 6C** in systematic ways that are highly unlikely to be simple mistakes. The Committee concludes that Dr. Sarkar, listed as a secondary author on Paper 40, had minimal if any role in this publication and there is insufficient evidence that he is responsible for this research misconduct.

Paper 41 (Reference #292): Li, Y., Ahmed, F., Ali, S., Philip, P.A., Kucuk, O., Sarkar, F.H. Inactivation of Nuclear Factor κB soy isoflavone genistein contributes to increased apoptosis induced by chemotherapeutic agents in human cancer cells. Cancer Res 65(15): 6934-6942 (2005).

Publication History: Received: December 28, 2004; Revised: March 9, 2005; Accepted: May 10, 2005.

NIH Funding: 5R01CA101870 (PI: F.H. Sarkar); 5R01CA083695 (subcontract from University of Texas SPORE grant - 5P20-CA101936; PI: J. Abbruzzese)

Other Funding: Aventis Pharmaceuticals (PI: F.H. Sarkar).

Allegation 131: The NF-κB supershift assay image from Figure 4E in **Paper 41** (Reference #292) was progressively manipulated and duplicated in three subsequent publications: Figure 2B in Wang, Z., et al.,

(2006d) (Paper 65; **Reference #278**), and Figure 4C in Rahman, et al., (2006) (Paper 59; **Reference #257)**, and Figure 5A in Wang, et al, (2007) (Paper 55; **Reference #231**), suggesting plagiarism and/or falsification.

The three other papers are, in order of publication date:

Paper 65 (**Reference #278**): Wang, Z., Banerjee, S., Li, Y., Rahman, K.M.W., Zhang, Y., Sarkar, F.H. Down-regulation of Notch-1 inhibits invasion by inactivation of nuclear factor-κB, vascular endothelial growth factor, and matrix metalloproteinase-9 in pancreatic cancer cells. Cancer Res 66(5): 2778-84 (2006d)

Publication History: Received: November 30, 2005; Revised: December 22, 2005; Accepted: December 28, 2005.

NIH Funding: 5R01CA101870 (PI: F.H. Sarkar); 5R01CA083695 (PI: F.H. Sarkar, subcontract award from University of Texas M.D. Anderson Cancer Center; SPORE grant - 5P20-CA101936; PI: J. Abbruzzese)

Paper 59 (**Reference #257**): Rahman, K.M.W., Sarkar, F.H., Banerjee, S., Wang, Z., Liao, D.J., Hong, X., Sarkar, N.H. Therapeutic intervention of experimental breast cancer bone metastasis by indole-3-carbinol in SCID-human mouse model. Mol Cancer Ther 5: 2747-2756 (2006)

Publication History: Received: April 21, 2006; Revised: August 9, 2006; Accepted: September 11, 2006.

DoD Funding: W81XWH-04-1-0689 and W81XWH-05-1-0505 (PI: W. Rahman)

Paper 55 (**Reference #231**): Wang, Z., Kong, D., Banerjee, S., Li, Y., Adsay, N.V., Abbruzzese, J., Sarkar, F.H. Down-regulation of platelet-derived growth factor-D inhibits cell growth and angiogenesis through inactivation of Notch-1 and Nuclear Factor-κB signaling. Cancer Res 67:11377-11385 (2007b)

Publication History: Received: July 23, 2007; Revised: September 13, 2007; Accepted: October 5, 2007.

NIH Funding: 5R01 CA101870-05 (PI: F.H.Sarkar); 1P20 CA010193-01 (University of Texas M. D. Anderson Cancer Center Specialized Program of Research Excellence; PI: J. Abbruzzese)

Other Funding: Puschelberg Foundation (PI: F.H. Sarkar).

Note: "Z. Wang and D. Kong contributed equally to this work."

RESPONSE:

In his response of February, 2014, Dr. Sarkar wrote that "the image of Figure 4E in this paper showed that the NF-κB band is specific, demonstrating that our EMSA experiment technically works very well ... Afterward, Dr. Wang and Dr. Rahman used this image as technical control in their papers and just showed the EMSA technique in our Lab proven to be successful." Dr. Sarkar said he "should have been more vigilant..." and that he "...did not wear that investigative eye when ... looking into the composite figure..." and also that he thought "... each of these persons had done their own control as a super shift."

Dr. Li testified that he generated the original image, that he did not know it had been re-used in subsequent publications, even when he was a co-author on one of the three other publications. He stated that he never manipulated the image, and that he did not know who did (Li Transcript, V.1, p.150, ll.23 to p.158, ll.8). In contradiction, Dr. Wang said that he [Dr. Wang] "...ask him [Dr. Li] to give me this image to use. He agreed to..." (Wang Transcript, V.1, p.139, ll. 25 to p.140, ll.1). Dr. Li said his image should have been cited (Li Transcript V.2, p.164, ll.20 to p.167, ll.19). Dr. Wang (Wang Transcript, V.1, p.135, ll. 13 to p.136, ll.2) said that "we all ever use this one for--to show the working--the system is working..." and that

is was the practice of Dr. Sarkar's lab to re-use the same image (cf, Wang Transcript, V.1, p.135, ll. 13 to p.138, ll.6).

Dr. Banerjee testified that he was not aware that the same figure was re-used in three papers and manipulated. He testified that he had done supershift assays but not for these papers (Banerjee Transcript, V.2, p.566, ll.24 to p.567, ll.8). Like others, he testified that the supershift assay "... is to show that your system is working" (Banerjee Transcript, V.2, p.568, ll.9-10). Dr. Banerjee testified he did not do these assays, had no role in making the figures, did not know the image was being re-used, and had not noticed either the duplication or the use of an Rb control band (which he did not use for supershift assays) when he reviewed the manuscript as an author (Banerjee Transcript, V.2, p.568, ll.12 to p.573, ll.4).

Dr. Wang testified that "this image only show people our system is working, so that's why we use this same image for multiple papers" (Wang Transcript, V.1, p.137, ll.4-6). Dr. Wang said "... we used this one to show that this one is working, is fine, yeah" (Wang Transcript, V.1, p.137, ll.15-17), and that the "whole lab" uses the same image (Wang Transcript, V.1, p.138, ll.7). Dr. Wang testified that "Yes. This one we--we knew we used this one multiple times, yes" (Wang Transcript, V.2, p.332, ll.20-21). In his first interview, Dr. Wang did not answer a question about how an image published in 2005 can show that the EMSA assay was working in 2006 or 2007, but later he testified that that was what he did (Wang Transcript, V.2, p.333, ll.3-7). When asked why he changed how the figure looked, Wang testified it was because sometimes the figure size needed to be bigger or smaller for a journal (cf, Wang Transcript, V.2, p.333, ll.11-16).

ANALYSIS:

See DIO4915 Image File C, slides 471-477.
A simple visual comparison of the 4 images of the NF-κB EMSA supershift assays, and the order in which these works were published, shows clearly that the apparently original image from Figure 4E in Paper 41 in 2005 was manipulated and duplicated progressively in Figure 2B in Reference #278 in 2006, and then in Figure 4C in Reference #157 in 2006, and then again in Figure 5A in Reference #231 in 2007 (DIO4915 Image File C, slides 473-476), with cropping and stretching and squeezing and blurring the copied images, effectively disguising the re-use of the same image.

Dr. Sarkar testified, in agreement with Drs. Li and Wang, that the supershift figure was "just a control" showing that the assay was working, which, the Committee concludes, means that Dr. Sarkar thought it was appropriate to re-use the same figure. However, the first publication in which the image was published (Paper 41) was not cited and there was no indication that the image was re-used with permission of the copyright holder, the original journal in which the image was published.

Dr. Sarkar's explanation that his re-use of the figure was justified because it was only showing that the EMSA assay worked indicates that Dr. Sarkar knew the figure was being copied. Dr. Sarkar's and Dr. Wang's point that the manipulations were cosmetic and meant only to match the size of a new figure to a journal's need is contradicted by the nature of the manipulations which clearly disguised the re-use of the image, and especially by blurring out the unique stippled pattern in the lower left of the image in Figure 5A in Reference #231, a change unrelated to size. Dr. Sarkar's and Dr. Wang's failure to cite prior publication or attribute copyright of the figure also indicates the intent to disguise the re-use, and/or a lack of understanding of plagiarism and standards of citation.

There is no evidence that the NFκB "supershift" assay was repeated for the experiments in the 3 subsequent papers. The only author in common in the 4 papers is Dr. Sarkar: he is corresponding author in 3 of the 4 papers (excepting Reference #257). Dr. Wang and Dr. Banerjee, who are not authors on the

original paper (Paper 41), are the only other co-authors in common in the 3 papers where the image was duplicated. There is no evidence that Dr. Banerjee or Dr. Kong played any role in these EMSA assays or in re-using the "supershift" assay image. Dr. Sarkar's acknowledgment that he "should have been more vigilant..." indicates he knew something needed to be watched out for, specifically, that he knew to be inappropriate re-use of the supershift figure, even as "just a control," and he knew that it was common practice in his lab to re-use images. Dr. Sarkar also said he is "ultimately ... fully responsible" (Sarkar Transcript, V.1, p.158, ll.1-7).

The earliest uses of the supershift assay image that was found by the Committee are in two powerpoint presentations:

E:\OriginalData\5\[NTFS]\Yiwei Li\3rd paper\1st Disk\5th Soy meeting\Soy isoflavone genistein inhibits NF-κB and sensitizes human-2.ppt, dated: 09/18/2003
(ppt. slide #24; lists "Fazlul Sarkar" as author.) See DIO4915 Image File C, slide 477.

E:\OriginalData\21 KCI\arkar ~2\labsSa~1\Sarka~13\Presen~1\Lectu~19\Soy Meeting Final.ppt, date 09/23/2005
(ppt. slide #25; presentation lists Drs. Li and Sarkar as presenters)

These presentations were not cited in Paper 41 and the .ppt slides had different doses of cisplatin and genistein than those published in Paper 41.

CONCLUSION:

The Committee finds, in **Allegation 131**, that the the "supershift" assay image from **Paper 41** originally published in 2005 was duplicated and manipulated in 3 subsequent publications (**References #257 & #278 in 2006;** and **Reference #231 in 2007**), apparently to give the impression that the EMSA validation assay was done for each study when in fact there is no evidence that the validation assay had been done. Further, in each subsequent instance, Dr. Wang and Dr. Sarkar failed to cite the original source of the figure. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published and re-published these fabricated and/or falsified figures, and plagiarized the earlier publications by failing to cite the prior uses and that, in each instance, this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 42 (Reference #026): Patzkó A, Bai Y, Saporta MA, Katona I, Wu X, Vizzuso D, Feltri ML, Wang S, Dillon LM, Kamholz J, Kirschner D, Sarkar FH, Wrabetz L, Shy ME. Curcumin derivatives promote Schwann cell differentiation and improve neuropathy in R98C CMT1B mice. Brain. 2012 135:3551-3566.

Publication History: Received: August 15, 2012; Revised: September 25, 2012; Accepted: September 30, 2012
NIH Funding: R01NS055256 (PI: L. Wrabetz); R01NS41319A (PI: M.E. Shy).
Other Funding: Muscular Dystrophy Association (PI: M.E. Shy),

Allegation 133: "In the top row of Figure 2A (the '+/+' mice), the "untreated" (left) and "CO" -treated conditions are the same image cropped differently with sections appearing identical (DIO4915 Image File C, slide 479).

RESPONSE:

Dr. Sarkar wrote that he had no responsibility for the allegations in this paper in his February 2014 response letter (Response Letter (2nd) – February 4, 2014, pp.1, 5).

ANALYSIS:

See DIO4915 Image File C, slides 478-479.
Simple visual comparison confirms that the photomicrographs appear to be identical images, cropped differently, re-sized slightly, and used to represent different experimental conditions. The methods note semi-thin serial sections were taken which means adjacent sections could appear very similar, but the specimens are from mice treated with curcumin ("CO") or not. Dr. Sarkar is listed as an author, but it was unclear what, if any, contribution he made. The Committee found no evidence that Dr. Sarkar contributed to the figure identified in the allegation. No original data or images were available.

CONCLUSION:

The Committee finds in **Allegation 133,** regarding **Figure 2A** in **Paper 42,** that there is no evidence that Dr. Sarkar is responsible for the image manipulation in this allegation. The Committee discovered no evidence that Dr. Sarkar had any contribution at all and concludes that there is no research misconduct by Dr. Sarkar regarding Allegation 133. The duplication of images in Figure 2A was apparently brought to the attention of the first and/or corresponding authors and the scientific record was apparently corrected (DIO4915 Image File C, slide 479; http://dx.doi.org/10.1093/brain/awu269).

Paper 43 (**Reference #107**): Bao, B., Wang, S., Ali, S., Kong, D., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Miele, L., Sarkar, F.H. Notch-1 induces epithelial–mesenchymal transition consistent with cancer stem cell phenotype in pancreatic cancer cells. Cancer Letters 307(1): 26–36 (2011)

Publication History: Received March 3, 2011; Accepted March 17, 2011
NIH Funding: 5R01CA131151, 3R01CA131151-02S1, 5R01CA132794 (PI: FH Sarkar);
Other Funding: Puschelberg Foundation; Guido Foundation

Allegation 47: In Figures 1B and 3C, the β-actin bands are clearly not from the same gel since they do not have the cuts and spacing of the other proteins (DIO4915 Image File C, slide 481).

Allegation 48: In Figure 2B, the β-actin bands used in this figure do not appear to have been generated from the same gel as the other protein bands depicted. Also the ZEB1 band looks cut and pasted (DIO4915 Image File C, slide 487).

RESPONSE:

For ***Allegation 47***, in his February, 2014 response, regarding "why the beta-actin bands are different," Dr. Sarkar wrote that "Figure 1B and Figure 3C were from different Western blots" and referred to specific lab notebooks and pages. The following files were listed as source materials and located on the "P" share drive:

p/Bin_FOLDER/bin/from computer/Western_scanning/4_2_2010/1_actin_1.
p/Bin_FOLDER/bin/from computer/Western_scanning/A1_A4_11_10_2010/Notch_FoxM1_actin_2

For ***Allegation 48***, "I initially set up 3 different experiment conditions namely "No treatment", "Negative miRNA", and "miR-200b" in the Western blot, and prepared these data in 3 different conditions (please see the lab Note #2, page 53, 55). My co-worker pointed out that "No treatment" and "Negative miRNA" were in the similar condition, and that the data from "No treatment" group could be removed. As suggested, I removed the data from "No treatment" group. However, I forgot to cut "β-actin band" out. I did not do any cutting and pasting in the figures at all."

"The locations of the files containing these original bands are in the p drive of my computer, specifically:
p/Transfer files from small drives_BIN/From fash drive9-2012/4G_flash_driver-12-1_2010/1st_manuscript/2nd_manuscripts/Data/Final_Figures/miR200b_trans_EMT_protein_AB.ppt"

Dr. Sarkar referred to "Lab Notebook #1, page# 74 for Figure 1B ..." and "...Lab Notebook # 2, page# 17 for Figure 3C."

ANALYSIS:

See DIO4915 Image File C, slides 480-487.
The response provided for Allegation 47 did not address whether or not the β-actin bands used in Figures 1B and 3C were derived from the correct Western blots. The file purportedly with the original images has no lanes labeled. The response to Allegation 48 seemed plausible although scans of the original blots were not provided but rather scans of cut portions of films, also without labels. The β-actin band in Figure 3C has been used before in Figure 1B from the paper. They are the same. The cited file "1_actin_1.jpg" was actually located on
"P_homes\baob\Bin_FOLDER/bin\from computer\Western_scanning\4_2_2010\1_actin_1"
which was saved on 04/05/2010.

The response to Allegation 48 is confusing because it is not clear why "No treatment" would be the same as "negative miRNA" or, even if they were equivalent, why one or the other would be excised from the data (DIO4915 Image File C, slide 487). Dr. Bao's lab notebooks record a date without a year and no designation of the experiment being performed. The indicated files appear to be final versions of images prepared for the publication. Notebooks notations were found for what appeared to be relevant experiments run in September, 2011 (DIO4915 Image File C, slides 484-486). In these experiments Dr. Bao does not appear to be confused by miRNA controls for PCR. One experiment was done but 3 Westerns were done on the same samples.

Allegation 47 was based in part on the testimony of Dr. Sarkar regarding Paper 21 describing how he thought control bands from one figure were copied into another to emphasize baseline differences due to transfection, and the substantial similarity between Paper 21 (Figures 1C & 4C) and Reference #107 (Figures 1B & 3C; DIO4915 Image File C, slides 372 & 481). However, the evaluation of Paper 21 (above) determined that copying did not occur as Dr. Sarkar had thought (cf., Sarkar Transcript, V.2, p.331, ll.6-9; p.333, ll.18-21) so the inference that the same duplication occurred here for Reference #107 does not hold. Visual examination of the figures shows that there was no duplication and no evidence of cutting and pasting. The fact that Figures 1B and 3C in Reference #107 are not the same is not research misconduct. On the other hand, the images used for β-actin bands in Figures 1B and 2B do not show spacing between lanes seen in all the other protein bands and are not from any of the Westerns that are the source of those figures. The β-actin bands as identified by Dr. Sarkar in Figure 1B are greatly manipulated – stretched horizontally and squeezed vertically – copy of lanes 5 and 6 from file:
"P_homes/boab/Bin_FOLDER/bin/from computer/Western_scanning/4_2_2010/1_actin_1

(DIO4915 Image File C, slides 481-483). The source images in the directories indicated above by Dr. Sarkar have no markings to indicate what the columns represent so it is not possible to determine with any confidence where the images in Figure 1B came from. Images in adjacent directories have similar images as well. The Zeb1 bands in Figure 2B show a cut mark but it is at the far right margin and so probably does not mean any inappropriate manipulation (DIO4915 Image File C, slide 487).

CONCLUSION:

The Committee finds, in **Allegations 47** and **48**, that Figures 1B and 2B, respectively, are not composites, and in particular that the bands in Figure 1B are not copies from Figure 3C. However, the Committee finds, based on the lack or different spacing between lanes, that the manipulated β-actin bands in Figure 1B and Figure 2B, as well as the β-actin bands in Figure 3C, are from different Westerns blots than the proteins for which they are supposed to be loading controls. The Committee finds that the wrong β-actin bands were apparently used even though the correct ones were should have been available, if they were run, judging from the laboratory notebooks. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified figures by using control bands from different Western blots and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 44 (**Reference #118**): Maitah, M.A., Ali, S., Ahmad, A., Gadgeel, S., Sarkar, F.H. Up-regulation of sonic hedgehog contributes to TGF-β1-induced epithelial to mesenchymal transition in NSCLC Cells. PLoS ONE 6 (1): e16068 (2011)

Publication History: Received: September 14, 2010; Accepted: December 5, 2010; Published: January 13, 2011
Funding: "The authors have no support or funding to report."

Allegation 49: Cutting and pasting in Figures 1C, 3D, and 5D; and the apparent mis-match between loading control lanes and protein bands. Loading controls do not appear to have been analyzed on the same gels. Figure 1C GAPDH and Figure 3D β-actin are same band. One has been stretched longitudinally and the contrast brightened to appear different.

RESPONSE:

Dr. Sarkar wrote that he found "... no basis for this allegation and cutting and pasting is very common" (Response Letter (2nd)-Feb. 4th-2014, p.2).

ANALYSIS:

See DIO4915 Image File C, slides 488-490.
The cutting and pasting was admitted although, the cut marks themselves are not clear suggesting that the edges were smoothed by manipulating the images (DIO4915 Image File C, slide 489). No original Western blots were submitted nor was information about the location of the original data provided. None were found. The mis-match between loading control bands (GAPDH, β-actin & β-tubulin) and their respective protein bands is that there are distinct, separated lanes in the protein bands, but the bands in the loading control bands run together (DIO4915 Image File C, slide 489). This mis-match between loading control bands (GAPDH, β-actin & β-tubulin) and protein bands in Figures 1C, 3D and 5D was not addressed. The image labeled "GAPHD" in Figure 1C and the one labeled "β-actin" in Figure 3D are the

same image, greatly manipulated and re-labeled (DIO4915 Image File C, slide 490). The "β-tubulin" image appears similar but is different from the other control images. The duplication and re-labeling of the same bands as "GAPHD" and "β-actin" in two figures is clear and not addressed by Dr. Sarkar. The role of Ms. Ali, co-author, in this allegation was not determined.

CONCLUSION:

The Committee finds in **Allegation 49**, that Dr. Sarkar admitted to cutting and pasting in Figures 1C, 3D and 5D in **Reference #118** as a common practice and thereby he acknowledged that he published control bands not associated with the protein bands in Figures 1C, 3D and 5D. Dr. Sarkar addressed neither this mis-match with control bands nor the duplication of the single "GAPHD"/"β-actin" image in Figures 1C and 3D. The Committee could not determine Ms. Ali's role, if any, or who was directly responsible for the copying, manipulating, re-labeling and re-using the same bands images. However, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 45 **(Reference #120):** Kanwar, S.S., Yu, Y., Nautiyal, J., Patel, B.B., Padhye, S., Sarkar, F.H., Majumdar, A.P.N. Difluorinated-curcumin (CDF): a novel curcumin analog is a potent inhibitor of colon cancer stem-like cells. Pharm Res 28:827-838 (2011)

Publication History: Received: August 26, 2010; Accepted: November 23, 2010; Published online: December 14, 2010
NIH Funding: 5R01AG014343 (PI: A.P.N. Majumdar); 3R01CA131151-02 (PI: F.H. Sarkar)
Other Funding: Department of Veterans Affairs (PI: A.P.N. Majumdar)
Note: Dr. Majumdar is the corresponding author.

Allegation 50: In Figure 6A, the far right lane of the top band is pasted in suggesting fabrication.

RESPONSE:

In his response letter dated February 14, 2014, Dr. Sarkar wrote: "It is important to note that I am NOT responsible for ... 50 (Reference #120)..." Dr. Majumdar, corresponding author, testified that he considered cutting and pasting acceptable when there are clear demarcations between the lanes, that this is acceptable to the journals (Majumdar Transcript, p.74, ll.18 to p.75, ll.16). Dr. Majumdar testified that for papers dealing with colon cancer where he is the corresponding author, the Western blots were done in his lab, not Dr. Sarkar's lab (Majumdar Transcript, p.20, ll.17 to p.21, ll.14).

ANALYSIS:

See DIO4915 Image File C, slides 491-492.
Since this publication involves colon cancer stem cells, work apparently was done in Dr. Majumdar's lab. There is a clear cut/paste mark between the 3rd and 4th lanes of the top bands (DIO4915 Image File C, slide 492). No original data were found and no scans of original gels were provided. There is no evidence Dr. Sarkar was involved with this paper. Contrary to his denial of responsibility, Dr. Sarkar's NIH grant is cited as supporting this research. Dr. Sarkar testified that, in general, being the PI on a grant that supports work does make him responsible for the contents of that paper (Sarkar Transcript, V.2, p.322, ll.15-18). Dr. Sarkar did not testify specifically about this allegation.

CONCLUSION:

Although Dr. Sarkar is PI on an NIH grant listed as supporting this research in **Reference #120**, and he acknowledged a general responsibility, there is insufficient evidence that research misconduct occurred or that Dr. Sarkar was played any role in creating the data used in Figure 6, or in generating the publication. Therefore, the Committee makes no determination of research misconduct by Dr. Sarkar regarding **Allegation 50**.

Paper 46 (**Reference #139**) Wang, Z., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Kong, D., Wojewod, C., Miele, L., Sarkar, F.H., Down-Regulation of Notch-1 is associated with Akt and FoxM1 in inducing cell growth inhibition and apoptosis in prostate cancer cells. Journal of Cellular Biochemistry 112:78–88 (2011)

Publication History: Received: June 8, 2010; Accepted: July 7, 2010; Published online: July 23, 2010
NIH Funding: NIH/NCI 5R01CA083695; NIH/NCI 1R01CA101870 (PI: F.H. Sarkar)
Other Funding: DOD Postdoctoral Training Award W81XWH-08-1-0196

Allegation 121: In Figure 2C, the β-actin bands are duplicated and manipulated and re-used for different treatment conditions: The β-actin band for the LY294002 condition with PC-3 cells is flipped and widened and re-used/re-labeled for the Wortmanin condition in the C4-2B cells (DIO4915 Image File C, slide 492). The β-actin band for the Wortmanin condition in the PC-3 cells is flipped and re-used/re-labeled for the LY294002 condition with the C4-2B cells.

Allegation 122: In Figures 2A & 3C, the β-actin bands are duplicated and manipulated and re-used for different treatment conditions: The β-actin band for the LNCaP and C4-2B columns in Figure 2A is duplicated, rotated slightly, re-used and re-labeled for PC-3 and PC-3ICN cells in Figure 3C (DIO4915 Image File, slide 495).

Allegation 140: Blots in Figure 3A in **Reference #139** appear to be duplicated in Figure 5A in **Reference #167** (Wang Z, et al., 2010). Specifically, the Notch-1 band lanes in Figure 5A of Reference #167 are labeled "CS" and "JS," for control and Jagged-1 siRNA treatment, respectively. The text of the Reference #167 states that "... PC-3 cells were transfected with Notch-1 siRNA, Jagged-1 siRNA and siRNA control" (p.727). These same images appear to be duplicated (the "CS" blot) and duplicated and re-labeled (the "JS" blot re-labeled "NS" for Notch-1 siRNA) in the Notch-1 band of the panel labeled "C4-2B" cells in Figure 3A of Reference #139. Further, the middle "NS" lane of the Notch-1 band in Figure 5A of Reference #167 appears to be blurred out or masked over (DIO4915 Image File C, slide 497).

The other paper is:

Paper 72 **(Reference #167)**: Wang Z, Li Y, Banerjee S, Kong D, Ahmad A, Nogueira V, Hay N, Sarkar FH. Down-regulation of Notch-1 and Jagged-1 inhibits prostate cancer cell growth, migration and invasion, and induces apoptosis via inactivation of Akt, mTOR, and NF-kappaB signaling pathways. J Cell Biochem. 109(4):726-736. (2010)

Publication History: Received August 11, 2009; Accepted November 10, 2009; Published online January 5, 2010
NIH Funding: NIH/NCI 5R01CA083695; NIH/NCI 1R01CA101870.
Other Funding: DOD Postdoctoral Training Award W81XWH-08-1-0196:

RESPONSE:

For Allegation 121, Dr. Sarkar wrote in file "Wang-Response-1.pptx" (slide 31) "... We disagree, the actins are not same. Please enlarge the bands and it will be clear. Similarly, for Allegation 122, Dr. Sarkar wrote

in file "Wang-Response-1.pptx" (slide 32), "The actins are not the same. One can see the difference after enlarging the bands."

For Allegation 140, Dr. Sarkar responded in the file named "Response to Allegation #4-Sept. 2014" that "... both papers are on the same topic and the experiments were done at same time, during the preparation of the manuscript (JCB 2011), it appears to have caused an error in the JCB 2011 article but the data published in JCB 2010 is correct" (p.24). Dr. Sarkar also claimed in November 2014 that "because of the computer crash twice many original data that were developed by Dr. Wang could not be found. However, Dr. Wang was able to find the data from what he and Dr. Sarkar termed "repeated experiments," data that showed similar findings (file: "Response-Wang et al.pdf", p.2; DIO4915 Image File C, slide 500).

When asked why these blots were copied and manipulated, Dr. Wang testified that he was sure the three conditions ("CS," "NS" & "JS) were done in both publications (Wang Transcript, V.2, p.345, ll.4-6). He said "this might also because copy and paste, due to copy and paste" (Wang Transcript, V.2, p.345, ll.12-13) when 6 bands were run – duplicates of the 3 transfections – and he selected some lanes for the paper (Wang Transcript, V.2, p.345, ll.15-23). Dr. Wang also testified that this was an issue of poor labelling and "that is really is the copy and paste got this mistake, because the JS should be put into JS, but when they copy and got the next line, the JS could become the NS" (Wang Transcript, V.2, p.345, ll.25 to p.346, ll.9).

Dr. Sarkar reported in November, 2014 (file: "Response-Wang et al.pdf", p.2) that he had submitted a "corrected" Figure 3A to the journal (DIO4915 Image File C, slides 505-506).

ANALYSIS:

See DIO4915 Image File C, slides 493-500.

For Allegations 121 and 122, the β-actin bands in Figures 2C, and 2A and 3C, in Reference #139 are determined not to be the same images when evaluated in enlarged, higher-definition images (DIO4915 Image File C, slide 496).

For Allegation 140, evaluations comparing enlarged images from the two published papers shows the "CS" and "JS" labeled lanes in the Notch-1 band in Figure 3A in Reference #139 are essentially identical to the Notch-1 band in Figure 5A in Reference #167. The resolution differs greatly between the figures but the images are the same (DIO4915 Image File C, slide 498). Dr. Wang's testimony did not explain the duplication of images. The text in Reference #167 stated that PC-3 cells were used for Notch transfection studies (pp. 727-728); neither the results (pp.731-732) nor the caption to Figure 5 in Reference #167 note which cells were used. The "CS" lane from PC-3 cells in Figure 5A is duplicated and re-labeled as from C4-2B cells in Figure 3A of Reference #139 (DIO4915 Image File C, slides 498-499). The "JS" lane from PC-3 cells in Figure 5A is duplicated and re-labeled as the "NS" lane from C4-2B cells in Figure 3A of Reference #139. Evaluations of an enlarged image shows the middle "NS" lane of the Notch-1 band in Figure 5A of Reference #167 has cut lines and differences in pixilation compared to adjacent areas of the band that are consistent with being blurred out or masked over (DIO4915 Image File C, slide 498-499).

In writing that "it appears to have caused an error" (file: "Response to Allegation #4-Sept. 2014," p.24), Dr. Sarkar seems to try to deflect his responsibility by implying that writing two papers at the same time "caused" the error. Similarly, Dr. Wang attempts to deflect his responsibility to an unspecified "they." No original images, scans or films were found for either figure in Allegation 140, no references to any documentation in lab notebooks, so it is not possible to evaluate the claim that "... the data published in JCB 2010 is correct" (i.e., in Paper 72 [Reference #167]). Appeals to a "computer crash" perhaps in 2005 or 2006 and "data from a repeat experiment" by Dr. Wang "...showing similar findings" are not responsive or relevant (cf, "Response to Allegation #4-Sept. 2014", p.24), and the Committee is skeptical that data supposedly from repeat experiments done at the same time are not also lost in the computer crashes, but

only the published data are lost. There is no information about what or where the "repeat" image came from. These manipulations are consistent with the practices in Dr. Sarkar's laboratory of copying, manipulating and re-labeling images.

CONCLUSIONS:

For Allegations 121 and 122, the Committee concludes that the β-actin bands in Figures 1A, 2C and 3C in Reference #139 are not the same images. There is no research misconduct for Allegations 121 or 122.

For Allegation 140, the Committee finds that the Notch-1 bands in lanes 1 and 3 from **Figure 5A** in **Reference #167** were copied into lanes 1 and 2 and re-labeled in Figure 3A (**Reference #139**). The Committee concludes that Dr. Sarkar knew this copying, manipulating and re-labeling occurred as standard practice in his lab. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3A and that this is research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103, by publishing falsified and/or fabricated results in Figure 3A (**Reference #139**) and Figure 5A (**Reference #167**).

Allegation 145: The DU145, LNCaP, C4-2B and PC-3 lanes of the Notch-1 band in Figure 1B of **Reference #139** (i.e., lanes 2, 3, 4 & 1 in Wang, Z., et al., 2011, J. Cell. Biochem., 112: 78–88), are re-ordered and manipulated (flipped horizontally) and re-labeled copies of the HPDE, BxPC-3, HPAC and PANC-28 lanes (lanes 1, 2, 3 & 5, respectively) of the Fox-M1 band in Figure 3A of **Reference #157** (Wang, Z., et al., (2010) Pharm Res 27:1159–1168). Also, the 4-lane β-actin bands in Figure 1B of Reference #139 are a copy of lanes 1 to 4 from Figure 3A of Reference #157 (DIO4915 Image File C, slides 501-502).

The other publication involved is:

Paper 76 **(Reference #157)**: Wang, Z., Li, Y., Ahmad, A., Banerjee, S., Azmi, A. S., Kong, D., Li, Y., Sarkar, F. H. FoxM1 is a novel target of a natural agent in pancreatic. Pharm Res 27:1159–1168 (2010)

Publication History: Received: November 23, 2009; Accepted: February 25, 2010; Published online: March 31, 2010
NIH Funding: R01CA131151 and R01CA132794 (PI: F.H. Sarkar)
Other Funding: Puschelberg Foundation; Guido Foundation

RESPONSE:

Dr. Sarkar wrote in file "Response-Wang et al.pdf" in November, 2014 (p.1), that "we initially assessed the expression of Notch-1 using 11 cell lines (DIO4915 Image File C, slides 505-506). The topic of our paper was relevant to the relationship between Notch-1 and FoxM1 in cancer cells, and thus resulted in an error where FoxM1 bands were used but marked as Notch-1 bands ..." He also wrote that "... it is important to note that the Figure 3A in Pharm Res 2010, 27: 1159-1168 is the right data." Dr. Sarkar admitted to a mistake with β-actin bands, too. He submitted original scans of Westerns with 11 cell lines and wrote that "... lanes 7-10 (four lanes) for Notch-1 is the correct image with corresponding actin control." Dr. Sarkar submitted a correction to Figure 1B that he sent to the journal (DIO4915 Image File C, slide 505, lower right panel). He wrote: "In this article published in J Cell Biochem, a minor mistake in Fig 1B and Fig 3A have recently been uncovered. The amended figure is included below. This minor error has no impact on the conclusions previously reported. The authors regret this error" (file: "Response-Wang et al.pdf", p.2).

ANALYSIS:

See DIO4915 Image File C, slides 501-506.

Visual evaluation shows clearly that the bands in the lanes labeled "PC-3," "DU145," "LNCaP" and "C4-2B" (i.e., lanes 1 through 4) in the bands labeled "Notch-1" in Figure 1B of Reference #139, are re-ordered and re-labeled copies of bands in lanes 1, 2, 3 & 5 of the row labeled "Fox-M1" in Figure 3A of Reference #157, where these bands are re-labeled "HPDE," "BxPC-3," "HPAC" and "PANC-28," respectively. See DIO4915 Image File C, slide 503. It is also clear that the 4-lane β-actin row in Figure 1B of Reference #139 is a copy of lanes 1 to 4 from Figure 3A of Reference #157 (DIO4915 Image File C, slide 504). Reference #139 was received as a manuscript by the journal on June 8, 2010, ~9 weeks after Reference #157 was first published online with the images in question, on March 31, 2010. There is no information about where the scan purported to be the original for Notch-1 for Reference #139 came from. Dr. Sarkar did not submit original images for FoxM1. That the topic of the publication was a relationship between Notch-1 and FoxM1 in cancer cells lines does not explain "an error" where individual bands were copies, re-arranged, and re-labeled. It is not clear how images from one publication studying pancreatic cancer (Reference #157) could mistakenly be copied into another manuscript studying prostate cancer (Reference #139). Dr. Sarkar had admitted that he was well aware this kind of manipulation is a standard practice in his lab. Nothing in the responses from Dr. Sarkar explains how it is that the images came to be so completely re-arranged among the lanes and re-labeled by mistake, nor where the scans used for the "correction" of the Notch-1 and the β-actin bands came from.

CONCLUSION:

For **Allegation 145**, the Committee finds that the copying and complete re-ordering and re-labeling of the bands from one published paper (**Reference #157**) to another (**Reference #139**) is clear. Dr. Sarkar's explanation of a "minor mistake" is simply not credible giving how much work was involved to do all the re-arranging, compared to what would be done if the "original" scans were really available as claimed. By a preponderance of the evidence the Committee concludes that Dr. Sarkar recklessly publishing falsified and/or fabricated data in Figure 1B and that this is research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Paper 47 (**Reference #149**): Banerjee, S., Azmi, A.S., Padhye, S., Singh, M.W., Baruah, J.B., Philip, P.A., Sarkar, F.H., Mohammad, R.M. Structure-activity studies on therapeutic potential of thymoquinone analogs in pancreatic cancer. Pharm Res 27: 1146–1158 (2010)

Publication History: Received: December 14, 2009; Accepted: March 31, 2010; Published: online April 27, 2010
NIH Funding: R01CA109389 (PI: R.M. Mohammad); R01CA083695, R01CA131151 & R01CA132794 (PI: F.H. Sarkar)
Other Funding: Guido Foundation

Note: see **Allegation 108** where the same image used here in Figure 5A (Reference #149) is used also as Figure 5 in Patent Application WO 2011/126544 A2.

Allegation 51: In Figure 5A, there is reason to believe that that image is manipulated by stretching, rotating, flipping and/or pasting in of images, that alter presentation of Western blot data for the Caspase-3, PARP and Bcl-2 bands (DIO4915 Image File C, slide 508).

RESPONSE:

The response is shown in the file "Banerjee 04 – Exhibit 155Ad – Allegation-II response-SB.pptx" (cf., DIO4915 Image File C, slides 509-510). This document provides scanned X-ray films that show the experimental images that were used in the composition of the Figure 5A.

ANALYSIS:

See DIO4915 Image File C, slides 507-516.
The images submitted in the response appear to be the source for Figure 5A with extensive manipulations of the raw data to produce the published images (DIO4915 Image File C, slides 510 & 512). Bands are excised and rows are flipped and there are no indications in the final image acknowledging these manipulations (DIO4915 Image File C, slide 508). For PARP, the bands labeled "cleaved PARP" in the submitted scan do not match the published image (DIO4915 Image File C, slides 510-511). In contrast, the published PARP bands are highly manipulated version of bands found in a file named "parp-bcl2.jpg" (DIO4915 Image File C, slides 512-513). Flipping the bands would switch PARP versus cleaved PARP bands relative to typical Westerns. There are no labels on lanes in file "parp-bcl2.jpg" so it cannot be determined how excising the substantially darker lane 2 may bias the presentation of results or their interpretation (DIO4915 Image File C, slide 511). The images in the scan submitted for Bcl-2 bands in the same file named "parp-bcl2.jpg" appear to match the published bands but at a different exposure (DIO4915 Image File C, slide 508). The labeling for the Bcl-2 bands is different than for the submitted PARP and Caspase scans so it is not clear if these are in fact the same experiment, raising further concerns. The submitted caspase bands appear to be the same images as those published but, as with PARP and Bcl-2, lane 2 was excised with no justification (DIO4915 Image File C, slides 508 & 512). A file named "caspace.jpg" with a scan matching what was submitted was found on the sequestered computers. Similar to PARP and Bcl-2 bands, a lane was excised from the caspace row (DIO4915 Image File C, slides 512-514). The response from Dr. Sarkar illustrates that inappropriate image manipulation occurred and failed to provide labeled originals for PARP so the claim that original data was provided cannot be verified. Dr. Banerjee had testified that images were regularly straightened, stretched and flipped in powerpoint during the composition of figures for publication. The scans submitted to the Committee claimed to be original data were not.

CONCLUSION:

The Committee finds, in **Allegation 51**, that as admitted by Dr. Sarkar, the PARP, caspase and Bcl-2 bands in **Figure 5A of Reference #149**, were manipulated by cutting and pasting to select particular lanes, and by re-sizing other bands. Since submitted scans either did not match the published images, and/or had no labels on scans to match what was published, the Committee cannot determine the authenticity of the results. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated results and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 48 **(Reference #177)**: Majumdar, A.P.N., Banerjee, S., Nautiyal, J., Patel, B.B., Patel, V., Du, J., Yu, Y., Elliott, A.A., Levi, E., Sarkar, F.H., Curcumin synergizes with resveratrol to inhibit colon cancer. Nutrition and Cancer, 61(4), 544–553 (2009)

Publication History: Submitted: April 10, 2008; Accepted: November 18, 2008.
NIH Funding: R01AG014343 (PI: A.P.N. Majumdar)
Other Funding: Department of Veterans Affairs
Note: Dr. Majumdar is the communicating author.

Allegation 52: In Figure 3, there are many rows and/or cells that were all cut and pasted and/or cropped (esp., β-actin). This manipulation indicates fabrication and/or falsification.

Allegation 53: In Figures 4A and 4B, the bands are highly pixilated and suggested substantial manipulation by being enlarged, stretched and cropped, and thereby suggesting falsification.

RESPONSE:

In his response letter dated February 14, 2014, Dr. Sarkar stated "It is important to note that I am NOT responsible for ... #52 (Reference #177), #53 (Reference #177)..."
Dr. Majumdar, first and corresponding author, testified that he considered cutting and pasting acceptable when there are clear demarcations between the lanes, that this is acceptable to the journals, and that there "... is a lot of cut and paste..." in Reference #177 (Majumdar Transcript, p.74, ll.18 to p.75, ll.16). Dr. Majumdar testified that for papers dealing with colon cancer where he is the corresponding author, the Western blots were done in his lab, not Dr. Sarkar's lab (Majumdar Transcript, p.20, ll.17 to p.21, ll.14).

ANALYSIS:

See DIO4915 Image File C, slides 517-519.
Since this publication involves colon cancer, the work apparently was done in Dr. Majumdar's lab. The text of the publication describes how Figure 3 shows the relatively greater effectiveness of "the combination of curcumin and resveratrol when compared with..." curcumin or resveratrol alone (p.549). This indicates that the bands in the Western blots in Figure 3 were used to quantify changes in the levels and activated forms of various proteins. Since the lanes in most bands are clearly cut and pasted and so do not represent images from the same gel, it appears comparisons may have been made between different Western blots. The β-actin bands appear to be from different blots and so likely do not represent loading controls for the bands indicated above in this figure. All this suggests manipulations to better portray the conclusions (DIO4925 Image File C, slides 518-519). The same appears to be true for Figures 4A and 4B.

Dr. Banerjee is a co-investigator on the paper. It is unclear what contribution he made. His lab notebooks are not clearly delineated by experiment and dates were rarely noted. Perusal of his lab notebooks show they cover up to 2007. No other references could be found related to the experiments covered in these allegations.

CONCLUSION:

Dr. Sarkar's grants are listed as the primary funding source for **Reference #177**, and he and Dr. Banerjee are co-authors. It is unclear whether they provided real input into this publication or who performed the experiments in question. There is insufficient information indicating that either Dr. Sarkar or Dr. Banerjee was involved in making Figures 3 or 4, or in generating the publication. Therefore the Committee makes no determination of research misconduct by Dr. Sarkar or Dr. Banerjee in Allegations 52 and 53.

Paper 49 (**Reference #186**): Banerjee, S., Kaseb, A.O., Wang, Z., Kong, D., Mohammad, M., Padhye, S., Sarkar, F.H., Mohammad, R.M. Antitumor activity of gemcitabine and oxaliplatin is augmented by thymoquinone in pancreatic cancer Cancer Res 69:5575-5583 (2009).

Publication History: Received: January 5, 2008; Revised: April 17, 2009; Accepted: May 5, 2009; Published online: June 23, 2009
NIH Funding: None cited.

Allegation 109: In Figure 2A, there is possible masking of the 3 left lanes for cleaved Caspase-3 and the space between the Caspase-3 lanes, suggesting fabrication and/or falsification (DIO4915 Image File C, slide 520).

RESPONSE:

Dr. Sarkar submitted a response with contributions from Dr. Banerjee ("Banerjee 01 - Exhibit 155Aa - Allegation-Recent response.docx," p.2). They wrote that "since the band at 0 (control) was bent, for cosmetic reasons, I straightened it up." They claimed to have submitted the original blot for the Bcl-xL bands, but the original caspase 3 and cytochrome C blots could not be found by them "despite many efforts." They wrote that the "caspase 3 bands have not been masked out" and submitted new experiments for caspase and cytochrome C to show "no masking of bands" and for cytochrome C they also exposed film overnight to show only "faint traces of 5th lane" (i.e., meaning that cytochrome C expression is greatly reduced after 50μM thymoquinone treatment; "Banerjee 01 - Exhibit 155Aa - Allegation-Recent response.docx," p.2).

Dr. Banerjee testified that "... as far as the masking goes ... there was a view that some masking I have done in Caspase-3, but that is not the case." When asked "have you ever used masking?" Dr. Banerjee said "No, no" (Banerjee Transcript, V.3, p.733, ll.15-22).

ANALYSIS:

See DIO4915 Image File C, slides 520-530.
Dr. Banerjee admitted cutting and re-orienting the left-most band in the Bcl-xL row in Figure 2A (DIO4915 Image File C, slide 522 & 526). The Committee found scans on the sequestered computer drives that contained the following relevant files on:

E:OrginalData\8\[NTFS]\Documents and Settings\banerjes\Desktop\New Folder (3)\New Folder\Kingston\Thymoquinone\TQpOSTER RELATED\HPAC\

bcl2- xl- .jpg (dated 4/7/2008, 10:03 pm) –
bcl-xl.jpg (dated 4/7/2008 10:01 pm) –
mcl1-bax.jpg (dated 4/7/2008, 10:41 pm) –

The whole scan in file **bcl2- xl- .jpg** was used in Figure 2A for the Bcl-xL and Bcl-2 bands, as well as being the apparent source of a cropped scan in file **bcl-xl.jpg**. The bcl2- xl- .jpg scan shows the altered first lane of Bcl-xL (DIO4915 Image File C, slides 523, 524 & 526). This is determined to a duplicate of the "original" scan submitted by Dr. Banerjee although this "original" scan has no date and is clearly cropped from a larger scan (Banerjee 04 – Exhibit 155d – Allegation-II response-58.pptx, slide 8). The whole scan in file **mcl1-bax.jpg** was the source of the Mcl-1 and Bax bands in Figure 2A. A visual evaluation shows that the lanes labeled Mcl-1 on the scan were rearranged and flipped horizontal to appear as published in the Mcl-1 row in Figure 2A (DIO4915 Image File C, slide 525). The manipulation (re-arrangement) of the lanes labeled Bcl-xL, Bcl-2, Mcl-1, and Bax in the whole scans means the lanes are re-aligned with different lane labels in the published version (e.g., lane 1 of "Bcl-xL" is lane 1 on the scan but published lane 1 of Bcl-2 is lane 3 on the scan; DIO4915 Image File C, slides 525 & 527). Therefore, the published bands do not represent their respective treatments. Neither whole scan indicated lane treatments (DIO4915 Image File C, 523-525). The original Bcl-xL scan was not included by Dr. Banerjee, only scans claimed to be from replicated experiments (Banerjee 01 - Exhibit 155Aa - Allegation-Recent response.docx, p.1). Close visual

examination of the published bands for caspase 3 and cytochrome C shows gray boxes with clearly defined edges and much less pixilation indicating masking of the areas between the caspase and cleaved caspase bands, and the 3 left lanes of the cleaved caspase bands, as well as the right-most lane of the cytochrome C bands (DIO4915 Image File C, slide 521). The replicated experiments shows an absence of expression in these same areas, even with long exposures to film, with uniform pixilation, not the edges and masking evident in the published bands. The replicate blots do not show the gray boxes or edges or altered pixilation. The published image for the Caspase-3 band (above the cleaved Caspase-3 band in Figure 2A) does not match the Caspase-3 image in the replicated blots (DIO4915 Image File C, slides 528-530). The response submitted by Dr. Sarkar also shows the manipulations and inconsistencies with the published figures.

CONCLUSION:

The Committee finds, in **Allegation 109**, that lanes in the Bcl-xL and Mcl-1 bands were altered and that the order of the published lanes of the Bcl-xL, Bcl-2, Mcl-1, and Bax bands do not match their lane positions in the original whole scans. It cannot be verified that any of these scans faithfully represent the experiments mentioned in the publication. The Committee finds that there is evidence of masking in the caspase-3 and cytochrome-C bands. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in **Figure 2A** in **Reference #186** and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 50 (**Reference #193**): Ali, S., Al-Sukhun, S., El-Rayes, B.F., Sarkar, F.H., Heilbrun, L.K., Philip, P.A., Protein kinases C isozymes are differentially expressed in human breast carcinomas. Life Sciences 84 766–771 (2009)

Publication History: Received: February 2, 2009; Accepted: March 13, 2009; Published: online March 24, 2009
NIH Funding: No funding acknowledgement on paper
Other Funding: No funding acknowledgement on paper

Allegation 54: Figures 1 and 3 both appear to be cut and pasted throughout, and/or manipulated in some bands. The cytosol PKC-ε band in Figure 1 appears stretched out vertically. Lanes 3 and 5 in the cytosol PKC-ε band in Figure 1 are duplicated (and squeezed vertically) in lanes 2 and 3 in the cytosol PKC-ε band of Figure 3. Those duplications are not seen in the β-actin bands. These duplications and manipulations indicate fabrication and/or falsification.

RESPONSE:

Dr. Sarkar submitted a response (file: "Shadan-Response.doc, p.9) and wrote: "... tumor breast tissue samples (T) from same patient were compared with tissue adjacent to tumor and were called normal adjacent (NA). We also compared the NA with the patients who had bread [sic] reduction without any signs of cancer, hence they were named as normal (N)." He wrote that he compared breast tumor tissue from 3 patients "normal adjacent" (NA) tissues and also compared the same NA tissues to normal (N) tissue and that separate figures were made for each set of comparisons to the same NA tissue. He wrote "the shape of the bands in figure 1 looks different in figure 3 because it was matched with rest of the normal bands in figure 3. It is not like one band was stretched out but it was the whole row... Both the figures were cropped and made separate, therefore the bands look different." A scan of the original data for PKC-ε was submitted (DIO4915 Image File C, slide 533). Ms. Ali testified about these manipulations (Ali

Transcript, V.2, p.202, ll.22 to p.224, ll.1) and admitted that the bands in Figure 3 derive from the same images in Figure 1 but were manipulated to make them appear as if a separate, single gel had been run. She described altering the image in powerpoint to make the bands more similar in size and shape to other elements in the composite in Figure 3 (Ali Transcript, V.2, p.208, ll.2-8).

ANALYSIS:

See DIO4915 Image File C, slides 531-534.
Images were submitted that match Figure 1. Dr. Sarkar and Ms. Ali admit that Figure 3 was prepared as a composite made by cutting, re-sorting lanes, and splicing together image elements and juxtaposing them differently (DIO4915 Image File C, slides 531 & 532). It is also admitted that the bands and rows of bands taken from Figure 1 were manipulated (stretched) to make them match, presumably the size of the "normal bands in figure 3". The original allegation focused on the PKC-ε bands, but all the "NA" bands in Figure 1 are copied into Figure 3. The re-use and re-ordering of lanes between Figure 1 and Figure 3 is consistent with the explanation of emphasizing different comparisons with the same data, as described in the abstract of Reference #193 (p.766). Relative to the original the PKC-ε bands for the cytosol panel, the bands for "NA" in Figure 1 are stretched vertically in Figure 1 and squeezed in Figure 3. On the other hand, the cytokeratin loading control bands are different in Figures 1 and 3 which is inconsistent with Dr. Sarkar's explanation of simple re-sorting to emphasize different comparisons. No original blots for the cytokeratin were submitted or found.

CONCLUSION:

For **Allegation 54**, based on the image analysis and testimony, the Committee finds that Ms. Ali intentionally re-used and re-arranged the bands between **Figures 1** and **3** in **Reference #193**, and Dr. Sarkar knew these duplications and re-arrangments were done. The manipulations give the impression that the Western blots were run as presented. The re-sizing of bands may be viewed as disguising the re-use rather than merely addressing formatting. Nevertheless, given how the results are portrayed in the text, the Committee finds that these while these duplications should have been more clearly delineated and while the "cosmetic" manipulations are inappropriate, the Committee concludes that there is insufficient evidence in this instance that there was intent to misrepresent the research record and so there is no determination of research misconduct.

Note: There is no Allegation 55.

Paper 51 (**Reference #196**): Gadgeel, S.M., Ali, S., Philip, P.A., Wozniak, A., Sarkar, F.H. Genistein enhances the effect of epidermal growth factor receptor tyrosine kinase inhibitors and inhibits nuclear factor kappa B in cell lung cancer cell lines. Cancer 115:2165–76 (2009).

Publication History: Received: August 15, 2008; Revised: October 28, 2008; Accepted: October 31, 2008; Published online: March 13, 2009
NIH Funding: None cited.
Other Funding: Astra-Zeneca (PI: S.M. Gadgeel); OSI Pharmaceuticals (PIs: S.M. Gadgeel & P.A. Philip); Genentech (PIs: S.M. Gadgeel & A. Wozniak).

Allegation 56: In Figure 4A, the Gef+Gen cell for Cox-2 appears to be pasted in and in Figure 4B, the right 2 lanes (Gen 25uM & Erl+Gen conditions) for COX-2 and EGFR appear to be pasted in. In Figure 4C, the whole

pAkt row appears to be uniformly blurred out or masked, and when enlarged the β-actin row has white "halos" in blots in all lanes that suggest manipulation. These manipulations indicate fabrication of data (DIO4915 Image File D, slide 537).

RESPONSE:

Regarding **Allegation 56**, Dr. Sarkar and Ms. Ali provided several images and some explanatory text (Shadan-Response.doc, p. 10). These images are described in the response as either the original images used in Figures 4A, 4B, and 4C or duplicate images that purport to demonstrate the same experimental results (DIO4915 Image File D, slide 538 & 541). The image submitted in the response for the COX-2 lane for Figure 4A was not the image in the original published figure but rather a "duplicate autoradiogram for COX-2 for Gefitinib (Gef) also known as Iressa" that Dr. Sarkar and Ms. Ali wrote "shows similar results" to the published figure (Shadan-Response, p. 10). The image submitted for the COX-2 lane for Figure 4B appears to contain the same bands used in the published figure. However, Dr. Sarkar and Ms. Ali admit to manipulating the original COX-2 band in H3255 cells by straightening bands that were a "... little curved and minor cosmetic changes were made to adjust with the rest of the figure" (Shadan-Response, p.10). The image submitted for the EGFR bands in Figure 4B was not the original but a "duplicate autoradiogram for EGFR" that "also shows similar results." (Shadan-Response, p.10). In Figure 4C, the submitted E-Cadherin image appears to contain the same bands as the published figure, although manipulated. Dr. Sarkar and Ms. Ali explained that "in figure 4C in H1650 two combinations were included in the gel but we only used one combination in final figure and also the first lane is positive control" (Shadan-Response, p.10). Dr. Sarkar and Ms. Ali wrote that in the "H1650 cell line there was no expression of pAkt both in the untreated and also treated with either (Gef) or (Erl) and in combination with Gen" (Shadan-Response, p. 10). Dr. Sarkar and Ms. Ali submitted images for the pAkt and β-actin bands that do not appear to match the published figure (Shadan-Response, p.10). It is not clear when the duplicated images were generated, but they could have been repeated for purposes of the response, as indicated in Ms. Ali's testimony (Ali Transcript, V.2, pp.225-226).

ANALYSIS:

See DIO4915 Image File D, slides 536-541.
Simple visual inspection shows cutting and pasting of: the bands labeled "Gef+Gen" in the COX-2 row in Figure 4A; the bands labeled "Gen 25 μM" and "Erl+Gen" in the COX-2 row of Figure 4B; and the bands labeled "Gen 25 μM" and "Erl+Gen" in the EGFR row in Figure 4B (DIO4915 Image File D, slide 538 & 539). The Committee was not able to find original data for these experiments and Dr. Sarkar and Ms. Ali were able to provide the original image only for the COX-2 results of Figure 4B. The pAkt image in Figure 4C appears to be a uniform gray box rather than an image taken from a film made of an actual gel (DIO4915 Image File D, slide 540). The Committee concluded that Ms. Ali created Figures 4A, 4B, and 4C since Ms. Ali stated that she had created the published figure (Ali Transcript, V.2, p.225, ll.19-22) and this allegation was included in the "Shadan-Response" document submitted by Dr. Sarkar.

The Committee analyzed the duplicate autoradiogram for the COX-2 results of Figure 4A and concluded it did not show "similar results" as claimed by Dr. Sarkar and Ms. Ali (DIO4915 Image File D, slide 539-541). Instead, the published and duplicate images look quite different, which would lead to different conclusions. Most notably, in the duplicate experiment, the highest COX-2 expression levels are seen for the genistein-only treatment. This disparity calls into question the authenticity of the published data.

Dr. Sarkar and Ms. Ali admitted that the COX-2 lane in Figure 4B was manipulated because the lane was curved and stated that this constitutes "minor cosmetic changes" (Shadan-Response, p.10). However, the

Committee concluded that these changes more than merely cosmetic. Rather the manipulation appeared to be done to imply that the COX-2 blot was from the same original gel as the other blots depicted in Figure 4B. Note that while the COX-2 bands are highly curved, the bands for the other proteins detected from this gel (e.g., EGFR, pAkt, β-actin) have a straighter presentation, indicating that these different proteins are likely blotted from different gels (DIO4915 Image File D, slides 538-539). Further, the far right band in the original image labeled "Erl+Gen" appears to be much lighter in the published figure than in the submitted image, indicating further manipulation to exaggerate the effect of the combined "Erl+Gen" treatment. The submitted duplicate EGFR image also is quite different from the manipulated image published in Figure 4B (DIO4915 Image File D, slide 539). The most obvious difference is the relative intensity of the right-most EGFR band in the "Erl+Gen" condition, compared to other treatments. While the duplicate image indicates that EGFR expression level is somewhat reduced by "Erl+Gen" treatment, this effect was exaggerated in the published image with the pasting in of the relatively very light rightmost band. This also calls into question the authenticity of the published data.

With regard to Figure 4C, the Committee concluded that the pAkt lane in the published figure was not taken from an original image. Rather some generic negative blot image appears to have been used to indicate a lack of pAkt expression in these cells. Initially Ms. Ali testified that this figure was constructed similarly to Figure 3C of **Allegation 23**, where she admitted that a generic negative gray image was re-utilized and presented four times to indicate a lack of expression for different proteins in different cell lines (Ali Transcript, V.2, p.225, ll.19-25 and p.229, ll.5-14). However, she subsequently contradicted this explanation, saying that the published "blank" pAkt image was derived from a film scan of the actual pAkt blot (Ali Transcript, V.2, p.229, ll.15-23).

The Committee concluded that the submitted E-Cadherin image corresponds to the published E-Cadherin image of Figure 4C, although the published image was manipulated to remove some of the bands. Dr. Sarkar and Ms. Ali admit to this manipulation. The Committee also concluded that the β-actin image submitted in the response is not the source β-actin image published in Figure 4C, since the bands in the submitted image are of different shapes and orientations. The Committee cannot verify the origin of the β-actin images used in the published figure or in the response. The Committee concluded that it is unlikely that either the published or the submitted β-actin images represent data that are authentic loading controls for this experiment.

CONCLUSION:

The Committee finds, in **Allegation 56**, that the Western blot images of **Figures 4A, 4B, and 4C**. in **Reference #196** are re-ordered and manipulated to misrepresent the results. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified data in Figures 4A, 4B, and 4C, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 52 (**Reference #213**): Li, Y., Wang, Z., Kong, D., Li, R., Sarkar, S.H., Sarkar, F.H. Regulation of Akt/FOXO3a/GSK-3β/AR signaling network by isoflavone in prostate cancer cells. J Biological Chem 283(41) 27707–27716 (2008).

Publication History: Received: December 13, 2010; Accepted: February 10, 2011; Published: online March 9, 2011
NIH Funding: 5R01CA083695 and 5R01CA101870 (PI: F.H. Sarkar)
Other Funding: Puschelberg Foundation

Allegation 57: There are multiple panels in Figure 1 (A, B, C [bottom part], D & F). Each appears to have multiple instances of cutting and pasting throughout, especially "Isoflavone" columns in 1A, 1B, 1F, as well as cropping (β-actin bands), blurring out/masking of specific blots, especially in Figure 1B, certain "Nuclear" pFOXO3a(Ser253) & AR bands. These manipulations raise concerns of fabrication or falsification (DIO4915 Image File D, slide 543).

Allegation 58: In Figure 2B, there are multiple instances of what appear to be pasting over or blocking out of images, especially in the "No / Isoflavone +" column for the Akt and p-Akt(Ser473) rows, the "Emp Vector / Isoflavone +" column for the p-Akt(Ser473) row, and all 4 "Isoflavone +" columns in the p-AR(Ser213) row (DIO4915 Image File D, slide 552).

RESPONSE:

Dr. Sarkar wrote that they "...did not paste, blur, or mask specific blot in Figure 1" or Figure 2B, and argued that isoflavone inhibits expression of the proteins tested so "...the signals of these proteins in the blot are very weak." He submitted "the original scan" for both Figure 1 and Figure 2B (DIO4915 Image File D, slides 545, 547, 458). Also, "when compositing Figure 1C and 1F, several extra lanes were cut out and a white space ... indicates the blot was cut or from different blot following the author instruction of the Journal" (file: "allegation 57.doc, p.1; DIO4915 Image File D, slide 548-549). Regarding Allegation 58, Dr. Sarkar provided the original 8-lane gels that match the images from Figure 2B. Finally, the "signal in green-square in original scan is same as the signal in red square questioned by committee in the published article (file: "allegation 58.doc, p.1; DIO4915 Image File D, slide 553).

ANALYSIS:

See DIO4915 Image File D, slides 542-553.
For Allegation 57, close visual examination of the published bands in Figures 1A, 1B, 1C, 1D and 1F does not show clear evidence of masking or blurring images as alleged (DIO4915 Image File D, slides 544, 546, 549). This is confirmed by the matching scans submitted by Dr. Sarkar (DIO4915 Image File D, slides 545, 547-548 & 550). In comparison to these originals, the publication appears to show a consistently higher contrast in the reproduced images (cf, Figure 1D; DIO4915 Image File D, slides 546 & 552). Altering contrast may exaggerate the appearance of manipulation. While the original data provided in the response clearly show that Figures 1A, 1C and 1F were composed of cut and pasted bands, there are outlines (Figure 1A) or white lines (Figures 1C & 1F) included by Dr. Sarkar to indicate the pasting (DIO4915 Image File D, slides 544 & 549). The small white space evident in Figures 1C and 1F between lanes 3 and 4 may be an unconventional mark to indicate the composite, but it is consistent with the journal's guidelines (http://www.jbc.org/site/misc/ifora.xhtml#manipulation; downloaded 1/29/15). The rows of bands in each panel in Figure 1 are also outlined indicating the panels are composed of separate rows of bands. The main issue with Figure 1A is that the 3 right-hand lanes are demarcated from the rest and could be either from separate parts of the same gel or from different gels (DIO4915 Image File D, slide 544). Therefore, although the figures are mosaic composites and may be using lanes from multiple films or exposures, as in Figure 1A, which would be inappropriate because comparisons of intensity from band to band across a row require that the bands come from the same exposure, the Committee finds that there is insufficient evidence of an intent to deceive.

Similarly for Allegation 58, close visual examination of the published bands in Figure 2B do not show clear evidence of masking or blurring images (DIO4915 Image File D, slides 552-533). This is confirmed by the matching scans submitted by Dr. Sarkar so that the published images are consistent with the original data.

CONCLUSION:

The Committee finds, for **Allegation 57**, regarding multiple panels in **Figure 1** of **Reference #213**, that while there is an inappropriate composite of separate gels, and while there may be unconventional marks indicating the composite, there is insufficient evidence of misrepresenting the research record by Dr. Sarkar. The Committee also concludes, for **Allegation 58** regarding Figure 2B, there is insufficient evidence of manipulations that misrepresent the results and so no research misconduct.

Paper 53 (**Reference #217**): Ali, S., Banerjee, S., Ahmad, A., El-Rayes, B.F., Philip, P.A., Sarkar, F.H. Apoptosis-inducing effect of erlotinib is potentiated by 3,3'-diindolylmethane *in vitro* and *in vivo* using an orthotopic model of pancreatic cancer. Mol Cancer Ther 7, 1708-1719 (2008)

Publication History: Received: November 2, 2007; Revised: April 11, 2008; Accepted: April 22, 2008; Published online
NIH Funding: None cited.
Other Funding: Guido Foundation
Note: "S. Ali and S. Banerjee contributed equally to this work."

Allegation 59: In Figure 3, there are cuts and pastes throughout; blurring or masking of some cells, especially across most or all columns for EGFR, pEGFR and cleaved PARP proteins under the MiAPaCa cells, and the first column of PARP and the last column of EGFR for BxPC-3 cells, all that indicate fabrication and/or falsification (DIO4915 Image File D, slide 555).

Allegation 60: In Figure 5A, there is cutting and pasting in every other column (e.g., control, B-DIM, Er, celocoxib, ...) in the BxPC-3 cell blots for the N NFκB and cyto NFκB lanes, suggesting fabrication.

RESPONSE:

Allegation 59: Dr. Sarkar wrote in file "Shadan-Response.doc" (p.12) in February, 2014, that: "As can be seen from original autoradiogram of EGFR with cell line BxPC-3 there is no cut and paste. As with EGFR and pEGFR with cell line MIAPaCa there were no visible bands both with untreated and treated cells with BDIM or Erlotinib (Er) also known as OSI or in combination treatment as can be seen from the original autoradiograms. PARP antibody shows 2-3 bands, one of which represent cleaved PARP, which does not show with untreated controls due to lack of apoptosis, hence no visible band. In MiAPaCa cells the cleaved PARP was also not visible for erlotinib treatment, which can be seen in the duplicate autoradiogram."

Allegation 60: Dr. Sarkar wrote in file "Shadan-Response.doc" (p.13) in February, 2014 that they "... were unable to find the autoradiograms that were scanned for publication. However, the duplicate autoradiogram also shows similar results."

ANALYSIS:

See DIO4915 Image File D, slides 554-567.
Regarding Allegation 59, potential source image files were found on this directory:
E:\12\[NTFS]\Documents and Settings\alis\My Documents\BDIM+OSI\
where there are also the figures published in Reference #217. Some .jpg files with relevant file names are found of cropped published bands in this directory, but no images were found of original Western blots (DIO4915 Image File D, slides 556-557; 561). These files show the same cutting and pasting as the

published bands (DIO4915 Image File D, slide 562). Two files labeled for PARP bands in BxPC-3 cells ("\parp(BxPC-3)a.jpg" and "\Composite(BxPC3)a.jpg") do not match the PARP bands published in Figure 3 (DIO4915 Image File D, slide 556). There are blank gray images labeled for EGFR and pEGFR in MIAPaCa cells. The only image on the computer drive that matches the published PARP band in MIAPaCa cells ("\parp(MIAPaCa)a.jpg") has side bars indicating it was saved after Figure 3 was made and so cannot be the source (DIO4915 Image File D, slides 558-559). Other versions of the PARP band in files "\Composite(MIAPaCa)a.jpg" and "\Survivin,Bcl2,Bcl-xl,EGFR,PARP,actin MIAPaCa.jpg" appear to match the upper row of the published PARP bands, but the lower rows are blank indicating the PARP bands were fabricated from multiple images (DIO4915 Image File D, slides 558-559).

No images found on: "E:\12\[NTFS]\Documents and Settings\alis\My Documents\BDIM+OSI\ match the images of larger scans submitted by Dr. Sarkar in "Shadan-Response.doc (pp.12-13); only smaller, apparently cropped images were found (DIO4915 Image File D, slide 561). The images of gels provided in Shadan-Response.docx for the PARP images (both BxPC-3 and MIAPaCa in Figure 3 are not the same gels as were used to prepare the published images (DIO4915 Image File D, slides 561-562), nor do they match the images found on the computer drive (DIO4915 Image File D, slide 563). The submitted PARP image is also unlikely to be the same experiment given the extra band visible between the short and long isoforms of the PARP protein for BxPC-3 (DIO4915 Image File D, slides 562-563). In the MIAPaCa experiment for PARP, either two separate images were used for the long and short forms of the PARP protein, or the gel image was manipulated to make the space between the bands smaller. The submitted PARP bands do not match the published image; no putatively original bands were submitted for the upper PARP bands in MIAPaCa cells (DIO4915 Image File D, slide 563).

In the EGRF panel in MIAPaCa cells, a blank gel was produced to represent the data in that panel. However, without positive controls, it is impossible to determine the validity of such an experiment or whether the experiment was even run. When pressed to produce laboratory notebooks to document negative experiments like these, Ms. Ali could not direct us to the pages of her laboratory notebooks, nor could she produce the actual data associated with any such experiments (DIO4915 Image File D, slides 560; 562-563).

Regarding Allegation 60, similar to Allegation 59, potential source image files for Figure 5A were found on the same directory for Reference #217:

E:\12\[NTFS]\Documents and Settings\alis\My Documents\BDIM+OSI\."

No images of original Western blots were found. Composite images matching bands in Figure 5A were found. These files show the same cutting and pasting as the published bands. The bands matching the "NNFκB" row are in the file named: "\BxPC-3 P65 trans (membrane).jpg". The bands matching the "cyto NFκB" row are in file: "\BxPC-3 P65 trans (cytosol).jpg". The bands matching the "β-actin row are in file: "\b-actin(trans)BxPC-3.jpg") (DIO4915 Image File D, slides 555-556). There are other files with bands composing some of the lanes in the final figure, but not all. There are no labels for any lane in any of these files on the computer drive. Dr. Sarkar and Ms. Ali wrote that they "... were unable to find the autoradiograms that were scanned for publication" but files matching published images were found by the Committee on:

E:\12\[NTFS]\Documents and Settings\alis\My Documents\BDIM+OSI\.

The Committee finds it difficult to believe that Dr. Sarkar and Ms. Ali could not find these original scans. As admitted by Dr. Sarkar and Ms. Ali, the images they did submit for Figure 5A do not match the published images (or the images found on the computer drive). The submitted scans have no information identifying about where they come from.

CONCLUSION:

The Committee finds, for both **Allegation 59** and **Allegation 60**, when comparing the published images to files on the computer drives, that there is clear evidence of cutting and pasting that appears to misrepresent the results. The Committee finds that the responses provided by Dr. Sarkar do not address the issue of image manipulation in published **Figures 3** or **5A**. The Committee finds that due to the disregard for basic standards of scientific record keeping, there is insufficient evidence to allow the work to be validated. The Committee finds that Ms. Ali clearly manipulated elements of the images in Figures 3 and 5A. The Committee finds that Dr. Sarkar's failure to submit original scans from the research record is evidence of research misconduct, and suggests he may have been trying to hide the fabrication. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3 and Figure 5A in **Reference #217**, and that in each instance this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 54 (**Reference #226**): Wang Z, Yu BW, Rahman KM, Ahmad F, Sarkar FH (2008) Induction of growth arrest and apoptosis in human breast cancer cells by 3,3-diindolylmethane is associated with induction and nuclear localization of p27kip. *Mol Cancer Ther* **7**: 341-9.

Publication History: Received: July 16, 2007; Revised: November 16, 2007; Accepted: December 28, 2007; Published: February, 2008.
NIH Funding: None cited.

Allegation 61: In Figure 3B, the DMSO-treated p27 row look like the 3 right lanes were blurred out/masked.

Allegation 62: In Figure 4B, there appears to be cut and pasting in every other column in the MEK row. In the MEK row, lanes 1-4 appear to be the same images as in lanes 6-10, but flipped horizontal. Also, in all the cytosol fraction columns (labeled: "C"), the Rb row appears to be blurred out/masked, suggesting falsification.

Allegation 62b: In Figure 2B, the images used in the P-Akt, Akt, and Actin bands, and the first 2 lanes of the P27 band, appear to be duplicates of the same image. This suggests falsification or fabrication of data.

RESPONSE:

As part of Dr. Sarkar's second response letter, a section contributed by the first author, Dr. Wang, indicated that the experiments of this paper "were done by the fourth author Fakhara Ahmad who left the lab many years ago and no further contact information is available. We do not have any records for these results" (Wang Response-2.docx; p.1). Dr. Wang testified similarly (Wang Transcript, V.2, p.377-378), and also that the manuscript was put together by Dr. Bennett Yu, who sent an early draft of this manuscript to Dr. Sarkar. Dr. Yu is the second author. Dr. Wang testified that he was listed as first author because he edited and rewrote the manuscript and perhaps also because he helped to direct Ms. Ahmad's research ("we designed this project"; Wang Transcript, V.2, p.378). In sum, neither Sarkar nor Wang provided any information relevant to these three allegations.

ANALYSIS:

See DIO4915 Image File D, slides 568-578.
Initial visual examination of Figures 2B, 3B and 4B in the pdf of the published manuscript shows potential evidence of image manipulation as alleged because of the considerable overall similarity among the

bands. Extensive searching of the sequestered hard-drives for original files found only six relevant files on Dr. Sarkar's desktop computer:

E:\OriginalData\2\dirCopy\ocumen~1\sarkarf\Desktop\Desk-T~1\Desk-T~2\Dr.Sa~3\Breast~6\MCT\), including the manuscript text (MCT-07-0476 11162007.doc) and the figures as published (figure-2.tif, figure-3.tif & figure-4.tif). These files were created on November 16, 2007, the date the revised manuscript was resubmitted to the journal. The Committee concludes that these are final versions sent to Dr. Sarkar by Dr. Wang for the revision, but the source files and scans of films were not found. These .tif images, at higher resolution that the .pdf file of the publication, provided a clearer view of the alleged image manipulations (e.g., splicing & masking). Analyses of all these images proved largely exculpatory.

Allegation 61: Manipulations consistent with blurring out or masking of the three rightmost lanes of the p27 row in Figure 3B are not evident within the higher-resolution .tif image (figure-3.tif; DIO4915 Image File D, slides 569-570). This figure appears to be authentic.

Allegation 62 is that there are 3 irregularities for Figure 4B: 1) apparent splicing between every other lane within the MEK image, 2) apparent duplication and inversion of four gel-band segment within the MEK image, and 3) apparent masking of bands in all of the "C" lanes within the Rb image. First, the high-resolution figure-4.tif shows no evidence of splicing between every other lane within the MEK image (DIO4915 Image File D, slide 571). Rather, the MEK image appears to be authentic. Likewise, there are no indications of splicing that would be expected for the alleged duplication and inversion of the four-band segment within the MEK image (DIO4915 Image File D, slide 572). Also, the bands themselves do show characteristic irregular shapes and that initially appear to be reproduced and inverted within the MEK row. However, closer inspection of each segment in the higher resolution .tif image reveals a finer set of unique irregularities not reproduced or inverted within the bands. This image, too, is authentic and not manipulated. Finally, regarding the alleged masking within the Rb image, again initial inspection of the image extracted from the .pdf file suggests masking due to apparent monotone gray rectangles in many of the "C" positions of the Rb bands. However, these monotone rectangles are not evident in the high-resolution figure-4.tif (DIO4915 Image File D, slides 573-575). Thus, the appearance of potential manipulations in the published figure seem likely to be an artifact of poorer resolution in the down-loaded publication. The Rb bands appear to be authentic.

Allegation 62b is that an image is re-used within all the rows in Figure 2B. Here again, many bands show characteristically irregular shapes appearing as if 'signature' shapes reproduced inappropriately in several bands (e.g., the blots in the rows for P-Akt and Akt panels look nearly identical). However, close inspection of the higher-resolution "figure-2.tif" finds many small features that clearly distinguish the two rows (DIO4915 Image File D, slide 576). Further, it is noted that these two rows are detecting the same Akt protein species with antibodies to either the phosphorylated form (P-Akt) alone, or both phosphorylated and unphosphorylated forms together (Akt). Thus, the particular band irregularities, imposed during gel electrophoresis, would be expected to be duplicated in both. A similar phenomenon may also explain the similarities of the P-Akt/Akt images to the Actin and p27 images. As all of these images are described as being derived from a Western blot of a single gel, irregularities imposed by the gel electrophoresis within a particular lane might be expected to be visualized in all of the individual proteins of that sample. Thus, a characteristic deformity seen for a Akt band might also be seen for other proteins from this same lane or sample, e.g. for Actin or p27. While the β-actin and p27 rows also show gross similarities with images in the P-Akt and Akt bands, close inspection of the higher-resolution figure-2.tif also reveals distinguishing patterns of small differences (DIO4915 Image File D, slides 577-578). In sum, all four of the Figure 2B rows are unique and distinguishable from one another and so appear to be authentic.

CONCLUSION:

The Committee finds in **Allegations 61, 62 and 62b** that the responses and subsequent analyses explain the published data and there is no evidence of research misconduct associated with **Figures 2B, 3B or 4B** in **Reference #226.** However, the Committee notes that the inability of Dr. Sarkar to provide the original data, or of the Committee to find relevant data in sequestered hard-drives, is another example of the lack of standard lab practices for data management and security in his laboratory, whether the data were lost, were taken by exiting lab personnel (i.e., Ms. Ahmad or Dr. Yu), or poorly labeled/indexed. The Committee concludes there is insufficient evidence that Dr. Sarkar or Dr. Wang engaged in research misconduct in Reference #226.

Paper 55 (Reference #231): Wang Z, Kong D, Banerjee S, Li Y, Adsay NV, Abbruzzese J, Sarkar FH (2007) Down-regulation of platelet-derived growth factor-D inhibits cell growth and angiogenesis through inactivation of Notch-1 and nuclear factor-kappaB signaling. *Cancer Res* **67**: 11377-85.

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NIH Funding: 5R01CA101870-05 (F.H. Sarkar) and 1P20-CA010193-01 (J. Abbruzzese).
Note: "Z. Wang and D. Kong contributed equally to this work."

Allegation 63: In Figure 2C, several blot images appear to have been cut and pasted and/or blurred out/masked for the PDGF-D bands: (top panels) the MIA PaCa and PANC-1 lanes (lanes 6 & 7); (middle panel) the "PS" lanes for the BxPC-3, Colo-357 and MIA PaCa cells (lanes 2, 4 & 6); (bottom panels) the "CP" lane for the MIA PaCa cells (lane 5). These manipulations indicate fabrication or falsification (DIO4915 Image File D, slide 580).

RESPONSE:

Dr. Sarkar submitted a response including materials apparently provided by Dr. Wang (Wang Response.pptx, slide 8) showing scans for the three PDGF-D Western blot rows in Allegation 63 (DIO4915 Image File D, slide 582). For the top PDGF-D panel, they provide what they purport to be the original film scan for the published data, writing that "the original PDGF-D autoradiogram showed no error for Fig 2C top panel". For the lower two PDGF-D panels, Dr. Sarkar and Dr. Wang wrote that they were unable to find the original films or film scans used for the published images. They instead provide film scans which they purport to be "duplicate autoradiograms from the same set of replicate experiments showing similar results".

ANALYSIS:

See DIO4915 Image File D, slides 579-583.
Visual inspection finds cut/paste marks in each of the three PDGF-D rows (DIO4915 Image File D, slide 581), indicating that these images were assembled by splicing together either different film scans or different portions of the same film scan. In contrast to what Dr. Sarkar and Dr. Wang claim, a simple visual comparison of the submitted "original" scan (DIO4915 Image File D, slide 582) shows that the top PDGF-D row also is not the source of the bands in the published figure (DIO4915 Image File D, slide 583). Dr. Sarkar and Dr. Wang were unable to provide original data for all three of the PDGF-D rows. This suggests that they either cannot find the data, or that the original data does not exist. This could also indicate that they tried to deceive the Committee.

CONCLUSION:

The Committee finds, in **Allegation 63**, that there is cutting and pasting and masking of Western blot images within all three of PDGF-D rows in **Figure 2C** of **Reference #231**. Dr. Sarkar submitted in response an image he and Dr. Wang claimed was original data. However it was not the same data. The inability of Dr. Sarkar to provide original films for any of these images suggests such data do not exist. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 2C and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. Although noted to be a co-first author, there is no evidence that Dr. Kong contributed to Figure 2C in Reference #231.

Allegation 64: In Figure 4A, a portion of the Notch-1 image from the upper composite of Figure 4A is duplicated and relabeled Bcl-2 in Figure 5 of Wang et al. (2006) Mol Can Ther **5**: 483-493 (Paper 64; Reference #277; see **Allegation 74**). In the lower panel of Figure 4A, apparent manipulations of BxPC-3/MIA PaCa cells for the bottom Notch-1 bands include being stretched and pasted over different background (DIO4915 Image File D, slide 584).

NOTE: In addition, there is duplicate use of Rb and/or β-actin bands in this paper – see **Allegations 82e, 86b, 94b, 94c, 94d**, and **94e**. And see also **Allegation 131** under Paper 41.
See: DIO4915 Image File G, slides 863-864, 934; and File H, slides 1038-1043.

RESPONSE:

This first part of Allegation 64 is that in Figure 4A, a composite of Western blots, the image published as "Notch-1" duplicates the bands published as "Bcl-2" in Figure 5 of Paper #64 (Ref #277). Dr. Sarkar submitted in response, with apparent contributions from Dr. Wang, that this duplication is a mistake. They wrote that "Bcl-2 was inadvertently labeled as Notch-1 in Figure 4A... [and] we found the autoradiogram for Notch-1 in Figure 4A" (file: Wang Response.docx, p.1). They provided a scan of a film that they purport to be the true Notch-1 Western blot result (DIO4915 Image File D, slide 585). Dr. Wang testified that he was responsible for both Figure 4A in Reference #231 (Paper 55) and Figure 5 in Reference #277 (Paper 64). Further, Dr. Wang indicated that his re-use of the same image as both Notch-1 and Bcl-2 in two different papers was an inadvertent mistake, which he suggested was likely the consequence of inadequately labeling of films from different Western blots done for the two papers, roughly contemporaneously [Wang Transcript, V.2, pp.341-344].

This second part of Allegation 64 is that in the lower panel of Figure 4A there are manipulations (cutting & pasting) within the Notch-1 bands (DIO4915 Image File D, slide 584). Dr. Sarkar submitted in response that they – meaning Dr. Wang and Dr. Sarkar – were unable to locate the original film or film scans published in the lower panel of Figure 4A. Dr. Sarkar submitted a film scan purported to be "duplicate autoradiogram from the same set of replicate experiments showing similar results". The apparent manipulations in the published image were not addressed by Dr. Sarkar or Dr. Wang.

ANALYSIS:

See DIO4915 Image File D, slides 584-588.
For the first part of Allegation 64, visual inspection of these two Western blot panels finds that the left-hand, 3-lane segment of both the Notch-1 bands (Figure 4A/Reference #231) and the Bcl-2 bands (Figure 5/Reference #64) derive from the same image, while the right-hand 3-lane segments differ (DIO4915 Image File D, slide 586). Visual comparison of these rows shows clearly that lanes 1 to 3 are duplicates,

with matching unique marks (DIO4915 Image File D, slides 586-587). In addition to this duplication, multiple cut/paste marks are evident in both images (DIO4915 Image File D, slides 586-587). Lane 4 in Figure 5 of Reference #277 is pasted in, showing cut marks as well as the far right edge of the underlying band (DIO4915 Image File D, slide 586 – lower right). The bands in the two rightmost lanes of the Bcl-2 panel (Figure 5, Paper 64) have been masked by overlaid gray rectangles (see Allegation 74). Further, in contrast to the captions in Reference #231, where lanes 1 to 4 in BxPC-3 and HPAC cells are treated with control ("CS") versus PDGF-D siRNA ("PS"), in Reference #277, the same images are captioned with control ("CS") versus Notch-1 siRNA ("NS"). The responses do not address the duplication between publications.

For the second part of Allegation 64, visual inspection shows clear evidence (cut marks) that lane 1 in the Notch-1 row in the lower-panel of Figure 4A is pasted in and that this image is not authentic (DIO4915 Image File D, slides 588). The inability of Dr. Wang and Dr. Sarkar to provide the original data for this image suggests the experiment was not done.

CONCLUSION:

The Committee finds, in **Allegation 64**, that there is clear duplication and re-labeling of Western blots bands in both the upper and lower panels of **Figure 4A** of **Reference #231**. The Committee finds the explanation by Dr. Sarkar that the duplicate reuse of a single image to represent two different proteins with two different treatments in two different papers was due to inadequate labeling not to be not credible, particularly given the manipulation of lanes (cutting & pasting). The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published falsified and/or fabricated results, and that in each instance this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 56 (**Reference #234**): Gadgeel, S.M., Ali, S., Philip, P.A., Ahmed, F., Wozniak, A., Sarkar, F.H. Response to dual blockade of epidermal growth factor receptor (EGFR) and cycloxygenase-2 in nonsmall cell lung cancer may be dependent on the EGFR mutational status of the tumor. Cancer 110: 2775–2784 (2007)

Publication History: Received: May 14, 2007; Revision received: July 5, 2007; Accepted: July 11, 2007.
NIH Funding: None cited.
Other Funding: Astra-Zeneca (PI: S.M. Gadgeel); OSI Pharmaceuticals (PIs: S.M. Gadgeel, P.A. Phillip & A. Wozniak); Pfizer (PI: S.M. Gadgeel).

Allegation 65: In Figure 1A, several Western blot lanes appear to be "smudged out" or masked. Specifically, for the COX2, P-STAT-3 and p-Akt bands, the lanes in the (left) H1650 column; and for the pEGFR and P-STAT-3 bands in (middle) H1781 cells (DIO4915 Image File D, slide 590).

Allegation 66: In Figure 5A & 5B, several lanes for both H1650 and H3255 appear to have images that are pasted over/masked or blurred. Specifically, in the H3255 cells (top panels), the right lanes of the pEGFR bands appear blurred. In the Akt band in Figure 5B (left panels), lane 4 (Gef+Cel column) appears to be masked over. In the lower H1650 panels, the COX-2 and pAkt bands on both Figure 5A and 5B, all lanes appear to be masked over (DIO4915 Image File D, slide 594).

RESPONSE:

Dr. Sarkar submitted a response and "original autoradiograms," with contribution from Ms. Ali, and wrote that for Allegations 65 and 66, "as can be seen from scanned images they are exactly same as seen in the published figure" (Shadan-Response.docx, pp.14-15; DIO4915 Image File D, slides 591; 596). Ms. Ali

testified that she did the experiments and that Dr. Gadjeel wrote the paper (Ali Transcript, V.3, p.335, ll.13-34). She said she ran three blots at the same time and that blank area are as they appear in the original gels (Ali Transcript, V.3, p.336, ll.17-22). Ms. Ali testified she did not paste in gray boxes but that for each lung cancer cell lines, the non-expressed bands are as they appeared in the each of the blots and they were unique blots for each cell type that she actually ran (Ali Transcript, V.3, p.337, ll.12 to p.338, ll.18).

ANALYSIS:

See DIO4915 Image File D, slides 589-600.
Visual examination of the rows in Figure 1A seem to show one possible faint cut mark in the "P-STAT" row and masking in others, but the pixilation appears to be consistent with most of the rest of the figure and so manipulations appear unlikely at first (DIO4915 Image File D, slide590). However, visual comparisons of the submitted original scans to the published images show that masking was used to eliminate stray blots/blemishes from the p-EGFR and p-STAT-3 bands, as well as some other kind of manipulations reduce the size and intensity of the Cox-2 blot in the H1782 cells (DIO4915 Image File D, slide 592-593), and so to exaggerate the relative differences in expression of Cox-2 among the cell types. So the published images are not the same as the submitted "originals," contrary to what Dr. Sarkar and Ms. Ali wrote: "... they are exactly same as seen in the published figure" (Shadan-Response.docx, pp.14).

For Allegation 66, visual examination of the upper rows in Figures 5A and 5B show evidence of masking in the p-EGFR bands in Figure 5A (H3255 cells; DIO4915 Image File D, slide 595). Visual comparisons of the submitted original scan to the published image shows clearly that masking was used to eliminate stray blots from the p-EGFR bands in Figure 5A (H3255 cells), and the submitted "original" does not match the published bands for the p-EGFR bands in Figure 5B (H3255 cells; DIO4915 Image File D, slide 596), contrary to what Dr. Sarkar and Ms. Ali wrote: "...they are same as seen in the published figure" (Shadan-Response.docx, pp.15). The published Akt bands in Figure 5B (H3255 cells) appear to have been squeezed and maybe rotated to align the bands straighter (DIO4915 Image File D, slides 597-598). The regions indicated in the "original" scans where there would be expression of Cox-2 and Akt in H1650 cells show none of the pixilation and blemishes seen in the published versions. There are no features at all in the so-called "original" scans as would be expected if these images were data from experiments that were run (DIO4915 Image File D, slides 599-600).

CONCLUSION:

The Committee finds in **Allegation 65**, that masking and other manipulations altered the appearance of certain Western blots published in **Figure 1A** in **Reference #234** beyond "cosmetic" changes, and that these alterations changed the results. The Committee finds in **Allegation 66**, that there was masking in p-EGFR bands of the H3255 cells in Figure 5A, and finds no evidence that the "data" published as non-expressed Cox-2 and Akt in the H1650 cells in **Figures 5A and 5B** are anything other than plain gray boxes. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified data in Reference #234 and that in each instance this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Paper 57 (**Reference #244**): Banerjee S, Hussain M, Wang Z, Saliganan A, Che M, Bonfil D, Cher M, Sarkar FH (2007) In vitro and in vivo molecular evidence for better therapeutic efficacy of ABT-627 and taxotere combination in prostate cancer. *Cancer Res* **67**: 3818-26.

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NIH Funding: not cited.
Other Funding: Abbott Laboratories, Chicago, IL

Allegation 67: In Figure 4D, the Bcl-xL, Bcl-2 & Bax & survivin bands are covered up and blurred with masking boxes; For PARP, the first lane ("-/-" condition) showing the cleaved fraction ('85kDa'), was covered up with some kind of overlay/masking. The survivin band is squeezed together more than the others and the 4th lane of survivin ('+/+" condition) appears blurred over. These manipulations indicate falsification and/or fabrication (DIO4915 Image File D, slide 602).

RESPONSE:

Dr. Sarkar submitted materials, contributed to by Dr. Banerjee, including images of scans that he wrote are original images (Banerjee-Response.pptx, slide 5; DIO4915 Image File D, slides 603-604). They submitted film scans for four of the five bands in question in Allegation 67. For the fifth, i.e. Bax, Dr. Banerjee and Dr. Sarkar wrote that the original film could not be located and consequently point to the "Bax.jpg" image file on the sequestered hard-drives as being a "copy of the scanned image". Dr. Sarkar claimed that these "original immunoblot are presented negating these allegations".

ANALYSIS:

See DIO4915 Image File D, slides 601-608.
The Committee finds the four film scans provided byDrs. Sarkar and Banerjee in their response to be authentic sources of the survivin, Bcl-xL, Bcl-2 and PARP bands in Figure 4D. However, a comparison of these original images to the published versions finds that the PARP and the Bcl-xL bands had undergone substantial alterations for publication. For PARP, the provided "original" scan is a 6-lane blot that was cut and pasted together to yield the published 4-lane image (DIO4915 Image File D, slide 605). The PARP image was also substantially compressed vertically (DIO4915 Image File D, slide 605). The Bcl-xL image was substantially cut and pasted to rearrange lanes. The published Bcl-xL image was also flipped vertically relative to the original scan; so that the published version is upside-down relative the other bands. The scan for survivin was rotated 2° CW and squeezed vertically. The scan for Bcl-2 appears not to have been manipulated (DIO4915 Image File D, slides 606-607). For the Bax row, Dr. Sarkar directed the Committee to a source file named "bax.jpg" on the sequestered hard-drives:

E:\OriginalData\8\[NTFS]\Documents and Settings\banerjes\My Documents\April2009\October2008\New Folder (2)\New Folder (3)\bax.jpg; creation date: 03/28/2006.

While the "bax.jpg" image indeed appears to be the source of the published Bax bands, it clearly is not, as described by Dr. Sarkar, just "a copy of the scanned image of the blot" (file: Banerjee- Response.pptx, slide 5), rather it is itself the obvious product of extensive cutting and pasting (DIO4915 Image File D, slide 607). The raw film scan for this image was not identified from the sequestered hard-drives, nor was it provided by Dr. Sarkar or Dr. Banerjee.

Three of the five images questioned by Allegation 67, namely the PARP, the Bcl-xL and the Bax images, clearly have undergone image manipulation. For PARP and Bcl-2, where original film scans were provided, the nature of the manipulation is clear. Both involve a reordering of the gel bands. Samples that were apparently not run in adjacent lanes were brought together through cutting and pasting. In addition to the rearranging, other significant manipulations were imposed on these two images as well: the PARP image is vertically compressed dramatically and the Bcl-2 image is flipped upside-down. The extreme

compression in the PARP image likely was done to fit both PARP rows of bands into the narrow space allocated other proteins. There is no apparent reason for the publishing the Bcl-2 bands upside-down. Regarding cutting and pasting in the Bax bands, original films were not submitted or found on sequestered hard-drives. Since original images were not made available for Bax, there is no way to evaluate how the bands from one or more films, may have been manipulated. In addition, while the PARP and Bcl-xL bands had bands rearranged in the published figure, six of the other seven bands in this composite Western blot show no evidence of cutting and pasting, indicating that the PARP and the Bcl-xL data derive from different gels. While this suggests that Dr. Banerjee did not follow what may be standard protocol for such experiments, where multiple proteins are derived by stripping and re-probing a single gel, there is inconsistency among witnesses about what constitutes "standard protocols" in Dr. Sarkar's lab.

CONCLUSION:

The Committee finds in **Allegation 67**, that there are three instances of image splicing in **Figure 4D** in **Reference #244** where lanes are re-arranged without indicating this was done. Dr. Banerjee is most directly responsible. The Committee determined that these manipulations appeared to be limited to re-arranging lanes and so-called "cosmetic" changes and concludes that there is insufficient evidence that this cutting and pasting and re-sizing rises to the level of research misconduct. This is another example of the accepted, inappropriate practices of image manipulation in Dr. Sarkar's laboratory, and as senior and corresponding author, and laboratory head and director of this research, Dr. Sarkar bears responsibility for these practices in his lab. However, the Committee concludes that there is insufficient evidence of research misconduct by Dr. Sarkar in Allegation 67.

Paper 58 (**Reference #247**): Raffoul, J.J, Banerjee, S., Singh-Gupta, V., Knoll, Z.E., Fite, A., Zhang, H., Abrams, J., Sarkar, F.H., Hillman, G.G. Down-regulation of apurinic/apyrimidinic endonuclease 1/Redox Factor-1 expression by soy isoflavones enhances prostate cancer radiotherapy In vitro and In vivo. Cancer Res 67(5): 2141-2149 (2007)

Publication History: Received: June 12, 2006; Revised: December 18, 2006; Accepted: January 5, 2007
NIH Funding: None
Other Funding: American Institute for Cancer Research 03B108 (PI: Hillman); American Cancer Society ROG-06-097-01 (PI: Hillman).
Notes: The acknowledgements state that Drs. Raffoul, Banerjee, and Singh-Gupta "have equally contributed to this study."
Allegation 68 had been repeated as Allegations 82c and 82d.

Allegation 68: In Figures 2D & 4D, the image for the Rb bands used in Figure 2D as a "nuclear protein loading control' for a Western blot analysis of APE1/Ref-1 in PC-3 cells, is the same image used in Figure 4D for Rb bands used as "an internal loading control" for nuclear extracts "... subjected to EMSA for evaluation of NF-κB DNA-binding activity..." The duplication of the Rb image from different gels for Figures 2D and/or 4D also indicates that the ratios in the graph could not have been properly generated.

Allegation 69: In Figures 5C & 5D, the image for the Rb band used in Figure 5C as a nuclear protein loading control for a Western blot analysis of APE1/Ref-1 in PC-3 primary prostate tumors, is the same image used in Figure 5D for Rb used as an internal loading control for nuclear extracts in an EMSA assay of NF-κB DNA-binding activity. The duplication of the Rb image from different gels for Figures 5C and/or 5D indicates that the ratios could not have been properly generated.

RESPONSE:

Dr. Sarkar responded (file: "Response Letter (2nd)-Feb. 4th-2014.docx") that he was "... NOT responsible..." because was "... not the primary or the senior author." Dr. Sarkar testified about a paper where the "...first author is Raffoul. That's not even in my lab, and whatever that person has done and the question being raised, this is fully independent laboratory. That is where Raffoul has done the work" (Sarkar Transcript, V.2, p.498, ll.6-10). Dr. Sarkar also testified that he was a coauthor because of the "... intellectual contribution" made and that "... Banerjee used to handle machine technique, so he must have assisted in the technology part of it" (Sarkar Transcript, V.2, p.498, ll.20 to p.499, ll.1).

For Allegation 69, Dr. Hillman testified that the Rb bands were the same for Figures 5C and 5D because "...the same nuclear extract were used for APE and for the EMSA assay..." (Hillman Transcript, V.2, p.116, ll.22-24). Similarly for Allegation 68 regarding Figures 2D and 4D, Dr. Hillman testified that the Rb images were the same because the same extract was used (cf., Hillman Transcript, V.2, p.117, ll.1-21). She also testified that she wondered if "... the similarities you see in those bands are due to the fact it is the same amount of protein is loaded" (Hillman Transcript, V.2, p.119, ll.19-21).

ANALYSIS:

See DIO4915 Image File D, slides 609-612.
Evaluation of the enlarged Rb band images in Figures 2D and 4D, and in Figure 5C and 5D, makes clear that the same Rb images are duplicated for different assays (DIO4915 Image File D, slides 610-612). Dr. Hillman explained that the use of the same images was intentional because the same nuclear extract was used for the respective paired EMSA and Western blot assays. It was not clear why Dr. Hillman would admit to using the same Rb images in different figures and later also wonder if the similarities were related instead "... to the fact it is the same amount of protein is loaded" (Hillman Transcript, V.2, p.119, ll.19-21). She later clarified this in testifying that "... there is only one assay done for the Rb" (Hillman Transcript, V.2, p.122, ll.6-7).

Regarding how the duplication of the Rb images in Allegations 68 and 69 would compromise the ratios generated for the bar graphs accompanying Figures 2D and 4D, and Figure 5C and 5D, there is nothing in the methods that says ratios were generated as part of the analyses, and the captions for Figures 2 and 4 state that "mean integrated density value (I.D.V.) of the band per microgram of protein loaded" are portrayed, not ratios.

CONCLUSION:

The Committee finds that the use of repeated Rb bands images in Figures 2D and 4D, and Figures 5C and 5D, may not reflect best practices. The Committee finds no intent to deceive since using the same Rb bands image of the same extract can be legitimate re-use in this case. The Committee concludes that there was no evidence of research misconduct in these instances by Dr. Sarkar in Reference #247.

Note: These other allegations for **Reference #247** are addressed under:

Allegation 83a: The Rb image was re-used (and manipulated) in Figure 2A & 2B (flipped; DIO4915 Image File G, slides 874-885.)

Allegation 83b: The Rb image was re-used (and manipulated) in Figure 4A (soy squeezed horizontally slightly; DIO4915 Image File G, slides 874-885.)

Allegation 83c: The Rb image was re-used (and manipulated) in Figure 4B (soy copied; genistein flipped, stretched and straightened; DIO4915 Image File G, slides 874-885.)

Paper 59 (**Reference #257**) Rahman, K.M., Sarkar, F.H., Banerjee, S., Wang, Z., Che, Liao, D., Hong, X., and Sarkar, N.H. Therapeutic intervention of experimental breast cancer bone metastasis by indole-3-carbinal in SCID-human mouse model. *Mol Cance Ther*: 5(11), 2747-2756 (2006)

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NIH Funding: None cited.
Other Funding: Department of Defense Concept Award – Grant numbers: W81XWH-04-1-0689 and W81XWH-05-1-0505. (PI: Dr. Rahman)

These allegations for **Reference #257** are addressed under:

Allegation 85a: The Rb image was re-used (and manipulated) in Figure 4A (squeezed horizontal; DIO4915 Image File G, slides 930.)

Allegation 85b: The Rb image was re-used (and manipulated) in Figure 4B (flipped horizontal, squeezed vertical; DIO4915 Image File G, slides 930.)

Allegation 86c: The 2-lane Rb image was re-used (and manipulated) in Figure 4C (stretched; DIO4915 Image File G, slides 930.)

Allegation 131: Duplication of an NF-κB supershift assay image from Figure 4E in Paper 41 (Reference #292; DIO4915 Image File C, slides 470-475).

Paper 60 (**Reference #258**): El-Rayes, B.F., Ali, S., Ali, I.F., Philip, P.A., Abbruzzese, J., Sarkar, F.H. Potentiation of the effect of erlotinib by genistein in pancreatic cancer: The role of Akt and Nuclear Factor-κB. Cancer Res 66:10553-10559 (2006)

Publication History: Received: June 26, 2006; Revised: August 11, 2006; Accepted: August 31, 2006.
NIH Funding: 1R01CA101870-03 (PI: F.H. Sarkar); PI of sub contract: F.H. Sarkar; PI/PD of P20: J. Abbruzzese, Specialized Programs of Research Excellence (SPORE) grant SP20-CA 101936-04, to University of Texas, MD Anderson Cancer Center.
Note: "...B.F. El-Rayes and S. Ali contributed equally to this work" as co-first authors.

Allegation 70: In Figure 2A, cutting, pasting, altering and masking appears several lanes, specifically survivin lanes 5, 6 & 7; Bcl-xL lanes 4, 5, 6 & 7, several lanes in Her-2-neu and β-actin, and Cox-2 lane 5. Several other lanes appear to have been removed or blocked out, specifically Bcl-2 lanes 1, 3 & 4, HER-2 lanes 3 & 4, COX-2 lanes 1 & 3, EGFR(170 kDa) lanes 3, 4 & 7, PhosphoAkt lanes 2, 4 & 6. These manipulations indicate falsification and/or fabrication of data. (DIO4915 Image File D, slides 615-616).

RESPONSE:

Dr. Sarkar submitted what he wrote were "all the original autoradiograms..." (Shadan-Response.docx, p.16; DIO4915 Image File D, slide 617). Ms. Ali apparently contributed to the response. Dr. Sarkar responded that while Figure 2A had 7 lanes for "... seven different pancreatic cancer cell lines" the actual autoradiograms used 9 cell lines "... of which lane 6 and 9 were not used in the published figure" which is why lane 6 shows cut marks. Dr. Sarkar and Ms. Ali explained that in the grey lanes "... no visible expression was observed, hence it shows blank" (Shadan-Response.docx, p.16; DIO4915 Image File D, slides 617-618).

ANALYSIS:

See DIO4915 Image File D, slides 615-627.
There is no information provided in or about the films or image files of submitted scans to verify the source of the images. Simple visual comparison of the submitted "original autoradiograms" to the published bands does confirm that lane 6 was cut out and lanes 5 and 7 were spliced together for all rows in Figure 2A (e.g., the survivin & Bcl-xL rows; DIO4915 Image File D, slides 618-626). Closer examination of the submitted survivin scan shows that published lanes 6, 7 and 8 are altered relative to lanes 1 to 6 after cropping and splicing (DIO4915 Image File D, slides 618-619). The submitted scan for Bcl-2 matches the published row, but blemishes on the scan are masked out in the published version (DIO4915 Image File D, slide 621). The submitted scans for the Heu-2-neu, Cox-2 and EGFR do not match the published bands. Published bands for Heu-2-neu (lanes 3 & 4) and Cox-2 (lane 3) show masking (DIO4915 Image File D, slides 622-623), and the originals are not provided. Lane 5 in the EGFR bands shows clear pasting in of an image and the source of that image and all of the EGFR bands is unknown (DIO4915 Image File D, slide 624). The scans for Bcl-xL, Bcl-2 and p-Akt appear to match the submitted originals, however published lanes 1, 3 and 4 in the Bcl-2 row and lane 7 in the p-Akt row are clearly masked to obscure stray marks and a faint band (DIO4915 Image File D, slides 620, 621, 625). The "original" β-actin bands do not match any of the published lanes (DIO4915 Image File D, slide 626).

CONCLUSION:

The Committee finds, in **Allegation 70**, that **Figure 2A** in **Reference #258**, beyond the admitted splicing out of original lane 6, has substantial manipulations throughout that mask lanes, modify or substitute bands, and obscure blots and stray marks. The Committee finds, contrary to the response by Dr. Sarkar and Ms. Ali, that four of the eight rows of data comprising the Western blots in Figure 2A are not from the original autoradiograms as claimed. Further, original or not, in six of the eight rows of bands, the bands in at least 2 lanes, other than the admitted splicing out of lane 6, were clearly manipulated to misrepresent the results. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published falsified and/or fabricated results, and that he knowingly and intentionally misrepresented data submitted in their response to the Committee as "original" when it was not, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 71a: In Figure 5A, cutting, pasting and/or copying in EGFR(170 kDa) lane 4, and for EGFR-p-Tyr the 4th lane which also appears to be the same as the 3rd lane at a different exposure. In Figure 5C, lane 4 for EGFR-p-Tyr appears to be pasted. In Figure 5E, the EGFR(170 kDa) and EGFR-p-Tyr rows appear completely blurred out/masked... (DIO4915 Image File D, slide 627).

RESPONSE:

Dr. Sarkar submitted scans claimed to be of "original autoradiograms" (Shadan-Response.docx, p.17; DIO4915 Image File D, slide 628). He and Ms. Ali wrote that "in figure 5A EGFR band in lane 3 & 4 were curved hence it was aligned to match with the rest of the figure." They responded that the scans show that the EGFR-p-Tyr lane 4 is not "the same as lane 3 at a different exposure," that in Figure 5C, lane 4 in the EGFR-p-Tyr row is not pasted in as it appears, and that in Figure 5E, the original autoradiograms show not that the EGFR and EGFR-p-Tyr rows in MIAPaCa are blurred out, but that "...both untreated and treated did not show any visible expression" of those proteins (Shadan-Response.docx, p.17; DIO4915 Image File D, slide 629).

ANALYSIS:

See DIO4915 Image File D, slides 627-633.
The caption to Figure 5 notes cell lines were treated with nothing (lane 1), or 25 µmol/L genistein (lane 2), or 2 µmol/L erlotinib (lane 3), or both (lane 4). There is no information provided in or about the films or image files of submitted scans to verify the source of the images. The "original" EGFR bands in lanes 3 and 4 in Figure 5A with BxPC-3 cells were re-aligned as admitted, although the shapes were also changed and Lane 2 in the published EGFR-p-Try row does not match the "original" band (DIO4915 Image File D, slide 629). The published EGFR-p-Try row in Figure 5C with HPAC cells does match the "original" bands (DIO4915 Image File D, slide 630). The "original" EGFR and EGFR-p-Tyr rows in Figure 5E with MIAPaCa cells are blank and gray similar to the published rows. But the published rows appear to have edges not seen in the "originals." In fact, there are no features at all in the "originals" and much less pixilation is seen in the area of the "original" scans (when contrast is enhanced) where bands would be than there is elsewhere in the same scan (DIO4915 Image File D, slides 631-632) suggesting that the scan submitted as "original" was itself manipulated. There is no information provided in or about the films or image files of submitted scans to verify the source of the images.

CONCLUSION:

The Committee finds, in **Allegation 71a**, that **Figures 5A** and **5C** in **Reference #258**, appear to be consistent with images submitted as originals, and that there was, as admitted, cutting and re-aligning of bands in Figure 5A. In **Figure 5E**, the Committee finds, contrary to the response by Dr. Sarkar and Ms. Ali, that the gray boxes in the EGFR and EGFR-p-Try rows contain pasted in boxes or are largely blurred or masked, that the size was manipulated, and that the images submitted as "originals" for these blots are themselves manipulated to appear as blank areas. The Committee finds that Dr. Sarkar misrepresented figures submitted as "original" data in responding to the Committee. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5E in Reference #258, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 71b: In Figures 5C & 5D, the Rb bands in Figure 5D is the same image as the β-actin line of Figure 5C (squeezed vertical, squeezed horizontal, background lightened) and the Rb bands in Figure 5B are the same as in Figure 5C in Barve, V., et al., J. Med. Chem 49, 3800-3808 (2006) (Paper 62; **Reference #267**). See DIO4915 Image File D, slide 633.

RESPONSE:

Dr. Sarkar submitted scans of "original autoradiograms" and he and Ms. Ali argue that "at the first glance they do look same, but when you look at it carefully they are similar but not the same" (Shadan-Response.docx, p.18). "The one on the left represent actin blots and the one on the right are Rb blots. According to the investigation the actin of figure 5C is same as Rb of figure 5D. It is also not matching with the autoradiogram that we have. This was not done intentionally, since both figure 5C and figure 5D are in the same row and in same figure 5. We do not recall duplicating it since this study was done in 2005. All the original autoradiograms of actin and Rb (3 actin and 3 Rb of three cell lines) are enclosed" (Shadan-Response.docx, p.18).

ANALYSIS:

See DIO4915 Image File D, slides 634-637.

A comparison shows that the β-actin bands in Figure 5C and the Rb bands in Figure 5D in Reference #258 are the same image (DIO4915 Image File D, slide 634). Dr. Sarkar and Ms. Ali admit that they are the same images and state that this was not intentional. The submitted "originals autoradiograms" for Figure 5C, confirm that the scan labeled "HPAC & MIAPaCa actins" matches the HPAC β-actin bands in Figure 5C and the Rb bands in Figure 5D. Neither Dr. Sarkar nor Ms. Ali claimed there was a mistake for the Rb bands in Figure 5B. The other scans submitted do match their respective published Figures (DIO4915 Image File D, slide 635).

Comparison of the β-actin bands of Figure 5B in Reference #258 and Figure 5C in Reference #267 shows they are the same (DIO4915 Image File D, slide 638). In contrast to Figure 5B in Reference #258 which uses BxPC-3 cells, Figure 5C in Reference #267 uses "...in primary pancreatic tumors from two representative mice derived from control and treated groups" (Reference #267, Figure 5C caption, p.3806). Reference #267 was submitted to the journal in October, 2005 and Reference #258 was submitted in June, 2006, so the images were apparently copied from the earlier Reference #267. Dr. Sarkar and Ms. Ali claim the re-use and re-labeling in Reference #258 "... was not done intentionally" (Shadan-Response.docx, p.18), and they show what is purported to be correct "original" Rb bands for HPAC cells (DIO4915 Image File D, slides 636). Additionally, the scan submitted as the original Rb bands in Figure 5B does not match, calling into question whether the use of the Rb band in Figure 5C was a mistake. The scans purported to be the correct Rb bands, however, appear in Dr. Sarkar's Progress Report 5R01CA101870-5 (File: 2007, 03 22 - Sarkar Proposal 07060904.pdf) and match the scans submitted for Figure 5 in Reference #258 (See Allegation 71c). Dr. Sarkar did not address the duplication and re-labeling in Figure 5C in Reference #267. Ms. Ali is not an author on Reference #267; only Dr. Sarkar is an author on both publications.

CONCLUSION:

The Committee finds, in **Allegation 71b**, that the control bands for **Figures 5C** and **5D** in **Reference #258**, are the same image labeled as both "β-actin" and "Rb." Dr. Sarkar and Ms. Ali write this was a mistake. The Committee finds that Ms. Ali duplicated, manipulated and re-labeled the control bands between Figures 5C and 5D in Reference #258. The Committee finds that the Rb control bands in **Figure 5B** in Reference #258 are the same image as in Figure 5C in **Reference #267**. The Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Allegation 71b and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 71c: In parts of Figures 5B, 5D & 5F, as in Allegation 71b but with different Rb bands were used in Figure 5 in Progress Report for 5R01CA101870-5 (File Name 2007, 03 22 - Sarkar Proposal 07060904.pdf).

RESPONSE:

Dr. Sarkar and Ms. Ali wrote that "this allegation is confusing because here they are asking about Rb and referring to allegation 100. When we look at allegation 100 they are asking about actin. Anyway, we have answered this in allegation 100" (Shadan-Response.docx, p.19).

ANALYSIS:

See DIO4915 Image File D, slides 638-639.
Dr. Sarkar and Ms. Ali are correct that this was confusing. Comparison with Allegation 100 shows that the difference in control bands between Figure 5 in Reference #258 and the progress report for 5R01CA101870-5 is because the apparently correct original images for Rb bands were used in the Progress

Report but not in the publication. This duplication of other bands in Figure 5 is already addressed in Allegation 71b (DIO4915 Image File D, slides 638-639).

CONCLUSION:

The Committee finds that the concerns addressed in **Allegation 71c**, regarding control bands for **Figure 5** in **Reference #258**, are already addressed in Allegation 71b. The concerns about the re-use of Figure 5 in progress report for 5R01CA101870-5 are addressed in **Allegation 100**. There is no evidence of further misconduct under Allegation 71c. Note that the *CONCLUSIONS* for Allegations 100 and 101 regarding use of the BxPC-3 panel in Figure 5 in Reference #258 in a progress report (also "Figure 5"), are consistent with the conclusions regarding Allegations 71a and 71b that rows in Figure 5 in Reference #258 are fabricated and/or falsified.

Paper 61 (**Reference #263**) Zhang, Y., Wang, Z., Ahmed, F., Banerjee, S., Li, Y., and Sarkar, F.H. Down-regulation of Jagged-1 induces cell growth inhibition and S phase arrest in prostate cancer cells. *Int. J. Cancer*: 119(9), 2071-2077 (2006)

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Note: "The first two authors contributed equally to this paper" (Drs. Y. Zhang and Z. Wang).

Allegation 72: In Figure 1C, the Notch-2 row image labeled as Notch-1 (flipped horizontal) is copied into Figure 3B in Wang, Z., et al., Cancer Res **66(5):** 2778-84 (2006) (**Reference #278**). This duplication and re-labeling of an image indicates fabrication (DIO4915 Image File D, slide 641).

Note: Allegation 72 regarding the Notch-2 bands in Figure 1C is covered under **Allegation 81k** (DIO4915 Image File F, slides 842-844). See **Allegation 93e** regarding re-use and manipulation of the β-actin bands in Figure 1B.

Allegation 73: In Figure 4D, the histone H1 lane 1 ('CS' condition) is pasted in, suggesting falsification (DIO4915 Image File D, slide 642).

RESPONSE:

Dr. Sarkar submitted a response, to which Dr. Wang contributed, and they wrote: "We were unable to locate the original autoradiogram that was scanned for publication; however we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Thus, no further action would be required" (Wang-Response-1.pptx, slide 10; DIO4915 Image File D, slide 641).

ANALYSIS:

See DIO4915 Image File D, slides 641-642.
The three scans submitted related only to Allegation 72; no scan submitted for the Histone H1 bands. A visual inspection confirms a clear cut mark between lanes 1 and 2 in the Histone H1 band of Figure 4D in Reference #263 (DIO4915 Image File D, slide 642). The submitted scans have no information identifying their source or dates. The "duplicate autoradiogram from the same set of replicate experiments" does

not address the allegations. This duplication, manipulation and re-labeling of Western blot data, as well as the inability to find original data, are consistent practices in Dr. Sarkar's lab.

CONCLUSION:

The Committeee finds that **Allegation 72** is addressed fully in Allegation 81k and there is no further evidence of research misconduct.
The Committee finds, in **Allegation 73**, a clear, unexplained and deliberate cut mark between lanes 1 and 2 in the "Histone H1" bands of **Figure 4D** in **Reference #263**, making a composite figures for which no sources for the bands were submitted or found. The Committee concludes, by a preponderance of the evidence, that Dr. Wang knowingly and intentionally fabricated and/or falsified the results in these and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published falsified and/or fabricated data in these figures and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89b: The two-lane β-actin image was re-used and manipulated in Figure 1C, copied from lanes 4 and 5 of the 6-lane β-actin bands in Figure 2A of **Paper 4** (Reference #259)

RESPONSE:

See DIO4915 Image File D, slides 643-644.
Dr. Sarkar submitted a response, to which Dr. Wang contributed, and they wrote that "... since actin bands are similar, it could have been inadvertently used (Wang-Response-1.pptx, slide 10). They reported that they "... found the autoradiograms for actin. One scan was submitted." Dr. Wang testified about Allegation 89b indirectly in his brief comments about Reference #263 (Wang Transcript, V.1, p.277, ll.9-23). Dr. Wang said that as second author he only "provided many reagents, the antibodies, and the cell lines" but could not remember if he provided any data for the paper (Wang Transcript, V.1, p.277, ll.16-21).

ANALYSIS:

A visual inspection confirms that the 2-lane β-actin bands in Figure 1C of Reference #263 is the same image as lanes 4 and 5 of the β-actin bands in Figure 2A (middle panel) of Paper 4 (Reference #259; DIO4915 Image File D, slide 643). Lanes 4 and 5 were flipped horizontal and squeezed vertical to appear as the 2-lane β-actin in Figure 1C. Figure 1C represents an experiment testing effects of Jagged-1 siRNA on Notch-1 expression in PC-3 cells, whereas, in contrast, the same images used Figure 2A represent a dose-response study testing the effects of B-DIM on PSA and AR expression in C4-2B cells, where lanes 4 and 5 are labeled for 10 and 25 μM B-DIM, respectively. The scan submitted by Drs. Sarkar and Wang does not match published Figure 1C (DIO4915 Image File D, slide 644).

CONCLUSION:

The Committee finds, in **Allegation 89b**, that the 2-lane β-actin in **Figure 1C** of **Reference #263** duplicates lanes 4 and 5 of the β-actin bands in Figure 2A (middle panel) of Paper 4 (Reference #259), despite being completely different experiments using different proteins, different treatments, and different cells, so there is no justification for the duplication. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated results and that this constitutes

research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

See also ***Allegation 93e***: The 6-lane β-actin image was re-used and manipulated in Figure 1B (DIO4915 Image File H, slides 1029-1031).

Paper 62 (**Reference #267**): Barve, V., Ahmed, F., Adsule, S., Banerjee, S., Kulkarni, S., Katiyar, P., Anson, C.E., Powell, A.K., Padhye, S., Sarkar, F.H. Synthesis, molecular characterization, and biological activity of novel synthetic derivatives of chromen-4-one in human cancer cells J. Med. Chem 49, 3800-3808 (2006)

Publication History: Received: October 21, 2005

Allegation 71b: In Figures 5C, the Rb bands are the same as in Figure 5B in Paper 60 (**Reference #258**), El-Rayes, et al., Cancer Res 66:10553-10559 (2006).

Note: Allegation 71b is addressed above under Paper 60 (Reference #258; see DIO4915 Image File D, slide 637).

CONCLUSION:

Since Reference #267 was submitted to the journal in October, 2005 and Reference #258 was submitted in June, 2006, the images were apparently copied from the earlier Reference #267.

Paper 63 (**Reference #272**) Wang, Z., Zhang, Y., Banerjee, S., Li, Y., and Sarkar, F.H. Notch-1 Down-Regulation by Curcumin Is Associated with the Inhibition of Cell Growth and the Induction of Apoptosis in Pancreatic Cancer Cells. *Cancer*: 106, 2503-2513 (2006b)

Publication History: Received September 6, 2005; Revision received December 19, 2005; Accepted January 11, 2006; Published online April 20, 2006.

NIH Funding: National Cancer Institute NIH – Grant number: 5R01CA101870-02 (PI: F. H. Sarkar)

Other Funding: University of Texas MD Anderson Cancer Center Grant: 1P20-CA010193-01; Sub contract award to F.H. Sarkar through a Specialized Programs of Research Excellence (SPORE) grant on pancreatic cancer awarded to James Abbruzzese.

These allegations for **Reference #272** are addressed under the **Rb bands Allegations 82 to 86.**

Allegation 83d: Wang, Z., et al., Cancer **106**:2503–13 (2006b) (**Reference #272**) Figure 4A and 4B Rb image was re-used (DIO4915 Image File G, slides 886-887)..

Allegation 83e: Figure 5D Rb image was re-used (DIO4915 Image File G, slides 886, 888).

Allegation 83f: Figure 6D Rb image was re-used (DIO4915 Image File G, slides 886, 889).

Allegation 86d: The 2-lane Rb image was re-used (and manipulated) in Figure 4C (stretched; See DIO4915 Image File G, slide 936).

These allegations for **Reference #272** are addressed under the **β-actin bands Allegations 87 to 94.**

Allegation 89c: The 4-lane β-Actin image was re-used and manipulated in Figure 3D under PANC-1 (background lightened; DIO4915 Image File H, slides 951-953).

Allegation 89d: The 4-lane β-Actin image was re-used and manipulated in Figure 5A (DIO4915 Image File H, slides 951, 954-955).

Allegation 90a: The 4-lane β-Actin image was re-used and manipulated in Figure 6A (flipped horizontal; DIO4915 Image File H, slides 982, 984-986).

Paper 64 (**Reference #277**) Wang, Z., Zhang, Y., Li, Y., Banerjee, S., Liao, J., and Sarkar, F.H. Down-regulation of Notch-1 contributes to cell growth inhibition and apoptosis in pancreatic cancer cells. *Mol Cance Ther*: 5(3), 483-493 (2006)

Publication History: Received: August 5, 2005; Revised: October 31, 2005; Accepted: January 5, 2006; Published: March, 2006.

NIH Funding: 5R01CA101870-02 (PI: F. H. Sarkar)

Other Funding: 1P20-CA010193-01: sub contract to F.H. Sarkar from SPORE grant (University of Texas MD, Anderson Cancer Center: PI/PD: J. Abbruzzese).

Allegation 74: In Figure 5, CDK2 lanes 5 & 6 are pasted in and Bcl-2 lanes 5 & 6 are smudged, removed or masked. Also, lanes 1-4 of p27 are used to create VEGF line in Figure 4B in **Allegation 75 (Reference #278)**. The Cyclin-D1 and Bcl-X_L bands are duplicated and re-labeled as Hes-1 and Cyclin-D1, respectively, in Figure 2C (left panel) of **Paper 3** (DIO4915 Image File D, slide 648).

Note: See also duplication in Allegation **64** regarding Figure 4A in **Reference #231** (DIO4915 Image File D, slides 584-587).

Note: See also duplication in Allegation **5a** regarding Figure 2C in **Paper 3** (DIO4915 Image File A, slides 29-37).

Note: See also duplication in Allegation **38a** regarding Figure 5B in **Paper 19** (DIO4915 Image File B, slides 355-356).

RESPONSE:

Dr. Sarkar submitted a response, with contributions from Dr. Wang, writing: "the cyclin D1 image is for this figure 5. CDK2 image is missing. We were unable to locate the original Bcl-2 autoradiogram that was scanned for publication; however we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Thus, no further action would be required" (Wang-Response-1.pptx, slide 11).

Dr. Sarkar testified about the flipping of the submitted image he said was the correct Hes-1 line for Figure 2C in Paper 3, and confirmed that the reason for flipping an image "would be to align the labels with the published image" (Sarkar Transcript, V.2, p.400, ll.3-9). Dr. Wang's testimony about Allegation 74 and related allegations is found in Wang Transcript, V.1, p.232, ll.13 to p.241, ll.25; p.242, ll.6 to p.243, ll.13; and V.2, p.340, ll.8 to p.348, ll.16. Dr. Wang admitted that the Hes-1 and Cyclin D1 bands in Figure 2C of Paper 3 are the same as the Cyclin D1 and Bcl-XL bands, respectively, in Figure 5, and admitted that he generated the images for these bands (Wang Transcript, V.1, p.232, ll.13 to p.233, ll.5). He acknowledges that the figures represent different experiments but that they were mis-labeled. He said "we often got the mistake like this way... because these all the papers we finish within one or two years. We submit the paper, four papers within six months, and a lot of work, and put some figures together cause mistakes" but only realized these mistakes when pointed out by the Committee (Wang Transcript, V.1, p.237, ll.18 to p.239, ll.1). Dr. Wang said he did not know if Dr. Sarkar knew about his mistakes and did not himself realized he was making mistakes at the time (Wang Transcript, V.1, p.239, ll.24 to p.240, ll.24). Dr. Wang attributed the mistakes he made to feeling pressure from "in the lab or outside... that's why this is four

papers submit within six months." Dr. Wang testified that Dr. Sarkar would only say "work harder" rather than having specific "expectations... to be pushing out papers and getting them done quickly" (Wang Transcript, V.1, p.241, ll.5-25). Regarding the re-use of the Notch-1 bands image in Figure 4A of Reference #231 as the Bcl-2 bands in Figure 5 of Reference #277, Dr. Wang admitted "So some of the figures, I don't know they are same or not, but sometimes we re-use the multiple lines, and we copy the line and put the figure. That's why they oftentimes see we have the figure like the copy and the paste. We have them marked like this one, and that--doing this, the process is where we got the mistake. We copied and paste the same one in the figures (Wang Transcript, V.2, p.341, ll.7-15). Dr. Wang attributed problems with figure labeling in general to "sometimes we don't label very clear...That is the reason we got the mistake, because sometimes it's not very clear, so we don't know this one is not the right one, that the one we use is wrong one... Most time we label it, but sometimes we are busy. We don't label clear. We just wrote--the time was wrote a very simple label... we just use N-1 or others" (Wang Transcript, V.2, p.343, ll.7 to p.344, ll.16). When asked by the Committee if "in general, are images important for the conclusions of your papers,"Dr. Wang testified "most of them not very important. They are just part of the results there. They don't affect the conclusion" and that figures are present in papers only to show that the authors "did a lot of work" (Wang Transcript, V.2, p.346, ll. 23 to p.348, ll.16).

ANALYSIS:

See DIO4915 Image File D, slides 647-664.
Simple visual inspection of Figure 5 in Reference #277 confirms a cut mark between lanes 4 and 5 in the CDK2 bands, a cut mark between lanes 4 and 5 in the Bcl-2 bands, and that lanes 5 and 6 were altered through smudging or erasure (DIO4915 Image File D, slides 649-652). The scan submitted by Dr. Wang is a duplicate and the image labeled Bcl-2 does not match the published figure. Visual inspection also confirms that lanes 2-4 of the p27 band of Figure 5 in Reference #277 are the same images as in lanes 1, 3 and 4 of the VEGF band in Figure 4B of Reference #278 (DIO4915 Image File D, slides 654-655). The p27 band was flipped vertical and stretched vertical to produce lanes 3 and 4 in the VEGF band and was additionally flipped vertical to produce lane 1 in the VEGF band. Figure 5 is a study of BxPC-3, HPAC, and PANC-1 cell lines after siRNA (CS; lane 3) or Notch-1 siRNA (NS; lane 4) treatments, in contrast to the lanes in Figure 4B showing treatment of BxPC-3 cells with control siRNA (CS), Notch-1 siRNA (NS), control plasmid (CP), and Notch-1 plasmid (NP): lane 1 is CS, lane 3 is CP, and lane 4 is NP. A visual comparison also confirms that Cyclin D1 and Bcl-XL bands of Figure 5 in Reference #277 are re-labeled as Hes-1 and Cyclin D1 bands, respectively, in Figure 2C of Paper 3 (cf: Allegation 5a). See DIO4915 Image File D, slides 656-657; 660-662). These bands are re-used for different treatment conditions: in Figure 5, the treatments are siRNA (CS) and Notch-1 siRNA (NS), but in Figure 2C they are control (C) and ERRP (T). Dr. Wang maintains that the Hes-1 and Cyclin D1 bands in Figure 2C are correctly labeled, yet the scans submitted by Dr. Wang for these bands (as part of his response to Allegation 5a) do not match the published bands (DIO4915 Image File D, slides 658-659).

Dr. Wang's testimony makes clear that he considers it standard protocol in Dr. Sarkar's lab to re-use figures, and that problems only arise in labeling figures in part because the lab was publishing a lot all at once. Dr. Wang makes it clear that the perspective in Dr. Sarkar's lab is that figures in publications are "not very important", "don't affect the conclusions" and are used only to show that they "did a lot of work" (Wang Transcript, V.2, p.346, ll. 23 to p.348, ll.16). This is underscored by the scan submitted by Dr. Wang that does not match the published figure. The Committee understands this perspective to be the foundation for how figures are constructed in Dr. Sarkar's lab.

CONCLUSION:

The Committee finds, as detailed in **Allegation 74** regarding **Figure 5** of **Reference #277**, several instances of bands being cut and pasted in and manipulated in multiple proteins (e.g., CDK2, Bcl-2, p27, VEGF), and copied and re-labeled (e.g., bands in Figure 2C of Paper 3), to represent different experiments with different treatments. The Committee finds that how images are handled and the inability to identity or verify bands (and thus the experiments), make it impossible to ascertain which (if any) images are correct for which experiment(s). The Committee finds that the evidence of the figures themselves and testimonies of Dr. Sarkar and Dr. Wang attest to the disregard with which they hold figures in their papers – insignificant, re-usable items, meant only to show that something was done – and reflected in the extremely poor and chaotic record keeping practiced by Dr. Sarkar and his lab. The Committee sees this perspective as common in Dr. Sarkar's lab and one that underlies much of the research misconduct. The Committee concludes that it is highly unlikely that the large number of re-uses and manipulations and re-labeling involved in Allegation 74 could have escaped Dr. Sarkar's notice with even casual examination. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the results in these figures and that, in each instance, this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.10

See the following allegations for **Reference #277** under **Notch-1 Allegations 80-81.**

Allegation 80c: Notch-1 image was re-used, manipulated, and/or re-named. Figure 9A as Notch-1 - (squeezed vertically) Caption notes treatment with '25μMol/L of genistein'" (DIO4915 Image File F, slides 810-811).

Allegation 81b: Notch-1 image was re-used, manipulated, and/or re-named Figure 8A as Notch-1 (upper group) – "Lanes 3 is the same as lane 2 in Figure 4A from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) (DIO4915 Image File F, slide 830).

Allegation 81c: Figure 1D as Notch-1 (upper group) – "Several lanes are the same as in Figure 4A from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**): Lane 1 is lane 1; Lane 2 is lane 3; Lane 3 is duplicated in Lanes 2, 4 &5; Lane 4 is lane 6" (DIO4915 Image File F, slides 831-832).

Allegation 81d: Figure 1D as Notch-1 (lower group) – "Several lanes are the same as in Figure 4A from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**): Lanes 1 & 2 are flipped horizontal and switched; Lane 3 is lanes 3 & 5 (5 is flipped horizontal); Lane 1 is repeated as lane 6. Lane 4 (flipped horizontal) is repeated in lane 1 in Figure 8A)" (DIO4915 Image File F, slides 831, 833).

Allegation 81i: In Figure 1B, the Notch-1 bands are appear to be a duplication, squeezed horizontally, of lanes 1-3 in the Notch-1 row in Figure 4A from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) **(Reference #284)** (DIO4915 Image File F, slide 838).

See the following allegations for **Reference #277** under **Rb Allegations 82-86.**

Allegation 83g: Figure 6A and 6B Rb image was re-used (DIO4915 Image File G, slides 886-887).

Allegation 83h: Figure 7E Rb image was re-used (stretched; DIO4915 Image File G, slides 886-887).

Allegation 83i: Figure 8D Rb image was re-used (stretched; DIO4915 Image File G, slides 886-887).

Allegation 83j: Figure 9D Rb image was re-used (stretched, a bit less; See DIO4915 Image File G, slides 886-887). (Note: This was original mistyped as "Figure 9E").

Allegation 84a: The 4-lane Rb image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 6C (DIO4915 Image File G, slides 886-887).

Allegation 86f: The 2-lane Rb image was re-used (and manipulated) in Figure 6D (stretched; DIO4915 Image File F, slide 902).

See the following allegations for **Reference 277** under **B-actin Allegations 87-94.**

Allegation 89e: The 4-lane β-Actin image was re-used and manipulated in Figure 8B (DIO4915 Image File H, slides 956-957).

Allegation 89f: The 4-lane β-Actin image was re-used and manipulated in Figure 7B (under CyclinD1; DIO4915 Image File H, slides 958-959).

Allegation 90b: The 4-lane β-Actin image was re-used and manipulated in Figure 7B (under Notch-1; DIO4915 Image File H, slides 982, 987).

Allegation 91c: The β-Actin image was re-used and manipulated in Figure 5 (lanes 1- 4 of 6 lanes; DIO4915 Image File H, slides 993, 997-998).

Allegation 92a: The 6-lane β-Actin image was re-used and manipulated in Figure 1D (bottom; DIO4915 Image File H, slide 1009).

Allegation 93f: The 6-lane β-Actin image was re-used and manipulated in Figure 1D (top; DIO4915 Image File H, slides 1029, 1032).

Paper 65 (**Reference #278**): Wang, Z., Banerjee, S., Li, Y., Rahman, K.M.W., Zhang, Y., Sarkar, F.H. Down-regulation of Notch-1 inhibits invasion by inactivation of nuclear factor-κB, vascular endothelial growth factor, and matrix metalloproteinase-9 in pancreatic cancer cells. Cancer Res 66(5): 2778-2784 (2006d)

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Other Funding: University of Texas MD Anderson Cancer Center – Grant number: 1P20-CA0101936-02; sub contract award to F.H. Sarkar through a SPORE grant on pancreatic cancer (PI/PD: J. Abbruzzese)

Allegation 75: The several parts involving Figures 3B, 4B & 5A will be addessed in turn:

In Figure 4B lanes 2 & 4 of the VEGF row are the same VEGF row in Figure 5A (stretched and flipped horizontal and re-labeled).

In Figure 5A MMP-9 lanes are duplicated in lanes 2 & 4 of MMP-9 in Figure 3B (flipped horizontal).

In Figure 5A, left β-actin lanes for MMP-9 are duplicated as β-actin lanes 2 & 3 for Figure 4B.

In Figure 5A, 2 right β-actin lanes for VEGF are duplicated as the β-actin lanes for Figure 1C.

In Figure 3B, the 2 right β-actin lanes (in columns labeled "CP" & "NP") are duplicated in Figure 1C in **Reference #263** in columns labeled "CS" and "JS". (See Allegation 89b).

In Figure 3B, the 2 right Notch-1 lanes (in columns labeled "CP" & "NP") are duplicated in Figure 1C in **Reference #263**, flipped and re-labeled as Notch-2, in columns labeled "CS" and "JS".

Note: See also Allegations 72, 74 and 131 regarding Reference #278.

GENERAL RESPONSE:

Dr. Sarkar submitted a response, with contributions from Dr. Wang, in which they wrote: "we were unable to locate the original autoradiograms that were scanned for publication; however we found the duplicate autoradiograms from the same set of replicate experiments showing similar results. Thus, no further

action would be required" (Wang-Response-1.pptx, slides 12-13). The scans from the "replicate experiments" were submitted adjacent to the figures in question. Some included arrows to highlight particular bands that the "replicate" data address (but it is unclear which figures/bands other submitted scans relate to; DIO4915 Image File D, slides 667-668).

All of the scans submitted by Dr. Sarkar and Dr. Wang for Allegation 75 are from "replicated experiments" and so by definition are not originals and cannot match the published blots.

Allegation 75: In Figure 4B, lanes 2 & 4 of the VEGF row are the same VEGF row in Figure 5A (stretched and flipped horizontal and re-labeled; DIO4915 Image File D, slide 666).

RESPONSE:

Dr. Sarkar and Dr. Wang "... disagree that lanes 1-4 of p27 are used to create VEGF line in allegation 75 because these bands are different" (Wang-Response-2.docx, p.1) and submitted an undated duplicate scan they claimed to be of the VEGF band in Figure 4B (Wang-Response-1.pptx, p.12).

ANALYSIS:

See DIO4915 Image File D, slides 665-670.
A simple visual analysis confirms that lanes 2 and 4 of the 4-lane VEGF band in Figure 4B of Reference #278 are the same blots as the 2-lane VEGF band in Figure 5A, also in Reference #278 (DIO4915 Image File D, slide 669). Lanes 2 and 4 of Figure 4B were stretched horizontal and flipped horizontal to yield the 2-lane VEGF bands version in Figure 5A. The cells in lanes 1 and 2 in Figure 5A were treated with control or VEGF siRNA, respectively, while in contrast, the same blot images used in lanes 4 and 2 in Figure 4B were labeled for treatment with for Notch-1 plasmid (NP) and Notch-1 siRNA (NS), respectively: these are different experiments. The "replicate" scan Dr. Wang submitted for the 4-lane VEGF bands in Figure 4B has no date, file name, or source information provided (Wang-Response-1.pptx, p.12; DIO4915 Image File D, slide 670). Dr. Sarkar and Dr. Wang disagreed but did not address the duplication, manipulation and re-labeling in Figures 4B and 5A.

CONCLUSION:

The Committee finds in **Allegation 75** in **Reference #278** that lanes 2 and 4 of the 4-lane VEGF bands in Figure 4B are manipulated and re-labeled copies of the blots in the 2-lane VEGF bands in Figure 5A, but represent different experimental treatments with the same images. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated results in Figures 5A and 4B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 75 (continued): In Figure 5A, MMP-9 lanes are duplicated in lanes 2 & 4 of MMP-9 in Figure 3B (flipped horizontal; DIO4915 Image File D, slide 666).

RESPONSE:

Dr. Sarkar and Dr. Wang submitted a scan that is purported to be a duplicate of the original scan used for the MMP-9 band in Figure 5A of Reference #278, and another scan indicated to be a duplicate of the scan used for the MMP-9 band in Figure 3B of Reference #278 (Wang-Response-1.pptx, p.12; DIO4915 Image File D, slide 667).

ANALYSIS:

See DIO4915 Image File D, slides 667, 671-673.
A simple visual analysis confirms that lanes 2 and 4 of the 4-lane MMP-9 band in Figure 3B of Reference #278 are the same blots as the 2-lane MMP-9 bands in Figure 5A, also in Reference #278 (DIO4915 Image File D, slide 671). Lanes 2 and 4 of Figure 4B were stretched horizontal and flipped horizontal to yield the 2-lane MMP-9 bands version in Figure 5A. The cells in lanes 1 and 2 in Figure 5A were treated with control or MMP-9 siRNA, respectively, while in contrast, the same blot images used in lanes 4 and 2 in Figure 3B were labeled for treatment with for Notch-1 plasmid (NP) and Notch-1 siRNA (NS), respectively: these are different experiments. The "replicate" scan submitted for the 2-lane MMP-9 bands in Figure 5A has no date, file name, or source information provided (Wang-Response-1.pptx, p.12; DIO4915 Image File D, slide 672). A scan labeled "β-actin" is indicated as the response to Figure 3B due to its proximity to the figure, but the image on the scan does not relate to the MMP-9 bands, nor does it match the β-actin band in Figure 3B (DIO4915 Image File D, slides 667 & 673; see also Allegation 89i). Confusion over the attribution of scans to different bands and different experiments in different figures attests to the poor recordkeeping in Dr. Sarkar's lab and the inability to verify the accuracy of the data. Dr. Sarkar and Dr. Wang did not address the duplication, manipulation and re-labeling in Figures 3B and 5A.

CONCLUSION:

The Committee finds in **Allegation 75** in **Reference #278** that lanes 2 and 4 of the 4-lane MMP-9 bands in Figure 3B are manipulated and re-labeled copies of the blots in the 2-lane MMP-9 bands in Figure 5A, but represent different experimental treatments with the same images. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated results in Figures 5A and 3B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 75 (continued): In Figure 5A, left β-actin lanes for MMP-9 are duplicated as β-actin lanes 2 & 3 for Figure 4B.

ANALYSIS:

See DIO4915 Image File D, slides 674-675.
A simple visual analysis confirms that the 2-lane β-actin bands under the MMP-9 panel in Figure 5A and lanes 2 and 3 of the 4-lane β-actin bands in Figure 4B of Reference #278 are the same blots as the 2-lane MMP-9 bands in Figure 5A, also in Reference #278 (DIO4915 Image File D, slides 666 & 674). The bands on Figure 5A were stretched horizontal. The cells in lanes 1 and 2 in Figure 5A were treated with control or MMP-9 siRNA, respectively, while in contrast, the same blot images used in lanes 2 and 3 in Figure 4B were labeled for treatment with for Notch-1 siRNA (NS) and control plasmid (CP), respectively: these are different experiments. The "replicate" scan(s) submitted for β-actin bands have no dates, file names, or source information provided (Wang-Response-1.pptx, p.12; DIO4915 Image File D, slides 673 & 676). Dr. Sarkar and Dr. Wang did not address the duplication, manipulation and re-labeling of β-actin bands in Figures 4B and 5A.

CONCLUSION:

The Committee finds in **Allegation 75** in **Reference #278** that 2-lane β-actin bands under the MMP-9 panel in Figure 5A are manipulated and re-labeled copies of the β-actin bands blots in lanes 2 and 3 in Figure 4B, but represent different experimental treatments with the same images. By a preponderance of the

evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated β-actin bands in Figures 5A and 4B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 75 (continued): In Figure 5A, the 2 right β-actin lanes for VEGF are duplicated as the β-actin lanes for Figure 1C.

RESPONSE:

Dr. Sarkar and Dr. Wang submitted the same scan for this part of the allegation that they submitted for Allegation 89g, concerning Figure 3B in Reference #278.

ANALYSIS:

See DIO4915 Image File D, slides 667, 673, and 676.
A simple visual analysis confirms that the 2 right lanes in the β-actin bands under the VEGF panel in Figure 5A Reference #278 are the same blots as the 2-lane β-actin bands under Notch-1 in Figure 1C also in Reference #278 (DIO4915 Image File D, slides 667 & 673). The cells in lanes 3 and 4 in Figure 5A were treated with control or VEGF siRNA, respectively, while in contrast, the same blot images used in lanes 1 and 2 in Figure 1C were labeled for treatment with control plasmid (CP) or Notch-1 plasmid (NP), respectively: different experiments. The "replicate" scan(s) submitted for β-actin bands have no dates, file names, or source information provided (DIO4915 Image File D, slides 667, 673 and 676). Dr. Sarkar and Dr. Wang did not address the duplication, manipulation and re-labeling of β-actin bands in Figures 1C and 5A.

CONCLUSION:

The Committee finds in **Allegation 75** in **Reference #278** that 2-lane β-actin bands under the VEGF panel in Figure 5A are manipulated and re-labeled copies of the β-actin bands under Notch-1 panel in Figure 1C, but represent different experimental treatments with the same images. This 2-lane β-actin blot appears in three different Figures (1C, 4B, and 5A) under different proteins with different treatments. It is impossible to verify which labeling, if any, is correct and thus impossible to verify the data. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated β-actin bands in Figures 1C and 5A and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 75 (continued): In Figure 3B, the 2 right β-actin lanes (in columns labeled "CP" & "NP") are duplicated in Figure 1C in **Reference #263** into columns labeled "CS" and "JS" (see also Allegation 81k about the Notch-1 band in Figure 3B).

RESPONSE:

No response addressed this part of Allegation 75. However, a scan was submitted for the β-actin bands in Figure 1C of Reference #263. The scan did not match the published figure (see Allegation 89b).

ANALYSIS:

See DIO4915 Image File D, slides 677-678.

A simple visual analysis confirms that 2-lane β-actin bands in the right panel under "CP" and "NP" labels in Figure 3B of Reference #278 are the same blots as the 2-lane β-actin bands in Figure 1C in Reference #263 (DIO4915 Image File D, slide 677 & 678). The bands in Figure 3B were stretched vertical to appear thicker in Figure 1C. The cells in Figure 3B were treated with control (CP) or Notch-1 plasmid (NP), respectively, while in contrast, the same blot images used in Figure 1C were labeled for treatment with control (CS) or Jagged-1 siRNA (JS), respectively: these are different experiments. No scans were submitted. Dr. Sarkar and Dr. Wang did not address the duplication, manipulation and re-labeling between these two figures.

CONCLUSION:

The Committee finds in **Allegation 75** in **Reference #278** that 2-lane β-actin bands under the right panel in Figure 3B are manipulated and re-labeled copies of the β-actin bands blots in Figure 1C of Reference #263, but represent different experimental treatments with the same images. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published falsified and/or fabricated β-actin bands in Figures 3B in Reference #278 and Figure 1C in Reference #263 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.
The Committee is unable to verify which bands, if any, is correct and so the figure cannot be authenticated.

Allegation 134: In Figure 1D, the panel labeled "NP" (for "NP, Notch-1 plasmid") is depicted as "Notch-1 cDNA–transfected cells ..." is the same image re-used in Figure 5B where it is labeled and captioned as a control condition siRNA-transfected BxPC-3 cells. The images are cropped differently and Figure 5B is a stretched version of Figure 1D (DIO4915 Image File D, slides 679-682).

RESPONSE:

Dr. Sarkar wrote in "Wang-Response-1.pptx" (slide 34) that "Figure 5B control siRNA is NP control." He wrote that he "... found the invasion figure for NP cells with control siRNA treatment" and submitted this figure (DIO4915 Image File D, slide 682). Dr. Sarkar testified that he agreed that the images were from the same photomicrograph and that the different labels in Figures 1D and 5B do not mean the same thing (Sarkar Transcript, V.1, p.249, ll.21-25). Dr. Sarkar said he did not know how the duplication and manipulations happened but he agreed that the manipulations "...are designed to make them look differently" (Sarkar Transcript, V.1, p.249, ll.11-14).
Dr. Wang testified that the images were the same in both figures (Wang Transcript, V.1, p.154, ll.4-6) but that they were the same because they were the same control conditions. He subsequently testified that they were different conditions and should have been different images; and then he testified that they were different overlapping photos of the same well; and then he denied there was stretching of the image; and then he said there was a mix-up of labels; and then he testified that he did stretch the image but it didn't matter because the number of cells is what matters and the cells are counted by a machine in another assay; and then he said he just enlarged the image to make it easier to count cells (Wang Transcript, V.1, pp.154-166).

ANALYSIS:

See DIO4915 Image File D, slides 679-682.
The images are clearly the same (DIO4915 Image File D, slides 679-681) and admitted by both Dr. Sarkar and Dr. Wang. The experimental conditions were different between the figures. Dr. Sarkar said he did not know how the mistake happened. Dr. Wang had at least 6 explanations and repeatedly contradicted

himself and Dr. Sarkar's testimony. The duplicated, manipulated and re-labeled photomicrograph in two figures misrepresented the results and gave the impression that the control conditions in two experiments were similar. A figure submitted in response (DIO4915 Image File D, slide 682) shows a similar green cell culture but there is no information about where this image came from. No lab records were found to show that these experiments were done.

CONCLUSION:

The Committee finds, in **Allegation 134**, that the same image cropped differently was used to represent different experimental conditions between **Figures 1D and 5B** in Paper 65 (**Reference #278**). Committee concludes, in the absence of any consistent explanation, that it is not credible that this duplication and manipulation was a mistake. Further, Dr. Sarkar and Dr. Wang failed to cite the original source of either the published figure or a purported replacement photomicrograph. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figures 1D and 5B and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

See also the following other allegations relevant to Paper 65 (**Reference #278**).

Allegation 80b: In Figure 6 in Paper 3, the same Notch-1 band image was re-used, manipulated, and/or re-labeled "MMP-9." Compared to Figure 3B in Reference #280, lanes 1 & 2 are flipped horizontal, lane 3 is flipped horizontal and re-used twice as both lanes 3 and 4. (DIO4915 Image File F, slides 808-809.)

Allegation 81h: Figure 3B as MMP-9 lanes 1 and 2 in Reference #278 are the same as lane 3 from Reference #284 with width increased.

Allegation 81k: In Figure 3B, the images for the bands in lanes 3 and 4 from the Notch-1 row, labeled 'CP' and 'NP' in Reference #278, appear to be duplicated, enlarged, flipped horizontally and labeled as Notch-2 in Figure 1C of Reference #263, and labeled 'CS' and 'JS'.

Allegation 83k: Figure 2A Rb image was re-used (stretched).

Allegation 86g: The 2-lane Rb image was re-used (and manipulated) in Figure 2B (stretched).

Allegation 89b: Figure 1C β-actin in Reference #263 that shows lanes 2 and 3 from Figure 3C in Reference #284 are the same as the 2-lane B-actin band under VEGF in Figure 5A in Reference #278.

Allegation 89g: The 4-lane β-Actin image was re-used and manipulated in Figure 3B (lanes 2&3, squeezed horizontal).

Allegation 89h: The 4-lane β-Actin image was re-used and manipulated in Figure 4B (squeezed horizontal a lot).

Allegation 89i: The 4-lane β-Actin image was re-used and manipulated in Figure 5A (lanes 2&3, stretched vertical slightly).

Allegation 91d: The β-Actin image was re-used and manipulated in Figure 1C (β-actin under Notch-1, lanes 2&3 stretched horizontal).

Allegation 91e: The β-Actin image was re-used and manipulated in Figure 5A (β-actin under VEGF, lanes 2&3).

Paper 66 (**Reference #280**) Mohammad, R., Banerjee, Li, Y., Aboukameel, A., Kucuk, O., and Sarkar, F.H. Cisplatin-Induced Antitumaor Activity Is Potentiated by the Soy Isoflavone Genistein in BxPC-3 Pancreatic Tumor Xenografts. *Cancer*: 106(6), 1260-1268 (2006)

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NIH Funding: 5R01CA101870-02 and 5R01CA083695-04 (PI: F.H. Sarkar)
Other Funding: 1P20-CA0101936-02; sub contract award to F.H. Sarkar through a SPORE grant to University of Texas MD Anderson Cancer (PI: J. Abbruzzese).
Note: "The first two authors contributed equally to this paper" (including Sanjeev Banerjee).

Allegation 76: In Figure 3B, lanes 3 and 4 of the $Bclx_L$ bands is same (but flipped horizontal and faded). (DIO4915 Image File E, slide 686).

Note: Clarification: Allegation 76 is about Figure 3B, not 2B.
Note: See also duplications of Notch-1, Rb and β-actin below.
Note: See also **Allegation 79a** (DIO4915 Image File E, slides 709-711).

RESPONSE:

Drs. Sarkar and Banerjee wrote in response "The original blot is presented with no evidence of alleged duplication/ fabrication" (Banerjee 04 - Exhibit 155Ad – Allegation-response-II-SB.pptx, slide 7; DIO4915 Image File E, slide 687). Dr. Banerjee testified that he made the images for Figure 3B in Reference #280 (Banerjee Transcript, V.2, p.360, ll.6-13). Also see Dr. Banerjee's testimony under Allegation 79a.

ANALYSIS:

See DIO4915 Image File E, slides 686-688.
A visual comparison confirms that lanes 3 and 4 of the $Bclx_L$ bands in Figure 3B of Reference #280 are not the same image and the submitted scan is the authentic source of the bands (DIO4915 Image File E, slides 687-688). The scan has no date or file name. However, the original bands are stretched horizontal and squeezed vertical to appear slightly longer and thinner as published.

CONCLUSION:

The Committee finds that lanes 3 and 4 of the $Bclx_L$ bands in Figure 3B of Reference #280 are not the same image. The Committee concludes that there is no evidence in support of **Allegation 76.**

See the following other allegations relevant to Paper 66 (**Reference #280**).

Allegation 80b: In Figure 6 in Paper 3, the same Notch-1 band image was re-used, manipulated, and/or re-labeled "MMP-9." Compared to Figure 3B in Reference #280, lanes 1 & 2 are flipped horizontal, lane 3 is flipped horizontal and re-used twice as both lanes 3 and 4 (DIO4915 Image File F, slides 808-809).
Allegation 80f: Figure 3B, here labeled Bcl-2 (compared to Reference #284, lanes 1&2 are switch with lanes 3&4; stretched; DIO4915 Image File F, slide 813).
Allegation 83L: Figure 4C Rb image was re-used (stretched; DIO4915 Image File G, slide 902).
Allegation 84c: The 4-lane Rb image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3A (stretched; DIO4915 Image File G, slide 920).
Allegation 91f: The β-actin image was re-used and manipulated in Figure 3B (DIO4915 Image File H, slides 1004-1005).

Paper 67 (**Reference #282**) Zhang, Y., Banerjee, S., Wang, Z., Hu X., Zhang, L., Mohammad, R., Aboukameel, A., Adsay, N., Che, M., Abbruzzese, J., Majumdar, A., Sarkar, F.H. Antitumor activity of epidermal growth factor receptor—related protein is mediated by inactivation of ErbB Receptors and Nuclear Factor-κB in pancreatic cancer. *Cancer Res*: 66:1025-1032 (2006)

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NIH Funding: 1R01CA101870-03 (PI: F.H. Sarkar); University of Texas MD Anderson Cancer Center – Grant number: SP20CA 101936-04: sub contract award to F.H. Sarkar through a Specialized Programs of Research Excellence (SPORE) grant SP20CA 101936-04 on pancreatic cancer (J. Abbruzzese).
Other Funding: Puschelberg Foundation

Allegation 77: In Figure 2D, the HPAC/pEGFR lanes 7 & 8 are pasted in suggesting data fabrication and/or falsification.

Allegation 77a: In Figure 1B, lanes 4 and 6, the "T" condition, of the pEGFR(Y1173) panel appear to be the same image, indicating fabrication by re-use/re-labeling of an image for different cell lines.

Allegation 78: In Figure 3A, the BxPC-3 row, pHER2 lanes 4 & 5 appear blurred out, and in Figure 3B, in the BxPC-3 top row, lanes 2 & 5 appear to be pasted in. These manipulations indicate data falsification and/or fabrication."

Note: Other duplicate uses of Rb bands and/or β-actin bands in this paper are listed below.

GENERAL RESPONSE:

Dr. Sarkar wrote: "There is no allegation for #77, 77a and 78" (Response Letter (2nd)-Feb. 4th-2014.docx, p. 3)

COMMENT: Dr. Sarkar's response reflects confusion over the allegations in Reference #282. The original complainant did not specify allegations about some figures. Upon examination of these images, the Committee raised specific concerns regarding Figures 1B, 2D and 3A, as detailed above in Allegations 77, 77a and 78, as well as others in Figures 1B and 3C. The phrase "no specific concerns" was an obvious error in context of the specific concerns listed immediately thereafter, but because Dr. Sarkar did not understand these the issues regarding Figure 1B (lanes 3 and 5 of the pEGFR(Y1173) panel) and Figure 3C (pHER3 panel lanes 2, 3 & 5; and β-actin band lanes 4 & 9) were allegations, the Committee makes no determination regarding these further issues about which Dr. Sarkar did not respond further.

Allegation 77: In Figure 2D, the HPAC/pEGFR lanes 7 & 8 are pasted in suggesting data fabrication and/or falsification.

Allegation 77a: In Figure 1B, lanes 4 and 6, the "T" condition, of the pEGFR(Y1173) panel appear to be the same image, indicating fabrication by re-use/re-labeling of an image for different cell lines.

Allegation 78: In Figure 3A, the BxPC-3 row, pHER2 lanes 4 & 5 appear blurred out, and in Figure 3B, in the BxPC-3 top row, lanes 2 & 5 appear to be pasted in. These manipulations indicate data falsification and/or fabrication.

ANALYSES:

See DIO4915 Image File E, slides 690-691.
For Allegation 77, a simple visual analysis confirms that lane 7 was pasted into the HPAC pEGFR(Y1173) band. Cut marks are present at the left and right sides of lanes 7. Erasure marks are present at the right side of lane 8 (DIO4915 Image File E, slides 690-691). No original scans were found.
See DIO4915 Image File E slides 692-693.
For Allegation 77a, a visual comparison confirms that lanes 4 and 6 are the same in the pEGFR(Y1173) lane in Figure 1B of Reference #282. The baseline for lane 6 is slightly higher than the baseline for line 4. Lane 4 is labeled as the treatment (T) for the HPAC cell line and lane 6 is labeled the treatment (T) for PANC-1 cell line (DIO4915 Image File E, slides 692-693).
See DIO4915 Image File E, slides 694-696.
For Allegation 78, a visual examination confirms that lane 4 of the BxPC-3 pHER2(Y1248) band in Figure 3A of Reference #282 has been smudged or erased. The only the left point of what was in the lane is still faintly apparent. Lane 5 has not been altered. A visual analysis confirms lane 5 has not been altered. In Figure 3B, in the BxPC-3 top row, lanes 2 & 5 show clear cut marks and possibly erasures, indicating the bands were pasted in (DIO4915 Image File E, slides 694-696).

CONCLUSIONS:

The Committee finds, in **Allegations 77, 77a** and **78**, that various lanes and blots were apparently duplicated, pasted in, re-labeled to represent different cell lines, and/or smudged or erased in certain rows in **Figures 1B, 2D, 3A** and **3B** of **Reference #282**. Although Dr. Sarkar likely bears some responsibility for Reference #282, in these instances, due to confusion commented upon above, the Committee makes no determination regarding research misconduct by Dr. Sarkar regarding these instances.

See the following additional allegations regarding **Reference #282**

Allegation 83m: Rb image was re-used Figure 4C (DIO4915 Image File G, slide 903).
Allegation 86h: The 2-lane Rb image was re-used (and manipulated) in Figure 4D (DIO4915 Image File G, slide 939).

Paper 68 (**Reference #284**) Wang, Z., Zhang, Y., Banerjee, S., Li, Y., and Sarkar, F.H. Inhibition of nuclear factor κB activity by genistein is mediated *via* Notch-1 signaling pathway in pancreatic cancer cells. *Int. J. Cancer*: 118, 1930-1936 (2006e)

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NIH Funding: 5R01CA101870-02 (PI: F.H. Sarkar); 1P20-CA010193-01 (PI of sub contract: F.H. Sarkar; the P20 PI/PD: J. Abbruzzese – Specialized Programs of Research Excellence (SPORE) grant to University of Texas, MD Anderson Cancer Center)

Allegation 79: In Figure 3C, lanes for Hes-1 and Bcl-xL are pasted in. Lane 4 of Hes-1 and Cyclin D1 (72 hrs) appear removed, smudged or lightened. Figure 3C re-appears in a different configuration as Figure 7B in **Reference #277** with Hes-1 re-labeled as Cyclin D1 and Cyclin-D1 re-labeled Hes-1. In Figure 3C, three proteins are matched to one β-actin bands. The same β-actin image is matched with Cyclin-D1 in Figure 7B in Reference #277, but a different β-actin bands image is used for Bcl-xL and Hes-1 rows in Reference #277. (DIO4915 Image File E, slides 698-699).

RESPONSE:

Dr. Sarkar submitted a response to which Dr. Wang had contributed: "We were unable to locate the original autoradiograms that were scanned for publication. There is no re-use of Bcl-XL. However, there is a mistake for Hes-1 and Cyclin D1 in Ref 284. Hes-1 label should be Cyclin D1, while Cyclin D1 should be Hes-1 in Ref 284" (Wang-Response-1.pptx, slide 14). A scanned image labeled "Bcl-xL" was submitted as a source for the Bcl-xL band of Figure 3C in Reference #284 (Wang-Response-1.pptx, slide 14; (DIO4915 Image File E, slide 698). Dr. Sarkar and Dr. Wang also wrote that "allegation 79 is not related with Figure 5C in allegation 74. It has error for Hes-1 and Cyclin D1 in Ref 284. Hes-1 label should be Cyclin D1, while Cyclin D1 should be Hes-1 in Ref 284. This is same experiments and same conditions. We just inadvertently labeled wrong protein names..." (Wang-Response-2.docx, p.1). (DIO4915 Image File E, slides 702-703).

Dr. Sarkar testified that the bands labeled Hes-1 and Cyclin D1 in Figure 3C were "mis-labelled" (Sarkar Transcript, V.2, p.427, ll.4-9) and that the labels should be switched to match the labels and images in Figure 7B of Reference #277 (Sarkar Transcript, V.2, p.430, l.18 to p.433, l.20). Dr. Sarkar stated: "Hes-1, we provided the film, and Cyclin D1 provided the film. The labeling is opposite, and then we agree that this is the case" (Sarkar Transcript, V.2, p.430, ll.7-9). However when it was pointed out to Dr. Sarkar that his written response to Allegation 79 said they "were unable to locate original autoradiograms that were scanned for publication" (Sarkar Transcript, V.2, p.427, l.19 to p. 428, l.5). He could not explain how the mistake happened or why separate and different β-actins bands were published for the same protein bands in Figure 7B of Reference #277 (Sarkar Transcript, V.2, p.427, l.19 to p.436, l.15).

Dr. Sarkar stated that β-actin was run for each protein but "when it is getting re-use of the data, Beta-actin could have been different, but the re-use [in Fig 3C] is definitely – is a mistake and is not permissible" (Sarkar Transcript, V.2, p.435, l.24 to p. 436, l.5). While Dr. Sarkar admitted that the re-use of data in Figure 3C was wrong, "...a mistake and is not permissible", he did not know whether Figure 3C in Reference #284 or Figure 7B in Reference #277 had the correct labels (Sarkar Transcript, V.2, p.427, l.19 to p.436, ll.15),

Dr. Wang testified that Figure 3C in Reference #284 and Figure 7B in Reference #277 were the same experiment (Wang Transcript, V.1, p.245, l.25 to p.246 l. 17). Dr. Wang said that he used two different β-actin bands because "...some journal ask us to put one by one, in each lane need to put an actin, because if you run every time you will get different – similar but different actin... As we read it, they said it is better to separate these figures. Before like they were only four together. Now they said that each one need actin" (Wang Transcript, V.1, p.247, ll.24 to p.246 ll. 2; p.249, ll.7-10). When asked why the results from one paper were not cited in the other papers, Dr. Wang said that many papers were sent out for review at the same time (Wang Transcript, V.1, p.249, ll.1-2).

ANALYSIS:

See DIO4915 Image File E, slides 699-708.
Simple visual inspection confirms that lane 4 in the row labeled "Hes-1" is the result of cutting-and-pasting. There are visible cut marks on all four sides of the band and the background of this lane indicating that a gray box has been pasted over this lane or the rectangular area has been erased. No scan or file for Hes-1 in Figure 3C was found on the sequestered computers nor was any scan or gel for Hes-1 submitted (DIO4915 Image File E, slide 704). The cutting and pasting of the 4th lane in the Hes-1 and Cyclin D1 rows was not addressed in the responses.

Simple visual inspection confirms that lane 4 in the row labeled "Cyclin D1" is also the result of cutting-and-pasting (DIO4915 Image File E, slide 705). There are visible cut marks on all four sides of the lane and a different band pasted over this. In the background of the scan, irregular-shaped medium gray "clouds" float between the lanes; however, the right side of the "cloud" between lanes 3 and 4 has a sharp edge where lane 4 begins, as does the left side of the background between lane 4 and where lane 4 ends. The edges of lane 4 are far more regular than the other lanes in the image. No scan or file for Cyclin D1 in Figure 3C was found on the sequestered computers nor was any scan or film for Cyclin D1 submitted (DIO4915 Image File E, slides 699 & 702). There is no date or file name or lane labels for the submitted Bcl-xL blots and so no way to confirm that this scan related to Figure 3C. Visual comparison shows that the submitted blots do not match the published Bcl-xL bands (DIO4915 Image File E, slides 699-704).

In Figure 3C of Reference #284, a single β-actin bands image aligns with all 3 proteins whereas in Figure 7B of Reference #277, each protein row is aligned with a different β-actin bands image. The β-actin image is Figure 3C in Reference #284 is re-used as the β-actin image for the Cyclin D1 bands in Figure 7B of Reference #277 (see Allegation 89f).

Dr. Sarkar and Dr. Wang claim that the labels for Hes-1 and Cyclin D1 in Figure 3C of Reference #284 should be switched and appear as labeled in Figure 7B of Reference #277. Yet they provide no evidence to support this. Reference #277 was submitted to the journal for review 7 weeks after Reference #284 was submitted, suggesting that the labeling in Reference #284 has primacy. In the course of evaluating Allegation 79 and the responses to it, it became clear, also, that the Cyclin D1 band image published in Reference #284 is re-used again later (September 6, 2005) in a separate instance in **Figure 3D** of **Reference #272**. Whereas the captions for Figure 3C in Reference #284 and Figure 7B in Reference #277 both describe time-course studies of protein expression changes in BxPC-3 pancreatic cancer cells after 25 μM genistein, the caption for Figure 3D in Reference #272 describes the same image in a dose-response study of changes in protein expression in PANC-1 cells after 72 hours of curcumin treatment (DIO4915 Image File E, slides 706-707). Additionally, the Hes-1 bands image in Figure 3D of Reference #272 and the Bcl-xL image in both Figure 3C of Reference #284 and Figure 5A of Paper 3, are re-used and re-labeled in other figures in other papers (e.g., see Allegations 80e & 81). There is no information presented or found in the laboratory record to determine which label is correct or that addresses the duplication of the images in the publications.

CONCLUSION:

The Committee finds in **Allegation 79** that lane 4 of the Hes-1 and the Cyclin D1 rows in **Figure 3C** in **Reference #284** are manipulated through cutting-and-pasting and/or by blurring an image. The Committee finds also that the Hes-1 and Cyclin D1 rows are duplicated in **Figure 7B** in **Reference #277** and copied and re-labeled in **Figure 3D in Reference #272.** (See also Allegation 94 for yet another re-use and re-labeling of the same Hes-1/Cyclin D1 image.) The Committee finds that the claim that labels were switched between the Hes-1 and Cyclin D1 rows by mistake not to be credible given the order of publication, the re-use of the same image again in Reference #272 in completely different experiments, and the absence of original data. Even if the duplications and re-labelings are mistakes, which is highly unlikely, it also appears highly unlikely that Dr. Sarkar and Dr. Wang know which image is which protein from which experiment in these publications (Paper 3; References #284, #277 & #272; DIO4915 Image File E, slides 706-708). Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the data in these figures, and in each instance, this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 79a: In Figure 6B, the images in the two lanes for the IκBα row with columns labeled "CS" ("control siRNA") and "NS" ("Notch-1 siRNA") are identical to the images in lanes 1 and 2 of the Bcl-xL row in Figure 3B in **Reference #280** where the columns are labeled 0 and 10 μM genistein (DIO4915 Image File E, slide 709).

Note: Allegation 76 originally indicated Figure 2B in Reference #280 but Figure 3B is the correct figure from Reference #280; the Drs. Sarkar and Wang did address Figure 3B in their responses.

RESPONSE:

Dr. Sarkar submitted a response to which Dr. Wang had contributed: "We were unable to locate the original autoradiograms that were scanned for publication; however, we found the duplicate autoradiograms from the same set of replicate experiments showing similar results" (Wang-Response-1.pptx, slide 15; DIO4915 Image File E, slide 710).

Dr. Wang testified that he created Figure 6B in Reference #284 and that it is a different experiment from that in Figure 3B in Reference #280, which was done by Dr. Banerjee (co-first author of Reference #280). However, Dr. Wang also said that he and Dr. Banerjee did the genistein plus Notch-1 siRNA studies together (Wang Transcript, V.1, p.249, ll.4-6). When asked if he had done the Western blot and Dr. Banerjee used his image for Figure 6B, or if he had used a blot that Dr. Banerjee ran, Dr. Wang said "...I don't know, cannot remember..." (Wang Transcript, V.1, p.253, ll.12-17). He maintained that an original film was submitted for Figure 6B, but then admitted that Dr. Banerjee had sent the film and that he (Dr. Wang) had not checked to see if it was the original film since he was in China at this time. Dr. Wang testified that Dr. Banerjee told him that he (Dr. Banerjee) had "found the original film on the I-kappa-B-alpha, and another original film" and on that basis Dr. Wang testified that "we have the Bcl-xl." However, Dr. Wang also testified that Dr. Banerjee wrote to him saying that the IKBα band in Figure 6B "is a mistake ... this band should be Bcl-xl" (Wang Transcript, V.1, p.255, l.18 to p.261, l.7).
Dr. Banerjee testified that he created Figure 3B in Reference #280 but that Dr. Wang created Figure 6B in Reference #284 (Banerjee Transcript, V.2, p.395, ll.9 to p.396, ll.18). Dr. Banerjee maintains that Figure 6B was copied from his earlier Figure 3B in Reference #280 (Banerjee Transcript, V.2, p.398, ll.15-16). Dr. Banerjee said that he "never composed any figure for Dr. Wang" but that when these papers were being prepared, Dr. Wang was without a computer for a while and shared Dr. Banerjee's computer at that time (Banerjee Transcript, V.2, p.401, l.1 to p.405, l.5).

ANALYSIS:

See DIO4915 Image File E, slides 709-713.
Simple visual inspection indicates that the two lanes of IKBα bands of Figure 6B in Reference #284 are the same images published in lanes 1 and 2 of the Bcl-xL bands in Figure 3B in Reference #280. The blots in both these Figures contain the same distinguishing marks (DIO4915 Image File E, slide 709). In contrast to Reference #284 where the caption for Figure 6B describes treatments with "Notch-1 siRNA" ("NS" column), the labels in Figure 3B of Reference #280 describe treatment with 0 or 10μM genistein. No date or file name was given for the submitted scan so there is no way to confirm that this scan related directly to Figure 6B in Reference #284.

Dr. Wang first admitted to creating Figure 6B in Reference #284. He later stated he could not remember if he or Dr. Banerjee created Figure 3B in Reference #280 (cf., Allegation 76), or implicitly, who copied from whom. Dr. Banerjee maintains he never created a figure for Dr. Wang. Both agree that Dr. Banerjee created Figure 3B. Dr. Banerjee said that he created Figure 3B first and was "uncomfortable" to see Figure 6B which he said looked "... identical, so it was copied from my paper or--I had the original blot ..." meaning that Dr. Wang had copied from Dr. Banerjee's figure (Banerjee Transcript, V.2, p.396, l.17 to

p.398, l.17). Dr. Banerjee suggested that because Dr. Wang had access to Dr. Banerjee's computer at the time both manuscripts were being prepared, Dr. Wang may have taken Dr. Banerjee's Figure 3B for use in Reference #284. Consistent with this explanation, Reference #280 was submitted about 2 months before Reference #284, and was accepted about three weeks after Reference #284.

Dr. Banerjee submitted the scans for Figure 6B and for Figure 3B of Reference #280 (regarding Allegation 76) in the response for Dr. Wang. Dr. Wang said that Dr. Banerjee told him by email that the IKBα row in Figure 6B had the wrong image and that it duplicated lanes 1 and 2 of the scan for Figure 3B in Reference #280. However, Dr. Wang still submitted a different scan for his response regarding for Figure 6B in Reference #284. Dr. Wang said Dr. Banerjee told him the scans were originals, but Dr. Wang did not check this, which contradicts the statement accompanying the response Dr. Sarkar submitted that the scans are duplicates since originals could not be found. The scan submitted for Figure 6B does not match the published figure (DIO4915 Image File E, slides 710-711). However, lanes 1 and 2 of the scan labeled "Bcl-xL" that was submitted for Allegation 76 (concerning lanes 3 and 4 of the Bcl-xL band in Figure 3B of Reference #280) do match Figure 6B (DIO4915 Image File E, slides 711-713)

CONCLUSION:

The Committee finds in **Allegation 79a** that the two lanes of the IKBα row in **Figure 6B** in **Reference #284** are re-labeled copies of lanes 1 and 2 from the Bcl-xL bands published in Figure 3B in Reference #280. The Committee concludes that Dr. Wang copied the image from Dr. Banerjee's computer and that Dr. Banerjee was not involved in this. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the data in these figures and that, in each instance, this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 138: Figure 2C in **Reference #284**, published first, appears to have been manipulated and re-used again in three other publications as, Figure 6D in **Reference #277** (Wang, et al, 2006c), and as Figure 4C in **Reference #272** (Wang, et al, 2006b), and as Figure 1D in **Paper 32** (Wang, et al, 2008). This figure, which presents a "supershift assay," was resized, cropped, stretched and/or squeezed, and duplicated in each successive publication without citing the first published use (DIO4915 Image File E, slide 714).

Note: Duplications of the Rb bands in these figures are detailed in **Allegation 86:**

Allegation 86d (DIO4915 Image File G, slide 936)
Allegation 86f (DIO4915 Image File G, slide 936)
Allegation 86k (DIO4915 Image File G, slide 934)

The three other publications, in order of publication date, are:

Paper 63 **(Reference #272):** Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. *Cancer* 106:2503–13 (2006b)

Publication History: Received: September 6, 2005; Revision received: December 19, 2005; Accepted: January 11, 2006.
NIH Funding: 5R01CA101870-02 (PI: F.H. Sarkar); SPORE Grant "1P20-CA010193-01" (PI:J. Abbruzzese)

Paper 64 **(Reference #277):** Wang, Z., Zhang, Y., Li, Y., Banerjee, S., Liao, J., Sarkar, F.H. *Molecular Cancer Ther* 5(3):483–93 (2006c)

Publication History: Received: August 3, 2005; Revised: October 31, 2005; Accepted: January 5, 2006

NIH Funding: 5R01CA101870-02 (PI: F.H. Sarkar) SPORE Grant "1P20-CA010193-01" (PI:J. Abbruzzese)

Paper 32 (Reference #218): Wang, Z., Song, W., Aboukameel, A., Mohammad, M., Wang, G., Banerjee, S., Wang, S., Kang, D., Wang, S., Sarkar, F.H., Mohammad, R. *Int J Cancer.* **123**(4):958-66 (2008)

Publication History: Received: July 7, 2007; Accepted after revision: March 11, 2008; Published online: June 4, 2008

NIH Funding: R01CA-109389 (PI: F.H. Sarkar); 5R01CA101870 (PI: F.H. Sarkar); P30CA22453 (PI: G. Bepler); U19CA11317 (PI: Shaomeng Wang, University of Michigan)

DOD Funding: Breast Cancer Program Grant BC0009140.

Note: "Conflict of Interest: University of Michigan has filed a patent on TW-37, which has been licensed by Ascenta Therapeutics Inc. University of Michigan and Dr. Shaomeng Wang own equity in Ascenta. Dr. Shaomeng Wang also serves as a consultant for Ascenta and is the principal investigator on a research contract from Ascenta to University of Michigan."

RESPONSE:

There was no specific response for Allegation 138 from Dr. Sarkar. Dr. Wang testified that this is another example of re-using a supershift image just to show that the assay is working (Wang Transcript, V.2, p.333, ll.20-22). Dr. Wang said that re-using the same supershift assay in other papers was fine because "the image only show people our system is working, so that's why we use this same image for multiple papers" (Wang Transcript, V.1, p.135, ll.19 to p.137, ll.6). Dr. Wang also testified that he thought there "... maybe more than four papers. There may be other papers also use. I don't know which paper" (Wang Transcript, V.2, p.333, ll.22-24). Dr. Wang testified that Dr. Banerjee gave him the supershift image "and said I could use it multiple times" and that "Dr. Banerjee knew we that we used multiple times." When asked how he could be sure that an assay from 2005 would still be valid when applied to different experiments in 2007, Dr. Wang said, "I think one time worked, so system already had worked before, because if you knew this technology, or this trick, or sometimes this one, maybe they thought they can do this one next time" (Wang Transcript, V.2, p.333, ll.17 to p.335, ll.24). Dr. Wang also admitted to changing the dimensions of figures (for a different supershift image) "because ... some of the papers, they need big size. Some have maybe need the small size" (Wang Transcript, V.2, p. 333, ll. 14-15).

ANALYSIS:

See DIO4915 Image File E, slides 714-719.

A close comparison of the four images of the NF-κB EMSA supershift assays in all four of these publications, and the order in which they were published, shows clearly that the image in Figure 2C in Reference #284 (Wang, et al., 2006e), published first (as far as the Committee is aware), was manipulated and re-used again as Figure 6D in Reference #277 (Wang, et al, 2006c), and then again as Figure 4C in Reference #272 (Wang, et al, 2006b), and then again as Figure 1D in Paper 32 (Wang, et al, 2008). See DIO4915 Image File E, slides 715-718. Certain unique marks and patterns appear in all four of the figures proving the identity of the images (DIO4915 Image File E, slide 719). This "supershift assay" image was resized, cropped, stretched and/or squeezed, and duplicated in each successive publication. This is the same issue with a different image in Allegation 131. While the captions for the four figures show only small differences in the description of the "supershift assay" *per se*, each caption and/or accompanying text implies that a supershift assay was performed for the specific experiment reported in each

publication. This was not so. None of the later publications cite the use of this assay or image in any of the earlier publications. The additional instances where Dr. Wang testified this same image may have been duplicated were not identified.

Allegation 138 is essentially identical in form to Allegation 131 which is also a duplication and manipulation of an NF-κB 'supershift' assay image. (Testimony regarding Allegation 131 is also relevant here). The Committee determined, as Dr. Wang admitted, that Allegation 138 is another case where a 'supershift' assay figure was re-used in multiple publications as proof that the EMSA methods worked in the lab. Dr. Wang's justification for re-using the supershift assay as an acceptable practice reflects consistent lax treatment of control data (i.e., Rb bands & β-actin loading controls) shown by Dr. Sarkar and other members of his laboratory. Dr. Wang's argument that the manipulations were only cosmetic is belied by the extent of re-resizing and blurring which were clearly intended to disguise the re-use of the image, and by the failure to cite prior publication of the figure. The ready acceptance in the lab of substantial changes to data in figures as "cosmetic" is evident in the testimony of Dr. Sarkar (e.g., Sarkar Transcript, V.1, p.100, ll.20-25; p.154, ll.5-7; p.158, ll.13-16; p.195, ll.6-22; p.259, ll.10-23), and Dr. Banerjee (e.g., Banerjee Transcript, V.2, p.455, ll.11-25; p.499, l.11 to p.500, l.7).

Dr. Sarkar failed to cite the prior source(s) of the figure. There is no evidence that the "supershift" assay was done for the 3 subsequent papers, or more than once, and once may be an inference.

CONCLUSION:

The Committee concludes, in **Allegation 138**, there was intentional manipulation and re-use of the 'supershift' assay image, published first, among these 4 publication at least, in 2006 in **Reference #284**, in three subsequent publications, two in 2006 (**References #272 & #277**) and another in 2008 (**Paper 32**). The evidence indicates that the re-use and the intentional manipulation of the images – including cropping, enlarging, stretching and squeezing – were done to give the impression that the EMSA validation assay was done for each publication. There is no evidence that the assay had been done again. Dr. Sarkar, Dr. Banerjee and Dr. Wang are the only authors in common in all four papers. Dr. Wang is first author for all, and Dr. Sarkar is corresponding author for References #284, #277 and #272. The Committee concludes that Dr. Sarkar knew the figure was being copied, and manipulated to disguise the re-use, and that he endorsed the re-use of the 'supershift' control image in figures in his publications "to show the assay was validated" (Sarkar Transcript, V.1, p.152, ll.3-4).

Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar intentionally and knowingly re-published the same "supershift" assay image from Reference #284 in three subsequent publications (Paper 32 and References #272 & #277). In each instance, these acts constitute fabrication and/or falsification of data, and plagiarism, and this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Also regarding Reference #284:

Allegations 80d, 80e, 81a, 81j are addressed under **Notch-1 Allegations 80-81.**
(DIO4915 Image File F, slides 812, 814-.820, 828-829, 840)

Allegations 83n, 83o, 83p, 83q, 86i are addressed under **Rb Allegations 82-86.**
(DIO4915 Image File G, slides 904-908, 940)

Allegations 89j, 89k, 89L, 90c, 92, 92b 4 are addressed under **β-actin Allegations 87-94.**
(DIO4915 Image File H, slides 969-978, 988, 1009-1011)

Allegations 95 and 134

(DIO4915 Image File I, slide 1050 and File D., slides 679-682, respectively.)

Related ***Allegation 89m*** is addressed under **Grant Application: 1 R01 CA131456-01** (file: 2007, 02 01 – Sarkar Proposal 07050620.pdf; DIO4915 Image File G, slides 903).

Paper 69 (**Reference #099**): Wang, Z., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Gunn, J.R., Kong, D., Bao, B., Ali, S., Gao, J., Mohammad, R.M., Miele, L., Korc, M., Sarkar, F.H. Activated K-ras and INK4a/Arf deficiency cooperate during the development of pancreatic cancer by activation of Notch and NF-κB signaling pathways. PLoS ONE 6(6): e20537, (2011)

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NIH Funding: 5R01CA131151, 5R01CA131151-S02, and 5R01CA132794 (PI: F.H. Sarkar); and CA-075059 (PI: M. Korc)
Other Funding: Puschelberg Foundation; Guido Foundation
Notes: An acknowledgement states that Drs. Wang and Banerjee "... contributed equally to this work."

Allegation 137: The 12 bands for "Notch 4" in Figure 1D appear to have been copied, stretched horizontally, squeezed vertically, and re-labeled as lanes 1 through 12 of the 13 bands in the "Bcl-2" row in Figure 3A (DIO4915 Image File E, slide 721).

RESPONSE:

Dr. Sarkar responded in a letter dated June 20, 2014 that "Figure 1D (Notch-4 band) is right ... PLoS One requested information on the question of Bcl-2 as indicated in the allegation, which has been corrected and the PLoS One will publish the erratum within the next few weeks..." (file: "Response-allegation-3.pdf", p.1). The correction request and corrected figure that Dr. Sarkar sent to PLoS One are shown in DIO4915 Image File E, slide 722. The text Dr. Sarkar wrote for the "PloS One Erratum" stated: "... there may be a minor error which has recently been discovered in the Bcl-2 lane although such a mistake has no impact on the overall findings and conclusions previously reported ... The authors regret this error" (file: "Response-allegation-3.pdf", p.2).
Dr. Banerjee, the co-first author, testified (Banerjee Transcript, V.3, p.733, ll.23 to p.735, ll.20) that he did not do the Western blots or make Figure 1D. Dr. Banerjee testified he did not contribute to Dr. Sarkar's response but that Dr. Wang had (Banerjee Transcript, V.3, p.734, ll.24-25). Dr. Banerjee did not know where the "corrected" Bcl-2 band had come from (Banerjee Transcript, V.3, p.735, ll.15-20).

Dr. Wang testified he composed a response that he sent to Dr. Sarkar, who submitted (Wang Transcript, V.2, p.316, ll.14-22). Asked why he used the Notch-4 band and called it Bcl-2, Dr. Wang testified that they had done many Westerns that may not have been labeled correctly either by using short-hand or not writing on the film (Wang Transcript, V.2, p.317, ll.3-16). He said he knew the "corrected" band was Bcl-2 "because others, the other, the film, the label that is here, like the p65 or p50, this is Bcl-2" (Wang Transcript, V.2, p.337, ll.24 to p.338, ll.1). When asked about his conclusions for Reference #099, Dr. Wang testified that "this paper just showed the Notch signaling pathway ... Bcl-2 is only the (unintelligible), the type of gene here, not important" (Wang Transcript, V.2, p.338, ll.15-21). Dr. Wang denied he used the Notch-4 band instead of the correct Bcl-2 image because it fit his results better (Wang Transcript, V.2, p.339, ll.15-18). He argued that the "relative difference between the IC and the KCl" in the "correct" Bcl-2 band was still consistent with the paper's conclusions (Wang Transcript, V.2, p.339, ll.22-24).

ANALYSIS:

See DIO4915 Image File E, slides 721-722.
Examination of the published Notch-4 and Bcl-2 images in Figure 1D shows the 12 lanes to be identical (DIO4915 Image File E, slide 721). Dr. Sarkar admitted they were copies without explaining how this "mistake" occurred or where the "correct" Bcl-2 band came from. No file with this image was found on Dr. Sarkar's computers and no information was submitted by Dr. Sarkar showing where the "corrected" image came from. No information is available to confirm that the Notch-4 "... is right..." or that the replacement band is actually Bcl-2 from these treatment conditions in these cells. If the Bcl-2 band is in fact correct, substituting it with a copy of the Notch-4 band effectively and dramatically improves the lane separation and consistency across all the proteins bands. Further, Dr. Wang's argument of consistent relative differences in the correct Bcl-2 band notwithstanding, compared to the "correct" blots, the substitution of the putative Notch-4 from Figure 1D was more clearly consistent with the interpretation of the results written in the caption of Figure 3A, specifically, that "Western blot analysis showing the up-regulated expression of IKK, p65, and NF-kB downstream genes in tumors derived from KCI mice." The bands submitted as a correction showed much higher Bcl-2 expression in the IC and KC mice than in the Notch-4 band, consistent with the text of the paper noting "...NF-kB downstream gene expression, such as Survivin, Bcl-2 ..." (p.7). See DIO4915 Image File E, slide 722, left side.

CONCLUSIONS:

The Committee finds, in **Allegation 137**, that in **Figure 3A** in Paper 69 (**Reference #099**) that a Western blot image labeled "Notch-4" from Figure 1D was re-ued and manipulated and re-labeled to misrepresent the relative differential expression of Bcl-2 in IC, KC and KCI mice. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published falsified data in Figure 3A and that this is research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

Paper 70 (**Reference #293**): Rahman, K.M.W., Ali, S., Aboukameel, A., Sarkar, S.H., Wang, Z., Philip, P.A., Sakr, W.A., Raz, A. Inactivation of NF-KB by 3,3'-diindolylmethane contributes to increased apoptosis induced by chemotherapeutic agent in breast cancer cells. Mol Cancer Ther 6(10), 2757-2765 (2007)

Note: This publication is not by Dr. Sarkar.
No allegations.
However, the 8-lane Rb image in file "Rb(vivo).jpg" appears in Figure 4C of Reference #293 which the Committee finds is relevant to analyses of duplicate Rb loading control bands and determining responsibility for fabrication and/or falsification. Ms. Ali and Dr. Wang are co-authors of Reference #293. A "Sanila H. Sarkar" is an author, whereas Dr. Sarkar and Dr. Banerjee are not.

Paper 71 (**Reference #111**): Bao B, Ali S, Kong D, Sarkar SH, Wang Z, Banerjee S, Aboukameel A, Padhye S, Philip PA, Sarkar FH. Anti-tumor activity of a novel compound-CDF is mediated by regulating miR-21, miR-200, and PTEN in pancreatic cancer. PLoS One. 6(3):e17850. DOI: 10.1371/journal.pone.0017850 (2011)

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Other Funding: Puschelberg and Guido foundations

Allegation 139: In Figure 5C, 3 photomicrographs of cells in culture appear to be copied and re-labeled as different treatments within the same figure. Specifically, the "AsPC-1 20 nmol/L GEM" image (2nd image in left panel) is duplicated as "CDF-pre-treated AsPC-1 0 nmol/L GEM" (1st image in right panel); the "AsPC-1 40 nmol/L GEM" image (4th image in left panel) is duplicated as "AsPC-1 6 µmol/L CDF" (6th image in left panel); and the "CDF-pre-treated AsPC-1 40 nmol/L GEM" image (4th image in right panel) is duplicated as "CDF-pre-treated AsPC-1 8 µmol/L CDF" (7th image in right panel). See DIO4915 Image File E, slide 725.

RESPONSE:

Dr. Sarkar submitted a response to this allegation in file "Response to #4-Sept. 2014.pdf" (pp.1-12; e.g., DIO4915 Image File E, slide 727) from Dr. Bao. Dr. Bao admits that the images shown in the figure are duplicated. Dr. Bao claims that this is an inadvertent duplication due to a simple mistake. He provides a description of the directory sources for the experiments, source and file names of original data, a series of photomicrographs taken on 6/22/10, and a copy of a lab notebook page "99" (DIO4915 Image File E, slide 728) that describes a series of samples that appear to match the experiment. A correction for the journal for Figure 5C was also submitted by Dr. Sarkar and Dr. Bao (Response to #4-Sept. 2014.pdf, p.23; DIO4915 Image File E, slide 727).

ANALYSIS:

See DIO4915 Image File E, slides 724-728.
A simple comparison shows the images in question are indeed 3 pairs of re-labeled duplicates (DIO4915 Image File E, slide 726). The Committee confirms that the lab notebook page was in Exhibit 01 - DIO4915 - Bao #1.pdf (p.55; notebook p.99). The procedure described in Dr. Bao's laboratory notebook has the same samples as the published experiment but seems to be at odds with the experiment in the publication leading to some confusion. The images provided appear to be brightfield micrographs whereas the procedures describe antibody staining of cells, so it is not clear that this is the same experiment. The description of how these images track from file names to experimental samples exemplifies the poor record keeping that could lead to errors of this type. All of the actual photomicrographs are named in the form "untitled00x.jpg" and only their directory number indicates their origin. There are multiple images within each file and often the first two images within a folder are identical. The sample numbering overlaps 1-10 for untreated and 1-7 for pre-treated with CDF and so that within any directory or folder, and between drives (e.g., "P_drive"), the names are ambiguous. It is impossible to determine whether this was a simple mistake as claimed by Dr. Bao or deception. However the lax standards for file naming and recordkeeping, highlighted here, make mistakes like this inevitable.

CONCLUSION:

The Committee finds that it is likely, in **Allegation 139**, that an error occurred in several panels in **Figure 5C** in **Reference #111**, leading to duplication of images. There is insufficient evidence supporting a specific intention to mislead in this instance. However, this instance is another clear example where lack of appropriate record keeping in Dr. Sarkar's laboratory contributed to an environment in which effective and accurate reporting of findings is uncertain.

Paper 72 (**Reference #167**): Wang Z, Li Y, Banerjee S, Kong D, Ahmad A, Nogueira V, Hay N, Sarkar FH. Down-regulation of Notch-1 and Jagged-1 inhibits prostate cancer cell growth, migration and invasion, and induces apoptosis via inactivation of Akt, mTOR, and NF-kappaB signaling pathways. J Cell Biochem. 109(4):726-736. (2010)

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Other Funding: DOD Postdoctoral Training Award W81XWH-08-1-0196:

Note: Paper 72 **(Reference #167)** is addressed under **Allegation 140** and covered under Paper 46 (Reference #139) above. (See DIO4915 Image File C, slides 495-498.)

Paper 73 **(Reference #296)**: Bao B, Ali S, Ahmad A, Li Y, Banerjee S, Kong D, Aboukameel A, Mohammad R, Van Buren E, Azmi AS, Sarkar FH (2014) Differentially expressed miRNAs in cancer-stem-like cells: markers for tumor cell aggressiveness of pancreatic cancer. *Stem Cells Dev* **23**: 1947-58.

Publication History: Received: November 13, 2013; Accepted after revision: April 14, 2014; Epub: June 6, 2014; Published: August 15, 2014.
NIH Funding: None cited.
Other Funding: Puschelberg Foundation; Guido Foundations.

Allegation 141: PubPeer stated "See problematic images here" and indicated apparent cut marks in Figure 1D that show up in a "contrast enhanced" image. There appears to be evidence of cutting and pasting and/or masking/blurring of images in the p21 and p27 band of Figure 1D (DIO4915 Image File E, slide 731).

RESPONSE:

In response, Dr. Sarkar provided a file from Dr. Bao (Response-Final Bao Paper 73 Ref 296.ppt). This file includes a scan of what is indicated to be the original film for the p21 blot in question (DIO4915 Image File E, slide 733).

ANALYSIS:

See DIO4915 Image File E, slides 730-734.
Examination of the published Figure 1D (DIO4915 Image File E, slide 732), as well as the images posted on PubPeer show no indications of cutting and pasting (DIO4915 Image File E, slide 731). The apparent cut mark seen on the published p21 image is, in fact, a scratch mark that is also evident on the submitted scan. Analysis of the scan provided shows that it is indeed the source of the bands published for the p21 and p27 rows, matched the published bands, including other unique identifying marks, and indicating that this published image is authentic (DIO4915 Image File E, slides 733-734).

CONCLUSION:

The Committee finds in **Allegation 141** that there is no evidence of cutting and pasting or other manipulations. The submitted scans match the bands published in **Figure 1D** of **Reference #296**. Therefore, the published figures are judged to be authentic and there is no evidence of research misconduct by Dr. Sarkar.

Paper 74 (**Reference #297**): Bao B, Azmi A, Aboukameel A, Ahmad A, Bolling-Fischer A, Sethi S, Ali S, Li Y, Kong D, Banerjee S, Back J, Sarkar FH. Pancreatic cancer stem-like cells display aggressive behavior mediated via activation of FoxQ1. *J. Biol. Chem.* 2014, 289:14520-14533.

Publication History: Received: November 5, 2013; Revised: March 25, 2014; Published online: April 9, 2014
NIH Funding: None cited.

Allegation 142: In Figure 7B, there appear to be instances of cutting and pasting and/or masking the "Triple negative" column (i.e., left) side of the Western blots in the EpCAM, Snail and HIF-1α bands, and less clearly so for the IL-6 band. The two β-actin bands do not show the same blot separation as all the other protein bands. The Snail image that PubPeer posted for Figure 7B was actually from Figure 10B. The EpCAM and Snail bands in Figure 10B, appear to have cutting and pasting and/or masking marks in the "MiaPaCa-2" column (i.e., right) side of the Western blot. The EZH2 band in Figure 10D appears to have cutting and pasting and/or masking marks in the "CSLC, anti-FoxQ1" column on the left of the blot. See DIO4915 Image File E, slide 736.

RESPONSE:

Dr. Sarkar wrote in response that separate Western blots were run for each protein and "the appropriate bands were cut from the individual original blots and used for creating the composite figures ... Based on our record, there are no evidence of any manipulation for any bands including IL-6, EpCAM, Snail, HIF-1α, p-Akt, p65, and β-actin bands in Figure 7B" (Response to Allegation #4-Sept. 2014, p.20). Scans of original films were submitted (Response to Allegation #4-Sept. 2014, pp.21-22). A "snapshot of the file folder containing these original X-ray films in the p drive" was not found in the response.

ANALYSIS:

See DIO4915 Image File E, slides 735-741.
Visual examination of the published bands do not appear to support the allegation by PubPeer. While not all of the original images were provided for the panels in Figure 7B, the ones that were provided do appear to match the published images (DIO4915 Image File E, slides 737-741). It is unclear why all of the image components were not provided, but the evidence supports that these figures are authentic representations of the experimental data.

CONCLUSION:

Examination of the evidence does not support allegations of misconduct relative to Figures 7B and 10B. These images appear to be authentic in this case.

Paper 75 (**Reference #301**): Lian F, Li Y, Bhuiyan M, Sarkar FH. p53-independent apoptosis induced by genistein in lung cancer cells. Nutr Cancer. 33(2):125-131 (1999)

Publication History: Submitted: October 19, 1998; Accepted in final form: December 22, 1998; Published: 1999; Published online: November 18, 2008
NIH Funding: None cited.

Allegation 143: In Figure 5, the β-actin bands on the upper right accompanying the p53 protein bands in H322 cells are copied, flipped left-to-right and re-used as the β-actin bands on the left panel to accompany the p21 protein bands in H460 cells (DIO4915 Image File E, slide 743).

RESPONSE:

Dr. Sarkar responded that this Reference #301 was from 1999, 15 years ago, it was sufficiently old that he no longer had records associated with the paper.

ANALYSIS:

See DIO4915 Image File E, slides 742-744.
As Dr. Sarkar indicated, Paper 75 (**Reference #301**) is outside the period under investigation. However, this publication is cited as support for the following NIH grant applications on which Dr. Sarkar is PI and that were submitted within the period under investigation.

A simple examination shows clearly that the β-actin bands from the p53 protein panel on the right side of Figure 5 are copied, flipped horizontally, and flipped vertically, and re-sized (squeezed vertically and horizontally) and re-used as the β-actin bands for the p21 protein panel on the left side (DIO4915 Image File E, slide 744). The bands from the right side were also re-produced at a higher contrast that the bands on the left side, eliminating faint bands visible above lanes 6 to 9 in the row on the left side. In contrast to the right side of Figure 5, which the caption says depicts H322 cells, the left side is supposed to depict H460 cells and such a duplication of control bands across cell types is not justified.

Further, Dr. Sarkar cited Reference #301 in three NIH grant applications:

2006	R01CA1 21 092-01A1	SPA#06050814 citation #82
2006	R01 CA121092-01	SPA#05083241 citation #77
2008	R01CA132794-01A1	SPA#08050727 citation # 9

CONCLUSION:

The Committee finds, in **Allegation 143**, that β-actin bands in **Figure 5** of **Reference #301** were duplicated and re-labeled and manipulated to disguise the duplication. Since the relative expression of p53 and p21 after genistein treatment between cell types was assessed as a ratio to β-actin (cf, Reference #301, p.128 & Figure 6), and these results are integral to the conclusions of the paper (pp.129-130), those conclusions are compromised by the misrepresentation of β-actin. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly fabricated and/or falsified the results in Figure 5 in Reference #301 and that this constitutes research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103. The Committee concludes that since Dr. Sarkar, as PI, cited the fabricated and/or falsified conclusions of Reference #301 to support NIH grant applications, in each instance this is also research misconduct as described in the WSU Policy and Procedures Regarding Research Misconduct 2010-2011 and 42 CFR Part 93.103.

This Committee also notes that the fabrication and/or falsification of data in Reference #301 from 1999 indicates that re-using, manipulating and re-labeling Western blot data, particularly of control bands, are common practices of long standing in Dr. Sarkar's laboratory.

Duplication and Manipulation of "Notch-1" Bands – Allegations groups 80 and 81

*General Issues – **Allegations groups 80 and 81***

The allegations here are that a few images of so-called Notch-1 protein bands from one or more Western blots were copied and manipulated (i.e., lanes rearranged, flipped, cropped, stretched, squeezed, etc.) and re-used, and sometimes re-labeled as other proteins, in many instances across many figures in several papers (see DIO4915 Image File F, 802-846). The different purposes for which the so-called "Notch-1" images were used repeatedly include experiments and assays of different proteins, with different cell lines and/or different tissue types, and/or different transfections, and/or different drug treatments at varying doses.

Note that the duplications and relabeling of the images in Allegations 80 and 81 are in addition to the repeated re-use and re-labeling of other so-called "Notch-1" images among other publications, specifically, Paper 3 (Allegations 5, 5a, 5b & 7), Paper 19 (Allegations 38 & 38a), Paper 25 (Allegation 45), Reference #263 (Allegation 75), Reference #277 (Allegations 38a, 74 & 79), Reference #278 (Allegation 75), Reference #280 (Allegation 76), and Reference #284 (Allegation 79).

General RESPONSE about Notch-1 bands:

Dr. Sarkar testified regarding the re-use of the same image for many different types of conditions that he "...can't imagine why someone will do it. That is the only comment I can make" (Sarkar Transcript, V.2, p.382, ll.1-3). When asked whether a possible motive to re-use images is that the experiments were never done, Dr. Sarkar testified that "that can be only proven by investigating the notebooks and the experiment and the data" (Sarkar Transcript, V.2, p.382, ll.7-15). Dr. Sarkar acknowledged that lab notebook and computer records were poor (Sarkar Transcript, V.2, p.382, ll.19-25). Dr. Wang testified that he drafted responses regarding Allegations 80 and 81 and sent them to Dr. Sarkar who edited and submitted them. They wrote in part in "Wang-Response-1.pptx" (slide 16) that "we found the duplicate autoradiograms from the same set of replicate experiments showing similar results ... thus, no further action would be required."

General ANALYSIS of Notch-1 bands:

The Committee examined all Western blot images in all of Dr. Sarkar's publications and grant applications from the period under investigation. Dr. Sarkar's papers and grants where these Notch-1 band images in Allegations 80 and/or 81 are found, and the involvement of others are:

Paper 3 (2006) –	Dr. Wang: first author; Dr. Banerjee co-author
Reference #263 (2006) –	Dr. Wang and Dr. Banerjee co-authors
Reference #277 (2006) –	Dr. Wang: first author; Dr. Banerjee co-author
Reference #278 (2006) –	Dr. Wang: first author; Dr. Banerjee co-author
Reference #280 (2006) –	Dr. Banerjee co-first author
Reference #284 (2006) –	Dr. Wang: first author; Dr. Banerjee co-author
1 R01 CA120008-01 (2005) –	Dr. Sarkar: PI
1 R01 CA131456-01 (2007) –	Dr. Sarkar: PI

Note: The β-actin control bands for several of the figures involved in Allegations 80 and 81 are also manipulated copies of the exact same image. These are considered under Allegation 91.

Allegation 80 (including 80a to 80g)

Overall, visual inspection of the images under Allegation 80 shows that the same images are used (DIO4915 Image File F, slides 803-824). Two Notch-1 images (slide 803) were re-used, manipulated (stretched, flipped, squeezed, and rearranged) and/or re-named in the following figures. One Notch-1 image is addressed in Allegations 80a, 80b, 80c, 80d & 80f), and a different Notch-1 image is addressed in Allegations 80e and 80g. In the response of February 4, 2014, Dr. Sarkar and Dr. Wang submitted scans which are not originals, there are no dates on these scans, no indications of where these scans can be found on the sequestered computers or in notebooks, and the scans do not match the published figures (DIO4915 Image File F, slides 805, 807, 816). No scans were submitted for Allegations 80c, 80d, or 80d.

Allegation 80a: The Notch-1 band image in Figure 5C in **Paper 3** was re-used, manipulated, and/or re-named as "Bcl-2" in Figure 3B in **Reference #280,** and in Figure 5A in **Reference #284.** Lanes 1 & 2 and lanes 3 & 4 are switched). The caption notes treatment with '5 μg/mL ERRP'."

RESPONSE:

In the response of February 4, 2014, Dr. Sarkar and Dr. Wang submitted scans for Allegation 80a. Dr. Wang testified that the band labeled "Notch-1" in Figure 5C in Paper 3 and the band labeled "Bcl-2" in Figure 3B in Reference #280 are different experiments, but that the Notch-1 band of Paper 3 is the same Notch-1 band of Reference #284 (Wang Transcript, V.1, p.264, ll.16-21). Dr. Wang does not consider Reference #280 his paper because he is not first author (Wang Transcript, V.1, p.251, ll.15 to p.253, ll.17). He admitted to duplicating this image in two different papers but testified that Dr. Sarkar was unaware of the duplication (Wang Transcript, V.1, p.265, ll.5 to p.266. ll.21). Dr. Wang admitted to changing the background color to correspond with the background of the other proteins shown in the respective paper and that he did so for the sake of clarity (Wang Transcript, V.1, p.266, ll.23 to p.267, ll.21). Dr. Banerjee is a co-first author on Reference #280. He testified he made Figures 3A, 3B and 4 in Reference #280 (Banerjee Transcript, V.2, p.360, ll.9-15). Dr. Banerjee said he never gave any images to Dr. Wang, that he was "uncomfortable" recognizing that a blot he had generated was re-used in figures that Dr. Wang had published, that he had no idea how his (Dr. Banerjee's) bands showed up in other papers, and that Dr. Wang had access to his computer at times (Banerjee Transcript, V.2, pp.396-404).

ANALYSIS:

See DIO4915 Image File F, slides 806-807.
Visual inspection of the images for Allegation 80a show that the same images are used in Figure 5C in Paper 3, Figure 3B in Reference #280, and Figure 5A in Reference #284. The same image is labeled as "Notch-1" in Paper 3 and in Reference #284, and as "Bcl-2" in Reference #280 (DIO4915 Image File F, slide 806). Further, the same image was used for different treatments. The caption for Figure 5C in Paper 3 reads the treatment tested in Notch-1 cDNA-transfected BxPC-3 cells is 5 μg/mL ERRP, whereas in Figure 3B in Reference #280 the treatment is a dose-response to 0-50 μM genistein in BxPC-3 cells, and in Figure 5A in Reference #284 the treatment tested, again in Notch-1 cDNA-transfected BxPC-3 cells, is 25 μM genistein. Dr. Wang testified that the Notch-1 band in Figure 5C in Paper 3 is the same image for the Notch-1 band in Figure 5A of Reference #284 (Wang Transcript, V.1, p.264, ll.16-21). The scans submitted for Allegation 80a are not original scans, do not match the published figures (DIO4915 Image File F, slide 807), and there is no date or any indication of where these scans can be found on the sequestered computers or in notebooks (DIO4915 Image File F, slides 806-807). The copied images are also manipulated: the band labeled "Bcl-2" in Figure 3B in Reference #280 has lanes 1 & 2 and 3 & 4 in the opposite order from how they appear in the band labeled "Notch-1" in Figure 5C of Paper 3. The Notch-1

band in Figure 5A in Reference #284 is squeezed vertically compared to the band labeled "Notch-1" in Figure 5C of Paper 3 (DIO4915 Image File F, slide 806).

CONCLUSION:

The Committee found that the so-called "Notch-1" and "Bcl-2" bands in Figure 5C in **Paper 3**, and Figure 3B in **Reference #280**, and Figure 5A in **Reference #284** were re-used and manipulated copies of the same image and that these images were also re-labeled as different proteins and treatment conditions. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in these figures and that, in each instance, this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. The Committee finds no evidence that Dr. Banerjee was involved in misconduct with respect to Allegation 80a.

Allegation 80b: In Figure 6 in **Paper 3**, the same Notch-1 band image was re-used, manipulated, and/or re-labeled "MMP-9." Compared to Figure 3B in **Reference #280,** lanes 1 & 2 are flipped horizontal, lane 3 is flipped horizontal and re-used twice as both lanes 3 and 4.

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "We found the duplicate autoradiograms from the same set of replicate experiments showing similar results. As alleged under 80e, there is no error and these bands in question are different. Thus, no further action would be required" (Wang-Response-2.pptx). Dr. Wang testified that the band labeled "Bcl-2" in Figure 3 of **Paper 3** and the band labeled "MMP-9" in Figure 6 in Paper 3 are different experiments, but that the Notch-1 image of Figure 5 in Paper 3 is the same Notch-1 for Figure 5A in Reference #284 (Wang Transcript, V.1, p.264, ll.16-21). Dr. Wang does not consider Reference #280 his paper because he is not first author (Wang Transcript, V.1, p.251, ll.15 to p.253, ll.17). He admitted doing the experiment in Figure 6 and that lanes 3 and 4 were the same, but by accident (Wang Transcript, V.1, p.268, ll.23 to p.271, ll.7). Dr. Wang admitted that lanes 3 and 4 of the band labeled "MMP-9" in Figure 6 of Paper 3 are the same, but said that the MMP-9 band was not the same as the band labeled "Bcl-2" in Figure 3C of Paper 3. The response also stated that the image was not the same image as the Notch-1 band in Figure 5A of Reference #284.

ANALYSIS:

See DIO4915 Image File F, slides 808-809.
The same image addressed in Allegation 80a for References #280 & #284, are again re-used in Figure 6 of Paper 3 for Allegation 80b. A visual analysis reveals that lanes 1 and 2 in the bands labeled "Bcl-2" in Figure 3 of Paper 3 are copied and flipped horizontal to become lanes 2 and 1, respectively, in the bands now labeled "MMP-9" in Figure 6 of Paper 3. Also, lane 4 the bands labeled "Bcl-2" in Figure 3B in Reference #280 is flipped horizontal and copied into both lanes 3 and 4 of the bands now labeled "MMP-9" in Figure 6 of Paper 3. The captions indicate that the treatment in Figure 3B in Reference #280 was a dose-response for genistein whereas for Figure 6 in Paper 3 the treatment was "ERRP." Further, the captions indicate that the Westerns in Figure 3B in Reference #280 assess BxPC-3 cells, an *in vitro* experiment, whereas in Figure 6 in Paper 3 they assess tumor tissue xenografts (DIO4915 Image File F, slides 808). The response regarding duplicate autoradiograms (DIO4915 Image File F, slides 809) does not address the allegation.

CONCLUSION:

The Committee determined, in **Allegation 80b**, that lanes 1, 2, and 4 of the bands labeled "Bcl-2" in Figure 3B of **Reference #280**, and also the bands labeled "Notch-1" in Figure 5C of Paper 3 (refer again to Allegation 80a), are manipulated copies in lanes 1-4 in the bands re-labeled "MMP-9" in Figure 6 of **Paper 3**. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the results in Figure 6 of Paper 3, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 80c: In Figure 9A in **Reference #277,** the same Notch-1 band image noted above was re-used, manipulated (squeezed vertically), and/or re-labeled, per the caption, as representing treatment with '25µMol/L of genistein', in contrast to the other treatments in Allegations 80a and 80b.

Allegation 80d: In Figure 5A in **Reference #284**, the same Notch-1 band image noted above in Allegations 80a, 80b and 80c, was re-used, manipulated (stretched), and/or re-labeled.

RESPONSE:

Dr. Sarkar and Dr. Wang responded that Figure 9A in Reference #277 (Allegation 80c) and Figure 5A in Reference #284 (Allegation 80d) are the same experiment even though they appear in different papers.

ANALYSIS:

See DIO4915 Image File F, slides 810-812.
As revealed by visual evaluation, the same image duplicated in Allegations 80a and 80b is again re-used in Figure 9A of Reference #277 for Allegation 80c (DIO4915 Image File F, slides 810-812). For Allegation 80d, Figure 5A in Reference #284 is also identical to Figure 9A in Reference #277, and is the same image as in Figure 5C in Paper 3 except that the bands labeled Notch-1 in Figure 9A are squeezed horizontally and narrower than the image in Figure 5C. The backgrounds for these figures in Reference #277, Reference #284 and Paper 3 are all different (slide 9). The treatment condition for Figure 9A in Reference #277 (and Figure 5A in Reference #284) is genistein, while the treatment for Figure 5C in Paper 3 is ERRP. The response that Figure 9A in Reference #277 (Allegation 80c) and Figure 5A in Reference #284 (Allegation 80d) are the same experiment appearing in different papers is not consistent with changes in backgrounds or image dimensions, and neither publication cites the other at the source of the figure. The captions and text indicate that the figures convey different results in References #277 and #284. Both figures show the overexpression of Notch-1, but the caption of Figure 9A in Reference #277 shows "overexpression of Notch-1 by cDNA transfection" while the text of the Reference #284 (p. 3, bottom left column) says that Figure 5A shows "Notch-1 expression was overexpressed by ICN transfection," even though the caption for Figure 5A says, "Notch-1 expression was upregulated by Notch-1 cDNA. Top panel: intracellular Notch-1 was increased in Notch-1 cDNA transfected BxPC-3 cells, compared to control-transfected cells."

CONCLUSION:

For Allegations 80c and 80d, the Committee found that the bands labeled "Notch-1" in Figure 9A of **Reference #277**, and in Figure 5C of **Paper 3**, and in Figure 5A in **Reference #284**, are manipulated copies of the same image as other so-called "Notch-1" bands with different treatment claimed in Paper 3. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the results involving these figures and that this constitutes multiple instances of research

misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Further, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar knowingly and intentionally published plagiarized data in Figure 9A of Reference #277 without acknowledging the prior publication of a nearly identical figure representing the same experiment in Figure 5C of Reference #284. This constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 80e is considered below together with Allegation 80g.

Allegation 80f: In Figure 3B in **Reference #280**, the same Notch-1 band image is labeled "Bcl-2." Compared to Figure 5A in Reference #284, lanes 1 & 2 are switched with lanes 3 & 4, and stretched.

RESPONSE:

Dr. Wang denied any role in Reference #280 because he is not the first author. Dr. Banerjee is the first author.

ANALYSIS:

See DIO4915 Image File F, slide 813.
As revealed by visual comparisons, the same so-called "Notch-1" bands image addressed in Allegations 80a through 80d is copied, manipulated and re-labeled in Figure 3B of Reference #280. The caption for Figure 3B reads, "(B) Western blot analysis demonstrated that genistein inhibited the protein expression of both Bcl-2 and Bcl-xL in a dose-dependent manner." Compared to the bands labeled "Notch-1" in Figure 5A in Reference #284, lanes 1 & 2 and lanes 3 & 4 are switched and re-labeled "Bcl-2" in in Figure 3B Reference #280. Further, the caption notes the treatment condition is different for each use of the same image, being various combinations of Notch-1 cDNA transfection with or without 25 μM genistein in BxPC-3 cells in Reference #284, whereas in Figure 3B in Reference #280, the treatment is a dose-response with genistein. Compare also to the ANALYSIS section of Allegation 80a.

CONCLUSION:

The Committee finds that the band labeled "Bcl-2" in Figure 3B of **Reference #280** is the same image as the band labeled "Notch-1" in Figure 5A of **Reference #284**, but with the lanes re-ordered, re-sized and re-labeled for both different proteins and treatments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the data in Figure 3B in Reference #280 and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegations 80e and 80g refer to a different so-called "Notch-1" image than that which was re-used in Allegations 80a, 80b, 80c, 80d and 80f (DIO4915 Allegations 80-81 Notch-1 images 120914.pptx, slides 2 & 18). Here, an identical image is re-used and manipulated in Figure 3C in **Reference #284**, where it is labeled "Bcl-xL," and in Figure 5A in **Paper 3**, where it is labeled "Notch-1" (Allegation 80e). The same image is re-used in Figure 4B in Grant application "1R01CA131456-01" where it is labeled "Bcl-Xl" and has a different β-actin control band (Allegation 80g).
Allegation 80e: The Bcl-xL image in Figure 3C of **Reference #284** is a manipulated duplicate of an image labeled "Notch-1" in Figure 5A from **Paper 3**.

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in Wang-Response-1.pptx (slide 16) that "We found the duplicate autoradiograms from the same set of replicate experiments showing similar results. As alleged under 80e, there is no error and these bands in question are different. Thus, no further action would be required." In file "Wang-Response-1.pptx" (slide 16) submitted by Dr. Sarkar, the response is "we disagree."

ANALYSIS:

See DIO4915 Image File F, slides 814-823.
As revealed by visual evaluation, the bands labeled "Bcl-xL" in Figure 3C in Reference #284 is a copied, manipulated (squeezed and re-ordered lanes) and re-labeled version of the bands labeled "Notch-1" in Figure 5A of Paper 3 (DIO4915 Image File F, slides 814-815). Reference #284 was published before Paper 3. Specifically, lanes 1 & 4 from the row labeled "Bcl-xL" band in Figure 3C in Reference #284 are copied directly from the bands labeled "Notch-1" in Figure 5A of Paper 3. Lanes 3 & 2 from the so-called "Bcl-xL" bands in Figure 3C are copied and flipped horizontal from lanes 3 & 2, respectively, in Figure 5A of Paper 3. The caption for Figure 3C in Reference #284 indicates that it is a time-course study following treatment with "25 μmol/l genistein in BxPC-3 pancreatic cancer cells," whereas the same manipulated image is reported in Figure 5A in Paper 3 to be a study of BxPC-3 cells following treatment with Notch-1 siRNA-transfection with or without 5 μg/mL ERRP.

There are no dates on the scans in the response (DIO4915 Image File F, slides 816-817). A visual examination of these scans shows that the scan labeled "Paper 284/Fig 3C" could correspond to the Bcl-xL line in Figure 3C. However, the scan was altered (stretched vertical) to appear thicker. The scan labeled "Paper 284/Fig 3C" dimly shows the time in hours above and the label "Bcl-xL" in the lower right. While the type size and spacing of the scan match the lower set of hours in published Figure 3C, they do not align when the lanes of the scan are added to the type. Additionally, the Bcl-xL label in the scan is in sans-serif type while Bcl-XL is in serif type in Figure 3C. All these issues with the scans raises doubts that there is any way to determine what are the original data.

The Notch-1 lanes in the scan labeled "Paper 3/Fig 5A" do not match the published image (DIO4915 Image File F, slides 816-820). It is also not clear if lane 4 in the scan was treated with 5 or 10 μg/ml ERRP in addition to Notch-1 siRNA. This scan also does not match the published image for Figure 3C in Reference #284, which uses the same Bcl-xL bands, with lanes 2 and 3 inverted. Figure 3C in Reference #284 is the basis for the image in the grant application. Therefore, the scan submitted matches neither the published image of Figure 3C in Reference #284 nor Figure 4B in the grant application.

CONCLUSION:

The Committee finds that the bands labeled "Bcl-xL" in Figure 3C of **Reference #284** is the same image – manipulated and re-ordered and re-labeled – as the bands labeled "Notch-1" in Figure 5A of **Paper 3.** These two figures use the same image to represent two different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in one or both of these figures and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 80g: APPLICATION: **1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf). The Bcl-Xl image in the upper right panel of Figure 4B in this NIH grant proposal appears to be same image used in both Figure 3C in **Reference #284** and labeled as "Bcl-xL" and in Figure 5A in **Paper 3** where it is labeled

"Notch-1" (refer to Allegation 80e). Also, the β-actin bands used in Figure 4B appear to be different from the β-actin bands used in the respective figures in both **Reference #284** and **Paper 3.**

RESPONSE:

Dr. Sarkar wrote in "Response-allegation-3.pdf" in June, 2014, in response to Allegation 80g (p. 3) that "84g [sic] is for R01 application, which inserted figure from our publication and there is no error." He included two scans, one labeled "Paper 3/Fig 5A" and the other labeled "Paper 284/Fig 3C."

ANALYSIS:

See DIO4915 Image File F, slides 821-824.
As revealed by visual evaluation, the bands labeled "Bcl-xL" in Figure 4B of this grant application is the same image as the band labeled "Bcl-Xl" in Figure 3C of Reference #284 (DIO4915 Image File F, slide 821). However, it has already been demonstrated that Figure 3C of References #284 is a copied, manipulated (squeezed and re-ordered lanes) and re-labeled version of the band labeled "Notch-1" in Figure 5A of Paper 3. Compare the similar ANALYSIS section for Allegation 80e. The grant application (1 R01 CA131456-01) was submitted after Reference #284 and Paper 3 were published. The caption for Figure 4 in the grant application suggests the treatment was a time-course following treatment with 25 μmol/l genistein, whereas images of the same lanes in Figure 5A of Paper 3 are represented to be effects following treatment with Notch-1 siRNA-transfection with or without 5 μg/mL ERRP. All this makes the content of the bands in the grant application at least uncertain. Also, the β-actin control bands image for Figure 4B of the grant application is a different image than that used for the β-actin bands in either Figure 3C of Reference #284 or Figure 5A of Paper 3 (DIO4915 Image File F, slides 822-824).

CONCLUSION:

The Committee finds that the bands labeled "Bcl-xL" in Figure 4B of the **grant Application 1R01CA131456-01** (File: **2007, 02 05 – Sarkar Proposal 07050620.pdf**) is the same image as the "Bcl-xL" bands in Figure 3C of Reference #284 and the bands labeled "Notch-1" in Figure 5A of Paper 3. The two figures have different β-actin bands and the same image represents different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted to NIH fabricated and/or falsified data misrepresenting results in Figure 4B and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 81 (including 81a to 81k)

Another so-called "Notch-1" image (DIO4915 Image File F, slides 825 & 827) was re-used, manipulated (stretched, flipped, squeezed, and rearranged) and/or re-labeled in figures in several publications and grant application. One so-called "Notch-1" image is addressed in Allegations 81a through 81k. Each occurrence of re-use, manipulation, and re-naming constitutes a separate allegation.

General *RESPONSE* for Allegation 81:

Dr. Sarkar submitted a response file "Wang-Response-1.docx" in "... against allegation #81 where response to 81b, c, e, f and 81g is indicated especially for Notch-1 re-use in different papers." The response was that "because 81a and 81b are same experiments, we used same figures. We disagree with allegation 81c and 81d. We cannot find the original films for allegation 81c and 81d, which were done 10 years ago. We found a duplicate autoradiogram from the same set of replicate experiments showing similar results. 81e,

81f and 81g are allegations for R01 application. 81e, 81f and 81g are almost same as 81b, c, and d. **We do not feel anything wrong**" (bold in original). Dr. Wang admits making these figures, but denied any re-use of this Notch-1 image in 81a, 81c, and 81d. (Wang Transcript, V.1, p.273, ll.25 to p.274, ll.9).

Allegation 81a: In Figure 4A in **Reference #284**, a Notch-1 image was re-used, manipulated, and/or re-named in Reference #277.

Allegation 81b: In Figure 8A from **Reference #277**, the same Notch-1 image was re-used, manipulated, and/or re-named.

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in file "Wang-Response-1.pptx" that this was the "'same treatment, no errors" (DIO4915 Image File F, slide 826). Dr. Sarkar also submitted "Response-allegation-3.pdf" (p.3) in June, 2014). Note that Figure 4A of Allegation 81a was also referenced in Allegations 81i and 81j so Dr. Sarkar wrote his response to Allegation 81a with responses to Allegations 81i and 81j. However, that response is placed here to specifically discuss Figure 4A.
Dr. Sarkar wrote that "the allegation is about Fig4A/284. Fig 4A/284 original image is missing. We were unable to locate the original Notch1 autoradiogram that was scanned for publication; however, we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Therefore, there is no error in our judgment."

ANALYSIS:

See DIO4915 Image File F, slides 828-830.
As revealed by visual comparison of images, the same image for lanes 3 and 4 in Figure 4A in Reference #284 are duplicated in Figure 8A of Reference #277. The captions for these two figures indicate similar treatments for both studies. Dr. Wang claims that the figures in Allegations 81a and 81b are the same experiment, however lanes 1 and 2 and the β-actin bands in each figure are different from each other, so these cannot be the same experiment (cf., DIO4915 Image File F, slides 806-807).

CONCLUSION:

The Committee finds that lanes from the bands labeled "Notch-1" in Figure 4A of **Reference #284** are the same images as lanes in Figure 8A in **Reference #277**. Despite the claims of Drs. Sarkar and Wang that these are the same experiments, other lanes do not match and different β-actin bands are used so these images cannot represent the same experiment. By a preponderance of the evidence, regarding both **Allegation 81a and 81b**, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified the results and that, in each instance, this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 81c: In Figure 1D in **Reference #277,** the bands labeled "Notch-1" (upper group) has several lanes are the same as in Figure 4A from **Reference #284**: Lane 1 is lane 1; Lane 2 is lane 3; Lane 3 is duplicated in Lanes 2, 4 & 5; Lane 4 is lane 6."

Allegation 81d: In Figure 1D in **Reference #277**, the bands labeled "Notch-1" (lower group) has several lanes that are the same as in Figure 4A in **Reference #284**: Lanes 1 & 2 are flipped horizontal and switched; Lane 3 is lanes 3 & 5 (5 is flipped horizontal); Lane 1 is repeated as lane 6. Lane 4 (flipped horizontal) is repeated in lane 1 in Figure 8A".

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that there were "No errors" (file: "Wang-Response-1.pptx," slide 17) regarding Allegations 81c and 81d. Dr. Wang testified that he made the figures addressed in Allegations 81c and 81d. He also stated that he provided these figures to Dr. Sarkar for a grant application (Wang Transcript, V.1, p.272, l.13 through p.275, l.20).

ANALYSIS:

See DIO4915 Image File F, slides 831-833.
As revealed by visual comparisons, the images for lanes in Figure 4A in Reference #284 are duplicated repeatedly in both panels of Figure 1D of Reference #277 (DIO4915 Image File F, slide 831). In the top panel of Figure 8A in Reference #277 (**Allegation 81c**), these lanes are copied from Figure 4A in Reference #284: lane 1 is lane 1; lanes 2 & 3 are copied to lanes 3 & 4; lane 3 is copied to lanes 2 & 4 & 5; and lanes 3 & 4 are copied to lanes 5 & 6. Similarly, in the bottom panel of Figure 1D in Reference #277 (**Allegation 81d**), the lanes are copied from Figure 4A in Reference #284: lanes 1 &2 (flipped horizontal) are copied to lanes 2 & 1; lane 3 is copied to lanes 3 & 5 (flipped horizontal); lanes 2 & 3 (flipped horizontal) are copied to lanes 5 & 6. The same images are used for both BxPC-3 cells alone (Reference #284) and three different cell types – BxPC-3, HPAC & PANC-1 – in Reference #277: it cannot be both. Further, the caption of Figure 4A in Reference #284 states that the treatments are combinations of Notch-1 siRNA with or without 25 μM genistein. In contrast, the same images in Figure 1D of Reference #277 represent treatments with (presumably Notch-1) siRNA (top panel) and (presumably Notch-1) cDNA transfection (bottom panel): it cannot be all three. Note that the same images are used in both the top and bottom panels of Figure 1D. Also as noted, several multiply copied lanes in the top and bottom panels of Figure 1D are manipulated (i.e., flipped horizontally). The two panels in Figure 1D which are supposed to represent different experiments have different β-actin bands. Also of note, the β-actin bands of Figure 4A of Reference #284 is duplicated in the first 4 lanes of the β-actin bands in the bottom panel in Figure 1D (see Allegations 92a and 92b). The scan submitted in response matches bands labeled "Notch-1" in neither the top or bottom panel in Figure 1D (DIO4915 Image File F, slides 832-833). There is no date or other identifying information on the scan.

CONCLUSION:

The Committee finds that the bands labeled "Notch-1" in both the top (Allegation 81c) and bottom panels (Allegation 81d) of Figure 1D of **Reference #277** are composed of repeatedly duplicated and manipulated and re-labeled lanes from Figure 4A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1D and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 81e: Figure 5 in **APPLICATION: 1 R01 CA120008-01** (File: 2005, 05 20 – Sarkar Proposal 05083189.pdf) "Compared to Figure 1D in **Reference #277**, lanes 1 & 2 are switched with 3 & 4 (flipped horizontal); lanes 5 & 6 are lanes 4 & 5 (flipped horizontal)."

ANALYSIS:

See DIO4915 Image File F, slide 834.
Notch-1 of Figure 5 in Grant Application 1 R01 CA120008-01 shares the lanes from the Notch-1 lines in the upper and lower groups of Figure 1D in Reference 277, but in a different order and orientation. The

individual lanes in Figure 5 are shorter than the lanes in Figure 1D, squeezed horizontal. The lanes in Notch-1 in Figure 5 are only for BxPC-3 cells, while the lanes in Notch-1 in Figure 1D in Reference 277 are for BxPC-3, HPAC, and PANC-1 cells. Additionally, the β-actin for Figure 5 is the same B-actin as for the lower group in Figure 1D, but the individual lanes are shorter and thicker from being squeezed horizontal (see Allegation 92c). The caption for Figure 5 in Grant Application 1 R01 CA120008-01 reads, "BxPC-3 pancreatic cancer cell growth inhibition by Notch-1 siRNA and genistein (bottom left panel). Notch-1 expression was down-regulated by genistein and Notch-1 siRNA as measured by Western blot analysis (top panel) where, 1. control; 2. 25 μmol/L genistein; 3. siRNA control; 4. siRNA control plus 25 μmol/L genistein; 5. Notch-1 siRNA and 6. Notch-1 siRNA plus 25 μmol/L genistein, respectively."

CONCLUSION:

The Committee found that the Notch-1 lanes in Figure 5 of Grant Application 1 R01 CA120008-01 are the same as the lanes in Figure 1D of Reference 277 but altered. Since the experiments in Figure 5 and Figure 1D of Reference 277 are different experiments, the Notch-1 lanes cannot represent the same experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted to NIH fabricated and/or falsified data misrepresenting results in Figure 5 and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103

Allegation 81f: Figure 1D (upper group) in **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf). *Same as Allegations **81b** and **81c** (immediately above)*

RESPONSE:

Dr. Wang admits that Dr. Sarkar asked him to provide the figure found in Allegations 81c and 81d for this grant (Allegations 81f and 81g) (Wang Transcript, V.1, p.275, ll.11-20).

ANALYSIS:

See ANALYSIS for Allegation 81c (DIO4915 Image File F, slide 834).

CONCLUSION:

The Committee finds that the bands labeled "Notch-1" (in the upper and lower groups) in Figure 1D of grant Application 1 R01 CA131456-01 are the same as Figure 1D of Reference #277. As such, they are composed of repeated and altered lanes that are shared between the two lines. In addition, these same lanes are shared with the Notch-1 line in Figure 4A of Reference 284, which is cited as an experiment using different proteins. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted to NIH fabricated and/or falsified data misrepresenting results in Figure 1D and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103

Allegation 81g: Figure 1D (lower group) in **APPLICATION: 1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf) *Same as Allegations **81b** and **81c** (immediately above)*

ANALYSIS and CONCLUSION:

See ANALYSIS and CONCLUSION for Allegation 81f (DIO4915 Image File F, slide 834).

Allegation 81h: In Figure 3B in **Reference #278**, the MMP-9 band in lanes 1 and 2 are same as lanes 3 and 4 from **Reference #284** (with width increased).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "lanes 1 and 2 are CS, NS in Ref 278, Lanes 1-4 are CS, genistein, NS, NS+gen in Ref 284. Due to copy and paste, it could have caused some mistake" (Wang-Response-1.docx, p.2).

ANALYSIS:

See DIO4915 Image File F, slide 834-837.
As revealed by simple visual evaluation, lanes 1 and 2 in the 'CS' & 'NS' conditions in the bands labeled "MMP-9" in Figure 3B of Reference #278 are copies of lanes 3 and 4 in the bands labeled "Notch-1" in Figure 5A of Reference #284. These so-called "MMP-9" blots are also copies of lanes 3 and 4 in the bands labeled "Notch-1" in Figure 8A of Reference #277 (cf, Allegations 81a & 81b). Lane 1 of Figure 3B has stretched vertical to appear thicker than lane 2. (Noted that this same lane was used for both lanes 2 and 3 in the band labeled "Notch-1" of Figure 8A in Reference #277.) All three of these figures report on BxPC-3 cells but the treatment conditions are different and contradictory among the multiple uses of the same images. In Reference #278, the 'CS' & 'NS' conditions for lanes 1 and 2 refer to "control siRNA" and "Notch-1 siRNA", respectively, whereas in Reference #284, lane 3 treatment is reported to be "Notch-1 cDNA" and lane 4 treatment is "Notch-1 cDNA plus 25 μM genistein," and in Reference #277, the lane 3 treatment is "Notch-1 siRNA" and lane 4 is "Notch-1 siRNA plus 25 μmol/L genistein." The scan submitted in response does not address the MMP-9 duplication, the image matches neither the MMP-9 nor the Notch-1 bands, and there are no indications in the response of where the scan came from (DIO4915 Image File F, slide 837).

CONCLUSION:

The Committee finds that lanes 1 and 2 of the bands labeled "MMP-9" in Figure 3B of **Reference #278** are clearly re-labeled copies of the images labeled "Notch-1" from different treatment conditions in Figure 4A of Reference #284 and Figure 8A of Reference #277.
For **Allegation 81g**, regarding **APPLICATION 1 R01 CA131456-01**, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted to NIH fabricated and/or falsified data misrepresenting results in Figure 1D and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

For **Allegation 81h,** with the same image in Figure 3B of **Reference #278**, the Committee concludes, by a preponderance of the evidence, that Dr. Sarkar recklessly published fabricated and/or falsified results and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 81i: In Figure 1B in **Reference #277**, the Notch-1 bands appear to be a duplication, squeezed horizontally, of lanes 1-3 in the Notch-1 band in Figure 4A from **Reference #284**.

RESPONSE:

Dr. Sarkar submitted file "Response-allegation-3.pdf" in June, 2014) and wrote "... the allegation is about Fig4A/284. Fig 4A/284 original image is missing. We were unable to locate the original Notch-1

autoradiogram that was scanned for publication; however, we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Therefore, there is no error in our judgment." (See Allegation 81a.)

ANALYSIS:

See DIO4915 Image File F, slide 838-839.
As revealed by simple visual evaluation, the bands labeled "Notch-1" for three different cell types (i.e., BxPC-3, HPAC & PANC-1) in Figure 1B of Reference #277 is a re-labeled copy of lanes 1, 2 and 3 from the bands labeled "Notch-1" in Figure 4A of Reference #284 (DIO4915 Image File F, slides 838-839). The bands in Figure 1B are stretched horizontal compared to Figure 4A. Figure 1B in Reference #277 is reportedly showing baseline levels of Notch-1 protein expression. In contrast, the caption for Figure 4A in Reference #284 reports the blots are from BxPC-3 cells only and represent different treatment conditions: "control," "25 μM genistein," and "Notch-1 siRNA," respectively, for lanes 1 to 3. Further, these figures have different β-actin bands.

CONCLUSION:

The Committee finds that the bands labeled "Notch-1" in Figure 1B of **Reference #277** are manipulated and relabeled copies of the images in the first three lanes from the bands labeled "Notch-1" in Figure 4A of Reference #284. The same images are used to represent different cells, experiments and treatments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 81j: In Figure 6B in **Reference #284**, the IKKα bands at top labeled 'CS' and 'NS' appear to be a duplication, stretched vertically, of lanes 3 & 4 in the Notch-1 row in Figure 4A from the same paper. In contrast to the 'CS' and 'NS' labels in Figure 6B, the caption of Figure 4A says that lanes 3 & 4 are treated with "(3) Notch-1 siRNA and (4) Notch-1 siRNA plus 25μM genistein".

RESPONSE:

Dr. Sarkar submitted file "Response-allegation-3.pdf" in June, 2014) and wrote "... the allegation is about Fig4A/284. Fig 4A/284 original image is missing. We were unable to locate the original Notch-1 autoradiogram that was scanned for publication; however, we found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Therefore, there is no error in our judgment." (See Allegation 81a.)

ANALYSIS:

See DIO4915 Image File F, slide 840-841.
As revealed by simple visual evaluation, the bands labeled "IKKα" in Figure 6B of Reference #284 is a re-labeled copy of lanes 3 and 4 from the bands labeled "Notch-1" in Figure 4A of the same publication – Reference #284 (DIO4915 Image File F, slide 840). The caption for Figure 6 and 6B reports that the "CS" and "NS" treatment conditions are "control siRNA" and "Notch-1 siRNA," respectively. In contrast, the caption for Figure 4A in Reference #284 reports the same blot images in lanes 3 and 4 represent different treatment conditions: "Notch-1 siRNA" and "Notch-1 siRNA plus 25 μM genistein," respectively, completely conflating control and treatment conditions between the two figures in the same publications.

Further, these figures have different β-actin bands. The scan submitted by Dr. Sarkar does not match the published Figure 4A of Reference #284 (DIO4915 Image File F, slides 841).

CONCLUSION:

The Committee finds that the bands labeled "IKKα" in Figure 6B of **Reference #284** is clearly a re-labeled copy of lanes from bands labeled "Notch-1" in Figure 4A of the same publication, representing different experimental conditions with the same image. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 6B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 81k: In Figure 3B in **Reference #278**, the images for the bands in lanes 3 and 4 from the Notch-1 row, labeled 'CP' and 'NP', appear to be duplicated, enlarged, flipped horizontally as Notch-2 in Figure 1C of **Reference #263**, and re-labeled 'CS' and 'JS'.

RESPONSE:

Dr. Sarkar submitted file "Response-allegation-3.pdf" in June, 2014) and wrote that "it is the same as previous allegation 75. We have addressed it. The image for Notch-2 in Fig1C/paper 263 is missing. We found a duplicate autoradiogram from the same set of replicate experiments showing similar results. Therefore, there is no error in our judgment." Dr. Wang admitted to making Figure 3B for Reference #278 but testified he did not make Figure 1C in Reference #263 and does not know who did (Wang Transcript, V.1, p.276, ll.14-25; p.277, ll.1-8; p.278, ll.3-12).

ANALYSIS:

See DIO4915 Image File F, slide 842-844.
As revealed by simple visual comparison, lanes 3 and 4 in the 'CP' & 'NP' conditions in the bands labeled "Notch-1" in Figure 3B of Reference #278 are manipulated copies of the bands labeled "Notch-2" in Figure 1C of Reference #263 (DIO4915 Image File F, slide 842). The two lanes labeled "Notch-1" in Figure 3B of Reference #278 are flipped horizontal in Figure 1C of Reference #263 and re-labeled not only as "Notch-2" protein, but the "CP" and "NP" conditions in Figure 3B are also re-labeled "JS" and "CS," respectively. Further, by flipping the treatment condition labels, the supposed control band in Figure 1C ("CS") is re-used as the treatment condition in Figure 3B ("NP"), and vice versa for the other bands. Again, as in Allegation 81j, a putative control image in one figure is used to represent a treatment effect in another figure. The captions also make clear that the same image is used to represent cells with different transfections: "Notch-1 siRNA transfection" in Figure 3B of Reference #278 in contrast to "Jagged-1 siRNA transfection" in Figure 1C in Reference #263. Further, the β-actin bands for the two figures are also different. The scan submitted does not match the published Figure 3B of Reference #278 (DIO4915 Image File F, slides 843-844).

CONCLUSION:

The Committee finds that "CP" and "NP" lanes of the bands labeled "Notch-1" in Figure 3B of Reference #278 are clear manipulated and re-labeled copies of the same images used in the two lanes of the bands labeled "Notch-2" in Figure 1C of **Reference #263**, representing different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated

and/or falsified results in Figure 3B, and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

General CONCLUSIONS about Notch-1 bands:

The images grouped in Allegations 80 and 81 are referred to as re-uses of a "Notch-1" image. However, as these preceeding *ANALYSES* reveal, the same images were also labeled as other proteins in this series (i.e., MMP-9, Bcl-2, Bcl-xL). Because no original films or scans of original films were submitted or found, the Committee cannot determine which protein(s) comprised the original Western blot images. The Committee determined that a few images of so-called "Notch-1" protein bands from one or more Western blots were intentionally copied and manipulated (i.e., lanes rearranged, flipped, cropped, stretched, squeezed, etc.), re-used and re-labeled as other proteins in many instances across many figures in several papers. The Committee does not find credible the repeated claims by Drs. Sarkar and Wang that they "... cannot find the original films for allegation[s] ... which were done 10 years ago" when they evidently had little difficulty producing what they frequently wrote or testified are "... duplicate autoradiogram from the same set of replicate experiments..." Each occurrence of re-use, manipulation, and re-labeling of a so-called "Notch-1" bands image constitutes a separate instance of research misconduct.

Duplication and Manipulation of Rb Loading Control Bands

*General Issues – **Allegations groups 82 to 86***

The Investigation Committee finds the evidence compelling that a single image of retinoblastoma protein (Rb) loading control bands was copied and manipulated (i.e., lanes rearranged, flipped, cropped, stretched, squeezed, etc.) and re-used in very many instances across many figures for diverse purposes over an extended period of time in Dr. Sarkar laboratory. The images and figures are shown in DIO4915 Image File G, slides 847-939, and listed below.

General RESPONSE about Rb bands:

Dr. Sarkar testified that the loading control should be "associated with a specific extract from some cell or some tissue" (Sarkar Transcript, V.1, p.54, ll.14-15) and that the loading controls of various experiments can look similar even though there are slight variations – thus the importance of every cell extract having its own loading control. Dr. Sarkar submitted in "Wang-Response-2.docx" (p.3) that "since Rb bands are similar, it could have been inadvertently used. We found the autoradiograms for Rb." Dr. Wang testified that "... the Rb, every time they look very same" (Wang Transcript, V.2, p.349, ll.17-18), and the reasons the Rb bands are the same are "One is the Rb is not important for the EMSA, and secondly, the Rb we run many times. At times they look same, whether they got mistake, choose the wrong Rb to use" (Wang Transcript, V.2, p.351, ll.17-20).

Dr. Sarkar testified that he considers figures (including their loading controls) to be data. However, he also stated that the "real data" of the experiments is "the gene of interest that you are investigating. That is the main data. That is the actual data"– not the loading control (Sarkar Transcript, V.2, p.309, ll.4-6). He also noted that "few years ago no reviewer will ever ask for any control. They will ask for equal loading of the protein, and then the trend started that, well, you have to show that a protein which normally would not change is not highly variable" (Sarkar Transcript, V.2, p.306, ll.20-24). Dr. Sarkar implied that when journals began to demand "... to show that a protein which normally would not change is not highly variable" (Sarkar Transcript, V.2, p.306, ll.20-24) as a loading control that "...doesn't change" that mistakes were made in some of the papers (Sarkar Transcript, V.2, p.307, ll.4-22).

Dr. Wang had testified that controls bands were not important and that they – meaning the people in Dr. Sarkar's lab, didn't know re-using Rb bands was "... not right to use" (cf, Wang Transcript, V.2, p.358, 14-16). Dr. Wang testified, in general, that images in figures are "most of them not very important. They are just part of the results there. They don't affect the conclusion" (Wang Transcript, V.2, p.346, ll.24 to p.347, ll.1-2). But he admitted that without a loading control for a particular gel, he cannot know if a loading error has occurred (Wang Transcript, V.1, p.167, ll.6 to p.169, ll.5). Dr. Wang testified that the Rb bands look alike and "...we choose the wrong one. They looks the same, so we chose this one, chose the wrong one. They--because--we run many Rbs, but they difficult to find which one is right one. So we selected the wrong one to use" (Wang Transcript, V.2, p.350, ll.10-14; V.2, p.354, ll.10 to p.356, ll.14). Dr. Wang testified that he ran the Rb Western blots for these EMSA assays (Wang Transcript, V.2, p.350, ll.15-23), and he also testified that Dr. Banerjee ran the EMSA assays (Wang Transcript, V.2, p.350, ll.15-23), and he testified that Dr. Banerjee gave him the EMSA figures and Rb band and told him to use it multiple times (Wang Transcript, V.2, p.334, ll.25 to p.355, ll.1-7). Dr. Wang also testified that he "never did the supershift" assays but that Dr. Banerjee did (Wang Transcript, V.2, p.335, ll.18-24).

Dr. Sarkar stated that he was not aware of the re-use and manipulation of the Rb bands and said that he would not have approved of it had he known. Yet he admits that for Rb "as a loading control, just as a

criteria that it doesn't change...I did not pay significant attention to it" (Sarkar Transcript, V.2, p.485, ll.11-12; 14). He claims this oversight was due to his being "extremely busy in the last ten to twelve years" (Sarkar Transcript, V.2, p.485, ll.18-19). When asked where the Western blots were that were run for the Rb controls for EMSA assays, Dr. Sarkar said "I didn't say it was run. Should have been run" (Sarkar Transcript, V.2, p.488, ll.24-25). He admitted that he did not demand to see the original films of the Rb loading controls because "it should be routine practice of a good lab to run those things" (Sarkar Transcript, V.2, p.490, ll.4-5; 8-9; p.491, ll.1-6). Dr. Sarkar said he did not check lab notebooks to see data on the experiments included in these allegations and assumed that the experiments were run correctly, trusting the composite figures that are shown to him at lab meetings (Sarkar Transcript, V.2, p.490, ll.18-23). He also stated that running loading controls on gels separate from the gels of the other proteins happens in his lab and is common practice in the field (Sarkar Transcript, V.1, p.184, ll.25 to p.185, ll.6-11).

Dr. Wang testified that he had conducted "almost all of the experiments" in publications where he is first author (Wang Transcript, V.1, p.65, ll.19-25 and p. 66, ll. 1-5), was responsible for composing the figures in the papers (Wang Transcript, V.1, p.70, ll.12-24), had put the Rb bands into the figures (Wang Transcript, V.1, p.178, ll.2-3), and that the Rb bands in the allegations appear to be similar (p.176, ll. 21-25 and p. 177, ll. 1-20) and that most of them looked the same (Wang Transcript, V.1, p.176, ll. 21-25 and p.182, ll. 9-14). He stated, however, that the ability to find records of loading controls for each of his experiments would not always be possible: "for loading control, we often don't write it down" (Wang Transcript, V.1, p.184, ll.15-16). Dr. Wang initially testified that it was appropriate to re-use an Rb if "it looks similar from the different treatment, different cell lines" (Wang Transcript, V.1, p.185, ll 3-11) but then retracted his statement, saying it was not appropriate and in the instances of these allegations, he had made a mistake and used the wrong Rb band (Wang Transcript, V.1, p.185, ll.12-25 to p.187, ll.7).

As a witness, Dr. Wang stated that he did not perform the EMSA assays in his first-author publications prior to 2007. EMSA assays for his papers before 2007 were done by Dr. Banerjee (Wang Transcript, V.1, p.38, ll.8-18). Dr. Wang also testified that Dr. Banerjee did the EMSA assays and that Dr. Banerjee gave him the figures, including the Westerns for the Rb control bands (Wang Transcript, V.2, p.334, ll.25 to p.355, ll.1-7). Dr. Wang said he learned the EMSA assay technique from Dr. Banerjee and followed Dr. Banerjee's EMSA protocol (Wang Transcript, V.1, p.38, ll.19-25 and p. 39, ll. 1-4). According to Dr. Wang, the EMSA assays in his publications were *in vitro* studies – done using cell cultures; the only publications using *in vivo* assays were those where Dr. Banerjee was the co-first author (Wang Transcript, V.1, p.40, ll.20-25 and p. 41, ll.1-4). Regarding the 2-lane Rb bands in "supershift" assays, the response was that these are "...just to show that our EMSA experimental system was working" (file: "Wang-Response-1.pptx," slide 21; file: "Wang-Response-2.docx," p.3).

Dr. Sarkar submitted two files in February, 2014, in response to specific allegations about Rb bands: "Wang-Response-1.pptx" and "Wang-Response-2.docx." Dr. Wang said he prepared these files and sent them to Dr. Sarkar to edit (Wang Transcript, V.2, p.316, ll.17-22). Dr. Sarkar submitted them to the Committee. The images submitted by Drs. Sarkar and Wang are purported to be original scans of films and/or duplicates from repeated experiments involving Rb controls. None of the images in the scanned films Drs. Sarkar and Wang submitted in response to Allegations 82-86 match the images in the publications or grants (file: "Wang-Response-1.ppt", slides 18-20). For many of those scanned films, Dr. Sarkar wrote that they are duplicates of repeated experiments and are not originals. None of the scans bear any dates or file names or descriptions of where they are located. No scans were submitted for the "supershift" assay.

Dr. Banerjee testified that he agreed the Rb bands are the same image (BanerjeeTranscript, V.2, p.349, ll.4-7), that the same image was re-used in the figures he was shown (Banerjee Transcript, V.2, p.387, ll.4-

6), and he admitted that the repetition of the image more than twice was deliberate and not a mistake and "...then you know very well what it is" (Banerjee Transcript, V.2, p.391, ll.22 to p.392, ll.8). Although he was co-first author for these papers, Dr. Banerjee contradicted Dr. Wang's testimony in stating that Dr. Wang did the EMSAs for these publications (BanerjeeTranscript, V.2, p.349, ll.8-11). He would "not comment" specifically on what Dr. Wang or others did with Rb bands (Banerjee Transcript, V.2, pp.393-394). Dr. Banerjee admitted that there were problems with duplicated Rb bands in Papers 5 and 16, but that this was a mistake (Banerjee Transcript, V.2, p.355, ll.19 to p.356, ll.20). He repeatedly asserted that the replication of the Rb bands was a mistake, but he was unable to find the record of the experiments in his lab notebooks/legal pads (Banerjee Transcript, V.2, pp.348-363). He stated that he never knowingly re-labeled bands in images (Banerjee Transcript, V.2, p.359, ll.12-15). He said that images might have been flipped accidently when films were scanned because "just to the naked eye" the equal loading bands can look alike (Banerjee Transcript, V.2, p.365, ll.3-11). Yet Dr. Banerjee also described his system for coding the orientation of films by marking or cutting a corner (Banerjee Transcript, V.2, p.365, ll.2 to p.367, ll.10).

Dr. Gilda Hillman described the purpose of Rb controls (Hillman Transcript, V.2, p.118, ll.1-15) and testified that an Rb band is "... just a control. The main experiment is what happened with those molecules" (Hillman Transcript, V.2, p. 188, ll. 16-17). She said she was "worried that... you [the Committee] will discredit data based on these controls, which are not the most important part" (Hillman Transcript, V.2, p.128, ll.3-6).

General ANALYSIS of Rb bands:

Dr. Sarkar's publications and grants applications where these Rb band images in Allegations 82 through 86 are found, with involvement of others are:

Paper 3 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
Paper 19 (2007)	– Dr. Wang: first author; Dr. Banerjee co-author
Paper 32 (2008)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #231 (2007)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #247 (2007)	– Dr. Raffoul: first author; Dr. Banerjee co-author
Reference #257 (2006)	– Dr. Rahman: first author; Dr. Banerjee co-author
Reference #277 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #278 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #280 (2006)	– Dr. Banerjee co-first author
Reference #282 (2006)	– Dr. Zhang: first author; Dr. Wang and Dr. Banerjee co-authors
Reference #284 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
1 R01 CA131151-01 (2007)	– Dr. Sarkar: PI
1 R01 CA131456-01 (2007)	– Dr. Sarkar: PI

The Committee examined closely all Rb control band images in all of Dr. Sarkar's publications and grant applications in the period under investigation. In investigating all available source files for Rb control bands in publications and grant applications, the Committee determined that a **single image of an 8-lane Rb "loading control" band from file "Rb(vivo).jpg" was repeatedly copied, and manipulated (i.e., lanes rearranged, flipped, cropped, stretched, squeezed, etc.), and that 6-, 7-, 4-, 3- and 2-lane fragments of that image were re-used in the published figures addressed in Allegations 82 through 86** (DIO4915 Image File G, slides 849-854). The image in file "Rb(vivo).jpg" was used essentially as a "master" and fragments re-used in very many instances across many figures in publications and grant applications, and for diverse purposes, by Dr. Sarkar and his research team, in particular by Dr. Wang and Dr. Banerjee. The "Rb(vivo).jpg" image has five primary manifestations in Dr. Sarkar's publications and grant applications,

each with dozens of repeated instances of re-use and manipulation in Allegations 82 through 86 (DIO4915 Image File G, slides 847-918).

Further, based upon a careful visual examination of each blot in "Rb(Vivo).jpg," the Committee determined that **the 8-lane image in Rb(vivo).jpg is itself also a composite constructed of 4 separate images of individual blots that are repeated and manipulated (i.e., flipped, squeezed, rearranged) within the 8-lane image** (DIO4915 Image File G, slide 850).

The Rb(vivo).jpg file is found only on the following sequestered computer drives.

- One copy on lab computer #12 and dated 04/03/2007:

E:\OriginalData\12\[NTFS]\Documents and Settings\alis\Rahman\BDIM+Tax(Breast)\Rb(vivo).jpg

- Two copies on the KCI "P" share drive and both dated 04/03/2007:

G:\25 KCI Dec 2013\P_homes\alis\Old Computer\Rahman\BDIM+Tax(Breast)\Rb(vivo).jpg
G:\25 KCI Dec 2013\P_homes\alis\My Documents\My Documents\Rahman\BDIM+Tax(Breast)\Rb(vivo).jpg

The Committee found no other copies of this image alone in files of any other name or type (e.g., jpg, tif, pdd, ppt, etc), other than as used in the publications and grant applications detailed in Allegations 82 through 86. The Committee concludes that "Rb(vivo).jpg" is a composite and the ultimate source of all the 2-, 3-, 4-, 6-, 7- and 8-band versions of the Rb bands detailed below. The Committee was unable to find original scans or films of either the entire 8-lane image, nor any of the 4 component single blots used in fabricating the 8-lane image (cf, DIO4915 Image File G, slides 841-854), nor any of the images used as Rb controls bands of any length in any of the allegations listed below. It is important to note that the date stamp for file "Rb(vivo).jpg" is April 3, 2007, but portions of the band appear in earlier papers (e.g., Allegation 82 from 2006). Also, no original scans or films were found by the Committee and no lab members submitted any original scans or films matching any of the published Rb bands. No laboratory records were found or submitted showing the Western blot assays for the Rb bands addressed in Allegations 82 through 86. **The Committee concludes, based upon the utter lack of evidence, that it is unlikely that Rb loading control Western blots were run for any of these publications.**

> ***Note:*** This same 8-lane Rb image also appears in Figure 4C of Paper 70 (**Reference #293**: Rahman, K.W., **Ali, S.,** Aboukameel, A., Sarkar, S.H., **Wang, Z.,** Philip, P.A., Sakr, W., Raz, A. (2007) Inactivation of NF-kB by 3,3'-diindolylmethane contributes to increased apoptosis induced by chemotherapeutic agent in breast cancer cells. Mol Cancer Ther 6: 2757-2765).
> [Ms. Ali and Dr. Wang are co-authors; Dr. Sarkar and Dr. Banerjee are not.]

Claims about scans Dr. Sarkar submitted in "Wang-Response-1.pptx" and "Wang-Response-2.docx" do not always agree. In "Wang-Response-1.pptx," they wrote that scans submitted for Allegations 83-84 are duplicate autoradiograms but in "Wang-Response-2.docx" they wrote "we found the autoradiograms for Rb," implying submitted scans are what was published. None of the scans have dates or other information identifying which experiment they are from. Marks on the scans, especially for Allegations 83-84, show remarkable similarity in visual appearance of labels across scans (e.g., position, handwriting, weight of pen marks) and across several experiments and publications. In contrast, most of the sequestered films had no labels. There is a lack of documentation of these experiments in lab notebooks. In the computers, there are many files named "Rb" but with no identifiable relationship to any experiment based on the file name, its directory name, or information on the scan. All this raises doubt that the duplicate Westerns submitted in the responses were made and labeled at the time of the original experiments.

The name "Rb(vivo)" for the source file implies that component Rb blots were derived from tissue extracts from *in vivo* experiments. However, the figures in Allegations 82 through 86 are usually results from *in vitro* or cell cultures experiments. The "Methods" sections of those papers note that cell cultures were used, with two exceptions where the captions and the "Methods" state the experiments from 2006 are *in vivo:* Allegations 83m and 83h (Reference #282; Figures 4C & 4D); and Allegations 85a, 85b, and 86c (Reference #257; Figures 4A, 4B & 4C). Therefore, if *in vivo* tissue-derived Rb loading control bands were used for all the *in vitro* experiments, it would constitute an additional level of research misconduct.

Specific Allegations 82 to 86:

The 6- and 7-lane versions of the source Rb image (Allegations 82), and the 4-lane versions (Allegations 83 & 84), and the 3-lane version (Allegations 85), and the 2-lane version (Allegation 86), are all ultimately re-used, re-purposed and manipulated fragments of the 8-lane Rb(vivo).jpg image in multiple figures. In many instances, the published smaller fragments are themselves manipulated copies of other fragments. For example, the 2- and 4-lane bands seem derived from the 6-lane band. The 4-lane bands of Allegations 83 are derived from the 6- or 7-lane bands of Allegation 82, themselves derived from Rb(vivo).jpg. Specifically, lanes 3 & 4 are lanes 2 & 3 of the 6-lane band flipped horizontal, stretched horizontally and vertically (lanes 1 & 2 are lanes 4 & 5 flipped horizontal), OR the 4-lane bands are comprised of the 7-lane Rb of Allegation 82 derived from Rb(vivo).jpg: lanes 1-4 (DIO4915 Image File G, slides 850-854). Further, the 3-lane Rb band of Allegation 85 may be derived from lanes 1-3 of the 4-lane Rb band, but stretched vertically, OR from either the 6- or 7-lane fragment, again ultimately derived from Rb(vivo).jpg. The 2-lane Rb bands in Allegation 86, associated with "supershift" assays as part of EMSA assays, were also re-used and manipulated fragments of the Rb(vivo).jpg or smaller versions, such as the 3-lane bands from Allegation 85. Regarding the 2-lane Rb bands in "supershift" assays, the response was that "this is super-shift experimental data just to show that our EMSA experimental system was working" (Wang-Response-1.pptx, slide 21; Wang Transcripts, V.2, p.332, ll.24 to p.334, ll.7) and that they "...used same "supershift" figure to show that our EMSA system was working" (Wang-Response-2.docx, p.3). No scans were submitted for 2-lane bands. In the end, **the Committee determined that the ubiquitous re-uses of "Rb(vivo).jpg" fragments were almost inextricably inter-twined and convoluted among dozens of figures with myriad possible trails through which the copying leading to any given use might be traced, particularly publications where the first author is Dr. Wang (and in his dissertation).**

The specific *ANALYSES* that follow list figures containing copies of fragments of the Rb(vivo).jpg image in publications and grant applications. In some instances, the misconduct is illustrated in greater detail to show how the published Rb bands are derived and manipulated from the 8-lane image and/or from smaller fragments, especially in the fabrication of the 4-lane bands. Because images became degraded with successive copying and manipulation, and because the lanes within Rb(vivo).jpg are duplicate blot images themselves, it was often not possible to determine which specific lanes within the Rb(vivo).jpg image were used in smaller fragments. **As detailed below, the Committee determined that each re-use of the image in Rb(vivo).jpg, and all its fragments, constitutes a separate instance of research misconduct.**

Note: The *RESPONSE* sections below are specific to the individual allegations. The General *RESPONSES* above are relevant to all instances in Allegations 82-86. The allegations regarding Rb bands were grouped and numbered by band length before it was recognized that all these images were derived from the same source. For the most part the allegations are covered in order by publication, but in some cases they are grouped based upon how they were addressed in the responses and/or because certain duplications of smaller fragments were apparently derived from larger ones.

Allegation 82a: In Figure 3A in **Paper 3** (Reference #262), a single 6- and/or 7-lane Rb image was re-used, manipulated, and/or re-named in Figure 3A.

RESPONSE:

Drs. Sarkar and Wang , wrote that "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control and actin. No errors or re-use of bands" (Wang-Response-1.pptx, slide 21). Dr. Wang testified that he could not remember making this figure, yet also claimed that he ran the EMSA assays because he is first author (Wang Transcript, V.1, p.173, ll.1-13). Dr. Banerjee testified that the Rb band image in Figure 3A was the same as the 6-lane Rb band (Banerjee Transcript, V.2, p.349, p.17 to p.350, ll.7). He stated that Dr. Wang was having difficulty with the EMSA because "he was not getting the band where it should come" (Banerjee Transcript, V.2, p.349, ll.14 to p.350, ll.6). Dr. Banerjee said he is a co-author because he edited the manuscript since Dr. Wang's English was not good, and admits to not catching the mistake in this figure. He states that Dr. Wang prepared this figure, but that he does not know how the mislabeling could have occurred or who would have done it (Banerjee Transcript, V.2, p.356, ll.20 to p.359, ll.16).

ANALYSIS:

See DIO4915 Image File G, slides 851-853.
The 6-lane Rb band of Figure 3A in Paper 3 is clearly a copy of lanes 1-6 of the 7-lane Rb band and lanes 2-7 of the 8-lane Rb(vivo).jpg image. The scanned image submitted in response is claimed to be from a repeated study, not the original experiment and that image does not match the published Rb blot (DIO4915 Image File G, slides 857 & 859). There is no information indicating this scan corresponds to the experiment reported as Figure 3A. The scan shows 2 sets of 6-lane "Rbs." The 2-lane Rb band in the "supershift" panel in Figure 3A is copied from lanes 2 & 3 of the 3-lane Rb band of Allegation 85, and/or from lanes 2 and 3 in the 6- or 7-lane version, and manipulated by being stretched horizontally and squeezed vertically (DIO4915 Image File G, slide 858-859).

CONCLUSION:

The Committee concludes, in **Allegation 82a**, that the 6-lane Rb bands published in **Figure 3A** of **Paper 3** are duplicated and manipulated copies of the Rb(vivo).jpg image. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 3A and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 82b: A 6-lane Rb image was re-used, manipulated (stretched), and re-named as β-actin (bottom panel) in Figure 1D in **Paper 19** (Reference #236).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control and actin. No errors or re-use of bands" (Wang-Response-1.pptx, slide18). Dr. Banerjee agreed that the Rb image and the β-actin of Figure 1D are the same image. He stated that Dr. Wang prepared this figure, but that he does not know how the mislabeling could have occurred or who would have done it. (Banerjee Transcript, V.2, p.356, ll.20 to p.359, ll.16). Dr. Wang

testified that "This is because Rb, they often also use the control. This all the same cell lines, and they got the treatment, yeah. Then they made--this could be run the same time because this is easy to run, the actin Rb very strong, so-- ... we thought like the protein and to run the actin, and we also got the nuclear protein from the Rb, so it's probably run the Rb and actin at the same time, and they are-- they got it wrong, the label" (Wang Transcript, V.2, p.354, ll.14-19 and p.354, ll.24 to p.355, ll.3).

ANALYSIS:

See DIO4915 Image File G, slides 860-861.
In their response, Dr. Sarkar and Dr. Wang did not address the allegation of labeling an Rb band as β-actin in Figure 1D of Paper 19. Dr. Wang's testimony was confused; in the end he said it was a labeling mistake. The Committee determined that the loading control band in Figure 1D (bottom panel) that is labeled "β-actin" is clearly a manipulated (stretched horizontally) copy of the 6-lane version of the Rb(vivo).jpg image. The lane order of the 6-lane band is changed in that lane 6 is moved to lane 1 in the "β-actin" band (DIO4915 Image File G, slide 860). The scan submitted in response does not match the published blot and there is no date on the scan nor any other information indicating that this scan corresponds to the experiment or β-actin in the published Western blot in Figure 1D (DIO4915 Image File G, slide 861). If the scan submitted in response is β-actin, then the use of the Rb image instead of this scan (or even a similar original) would also misrepresent the results since the submitted "β-actin" scan shows unequal loading between lanes 1-3 and lanes 4-6 (DIO4915 Image File G, slide 860).

CONCLUSION:

The Committee concludes, in **Allegation 82b**, that the control band published in **Figure 1D** of **Paper 19** is a manipulated copy of the 6-lane version of the Rb(vivo).jpg image re-labeled as "β-actin" that misrepresents the results. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 1D and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 82c: A single 6- and/or 7-lane Rb image was re-used, manipulated, and/or re-named in Figure 2D.

Allegation 82d: A single 6- and/or 7-lane Rb image was re-used, manipulated, and/or re-named in Figure 4D

> ***Note: Allegations 82c*** and ***82d*** are duplications of Allegation 68; they are, therefore, no longer considered.

Allegation 82e: In Figure 5A in Paper 55 (**Reference #231**), a 6-lane Rb image was re-used and manipulated for both the right and left panels of the figure.

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used. We found the autoradiograms for Rb" (Wang-Response-2.docx, p.3). Dr. Sarkar and Dr. Wang wrote that "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control and actin. No errors or re-use of bands" (Wang-Response-1.pptx, slide 18). Dr. Banerjee agreed that the images were the same as the 6-lane Rb band he had seen throughout his testimony concerning the Rb band allegations and he stated that Dr. Wang did the EMSA experiment for Figure 5A (Banerjee Transcript, p.377, ll.6 to p.378, ll.10). The left panel shows down regulation of siRNA plasmids (labeled "CS" and "PS")

and the right panel shows up regulation of PDGF-D plasmids (labeled "CP" and "PP") and therefore cannot have been the same Rb control band (Banerjee Transcript, p.379, ll.28 through p.380, ll.25).

ANALYSIS:

See DIO4915 Image File G, slides 863-864.
Visual examination shows that the 6-lane Rb band of Figure 5A in Reference #231 is the 6-lane Rb band in lanes 2-7 of the 8-lane Rb(vivo).jpg image. Lane 5 in the right-hand panel is shifted to a slightly lower position than lane 5 in the left-hand panel (DIO4915 Image File G, slide 860). The submitted scan is not the original scan (DIO4915 Image File G, slide 857). . There is no date or other information on the scan indicating that this scan corresponds to the specific experiments in either the left and right panels of Figure 5A. The submitted scan has 12 lanes labeled "Rb" and nothing indicates which lanes are supposed to be in which published panel of Figure 5A (DIO4915 Image File G, slide 861). The scan does not match the published Rb band in Figure 5A.

CONCLUSION:

The Committee found no evidence that either of the Rb banda in **Figure 5A** of **Reference #231** corresponds to their assays. The published 6-lane Rb bands are clearly manipulated versions of the file Rb(vivo).jpg, itself a constructed image for which there is no source documentation. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 5A and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 82f: In Figure1D (left panel) **Paper 32** (Reference #218), a 7-lane version of the Rb(vivo).jpg image was re-used and manipulated.

RESPONSES:

Dr. Sarkar and Dr. Wang wrote that "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control and actin. No errors or re-use of bands" (Wang-Response-1.pptx, slide 21). Dr. Banerjee testified that he had no role in constructing the figures in Paper 32 and that that was done by Dr. Wang (Banerjee Transcript, p.381, ll.1 to p.382, ll.3; p.387, ll.25 to p.386, ll.6). Dr. Banerjee said his contribution to this paper was to read the manuscript (Banerjee Transcript, V.2, p.383, ll.21 to p.384, ll.9). No original scan was submitted.

ANALYSES:

See DIO4915 Image File G, slides 865-866.
Simple visual examination shoes clearly that the 7-lane Rb band of Figure 1D in Paper 32 is comprised of lanes 2-8 of Rb(vivo).jpg (DIO4915 Image File G, slide 865-866). This EMSA assay depicted NF-κB activation in a panel of pancreatic cancer cell lines, including AsPC-1, BxPC-3, Colo-357, HPAC, L3.6pl, MIAPaCa and PANC-1 (lanes 1–7, respectively). This mean image cannot validly be either an "extract control" for any one cell line, nor in studies of any other one or more cell lines. The duplicate autoradiogram submitted is not the original scan and has no date or other information about the experiment in Figure 1D.

CONCLUSIONS:

The Committee concludes, in **Allegation 82f**, that the 7-lane Rb band published in Figure 1D (left panel) of **Paper 32** is a manipulated copy of the 7-lane version of the Rb(vivo).jpg image. The Committee finds no

evidence that Western blot assays were performed as controls for the assays in Figure 1D. The scans submitted in response do not match the published Rb bands and there is no date on the scans or other information indicating this scan corresponds to the experiment in the figure. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 1D and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 82g: In Figure 6C in **Paper 32** (Reference #218), the 4-lane Rb band is composed of fragments of the 6-lane version of Rb(vivo).jpg that are squeezed horizontal: lanes 1-4 in Figure 6C are the same images as lanes 3, 5, 1 & 2, respectively, in the 6-lane version.

RESPONSES:

Dr. Sarkar and Dr. Wang wrote that "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control and actin. No errors or re-use of bands" (Wang-Response-1.pptx, slide 21).

ANALYSIS:

See DIO4915 Image File G, slides 867-868.
The 4-lane Rb of Figure 6C in Paper 32 is comprised of the 6-lane Rb of Allegation 82 derived from Rb(vivo).jpg: lanes 1 and 2 of the 6-lane Rb are lanes 5 and 6 of Fig 6C; lanes 5 and 6 of the 6-lane Rb bands are lanes 3 and 4 of Figure 6C (DIO4915 Image File G, slide 867). The scan in the submitted Response from Dr. Wang is a duplicate, not the original scan (Wang-Response-1.pptx, slide 18). There is no date on the scan and no indication that this scan corresponds to the specific experiments or the assayed proteins in Fig 6C. The scan does not match the published Rb in Fig 6C. (DIO4915 Image File G, slide 868).

CONCLUSIONS:

The Committee found no evidence that the control Rb band in **Figure 6C** of **Paper 32** corresponds to the assay. The published Rb band is clearly a manipulated fragment of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes, in **Allegation 82g**, that Dr. Wang knowingly and intentionally misrepresented the results by fabricating and/or falsifying the data in Figure 6C, and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 6C and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 82h: In Figure 3A in **Paper 32** (Reference #218), panel 4 from the left for BxPC-3 cells (time course study) – a 3-lane band (squeezed horizontal) composed of lanes 2, 3 & 4 of the 6-lane version.

Allegation 82i: In Figure 3A in **Paper 32** (Reference #218), panel 5 from the left for BxPC-3 cells (dose-response study) – a 3-lane band (squeezed horizontal) is copied from the 6-lane band, where lane 1 is now lane 3; lane 1 of this right panel is lane 5 and lane 2 is lane 1)

RESPONSES:

Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used. We found the autoradiograms for Rb" (Wang-Response-2.docx, p.3). Dr. Wang admitted that he did the experiments in Paper 32, Figure 3A, but maintained that the Rb bands in the left and right panels of Figure 3A were different (Wang Transcript, V.1, p.188, ll.5 to p.190, ll.17). He later said that he did not know how one of the Rbs could have been inverted, and also said that he had not chosen the right (meaning "correct") Rb band (Wang Transcript, V.1, p.191, ll.2-21). Drs. Sarkar and Wang submitted one scan purported to contain the Rb bands Allegations 82h and 82i (Wang-Response-1.pptx, slide 21).

ANALYSES:

See DIO4915 Image File G, slides 867-870.
Simple visual evaluation shows the 3-lane Rb band for panel 4 (time course for BxPC-3 cells) and panel 5 (dose-response study for BxPC-3 cells) of **Figure 3A** in **Paper 32** are comprised of lanes 2-5 from the 6-lane Rb band of Allegation 82 and derived ultimately from Rb(vivo).jpg (DIO4915 Image File G, slide 869). Panel 4 is squeezed horizontally and composed of lanes 2, 3 & 4 from the 6-lane fragment. Panel 5 is copied from the 6-lane band where lane 1 is now lane 3; lane 1 of this right panel is lane 5 and lane 2 is lane 1, and manipulated (squeezed horizontally). The scans submitted in response by Drs. Sarkar and Wang are not the original data. There is no date on the scans or other information linking the scans to the specific experiment in panel 4 of Figure 3A. The scan does not match the published Rb bands (DIO4915 Image File G, slide 870).

CONCLUSION:

The Committee found no evidence, for **Allegations 82h** and **82i,** that the Rb bands for the panels in **Figure 3A** in **Paper 32** corresponds to their respective assays, and concludes that all these Rb bands in Figure 3A are manipulated copies derived ultimately from the image in Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 3A and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83a: *Rb image was re-used (and manipulated)* Figure 2A & 2B (flipped) in Paper 58 (**Reference #247**).

Allegation 83b: *Rb image was re-used (and manipulated)* Figure 4A (Soy squeezed horizontally slightly) in Paper 58 (**Reference #247**).

Allegation 83c: *Rb image was re-used (and manipulated)* Figure 4B (Soy copied; Genistein flipped, stretched and straightened) in Paper 58 (**Reference #247**).

RESPONSE:

Dr. Sarkar (second to the last author) and Dr. Wang (not an author) wrote that "since Rb bands are similar, it could have been inadvertently used" (Wang-Response-2.docx" (p.2). Sarkar also wrote "83a, b, c is for Raffoul's paper (This is NOT my article). We found the autoradiograms for Rb in response to other allegation #83." Dr. Sarkar wrote that "Allegation #83a, 83b and 83c is NOT my publication..." (Response Letter (2nd) Feb. 4th-2014.docx, p.3). In "Wang-Response-1.pptx" regarding Allegation 83, he and Dr. Wang wrote: "We found the duplicate autoradiograms from the same set of replicate experiments

showing RB control, and there are no re-use of bands. Therefore, these allegations are not correct, hence no further action would be required."

Dr. Hillman testified that she could not find the original films for the Rb controls nor relevant documentation of Figures 2A, 2B, 4A & 4B in the notebooks of her assistants/students, Dr. Singh-Gupta or Dr. Raffoul. She maintained her trust that the Rb Western blot assays had indeed been run, and in her lab, saying that the lack of notebook documentation was simply "neglect...I think the controls for them [Dr. Singh-Gupta and Dr. Raffoul] are trivial. You know, that's not the real data" (Hillman Transcript, V.2, p.l33, ll 6 to p.136, ll.5). Dr. Hillman stated Dr. Raffoul had sent her the four Rb scans that she submitted in response to these allegations (Hillman Transcript, V.2, p.104, ll.6-13). Dr. Hillman had only scans of the Rb bands in these allegations and could not find the original films (Hillman Transcript, V.2, p.150, ll.12-14). She said that she "checked again and again with Dr. Singh-Gupta or Dr. Raffoul, they confirmed that they did the controls themselves and that they did not get them from Dr. Banerjee, and Dr. Banerjee did not have access to their files" (Hillman Transcript, V.2, p.161, ll.20-24). She was "not aware" that they had, according to Dr. Banerjee's testimony, shared Dr. Banerjee's computer (Hillman Transcript, V.2, p. 162, ll.3-16; p.164, ll.10-11). Others also had access to the files on Dr. Banerjee's computer (e.g., Drs. Singh-Gupta and Raffoul from Dr. Hillman's lab; Banerjee Transcript, V.1, p.371, ll.15 to p.373, ll.14).

ANALYSIS:

See DIO4915 Image File G, slides 874-885.
Close comparisons of the Rb bands in Figures 2A, 2B, 4A and 4B show that are the same images. Figures 2A (left & right panels) and Figure 4A (right panel) and Figure 4B (right panel) are the same image (DIO4915 Image File G, slides 874-877). Also, the right and left panels from Figure 2B are the same image, different from the others, but the same as in Allegation 84, which is a flipped version of Allegation 83 fragment (DIO4915 Image File G, slides 849 & 854). Finally, the Rb bands in left panels of Figures 4A and 4B are also the same, but different from all the other panels in Figures 2 and 4 (DIO4915 Image File G, slides 878-880). These copies of the same Rb bands have been variously manipulated by being rotated, flipped and squeezed (DIO4915 Image File G, slides 874-880). The same bands are used across all these panels despite the fact that they are labeled for different experiments: Figure 2 is a Western blot whereas Figure 4 is an EMSA assay; Figures 2A and 4A are dose-response studies whereas Figures 2B and 4B are time course studies; and the left panels of Figures 2 and 4 are treatments with "genistein" whereas and the right panels are treatments with "soy." The same control images cannot validly serve for all these experimental permutations.

Dr. Hillman submitted two figures showing the work-up of Figures 2 and 4 from her lab that match all the published panels (DIO4915 Image File G, slides 881-882). Four other files with scans submitted by Dr. Hillman for Figure 2A and 2B are labeled to correspond to the published Rb bands, however, the one labeled "APE Rb 4.Fig2B soy" does not match the published Rb for Figure 2B "soy." Instead, its is the same image as the Rb bands scan submitted for Figure 2A genistein and soy and not the orientation of the Rb band for Figure 2B "genistein" (DIO4915 Image File G, slide 883). The only difference in the Rb bands scan for Figure 2B "soy" is that it has been squeezed horizontally. Dr. Hillman stated that because she was having difficulty matching the Rb scans to the published images, she relabeled the scans for Figures 2A and 2B to make it easier to identify how they correspondence to what was published (Hillman Transcript, V.2, p.125, ll.15 through p.130, ll.2). See file names in DIO4915 Image File G, slides 883-884. Three of the four scans submitted by Dr. Hillman match the published Rbs, but the fourth Rb (for Figure 2B, "soy" panel) is a flipped version of the image in the other scans

Analyses of the image files Dr. Hillman labeled and that she said were sent to her by Dr. Rahman (first author), shows that they too are the same images, consistent with the analysis above for the published bands (DIO4915 Image File G, slides 883-884). They show the same unique identifying marks for both Figure 2 and Figure 4. Further, those unique marks show clearly that these Rb bands are also derived from lanes 2-5 from Rb(vivo).jpg (DIO4915 Image File G, slide 885). The Committee could not determine how the Rb(vivo).jpg-derived bands came to be in Dr. Rahman's possession or used in Dr. Hillman's lab. She insisted all the work was done in her lab; Dr. Banerjee admitted to working with Dr. Rahman but denied giving him Rb(vivo).jpg, or getting the file from him.

CONCLUSION:

The Committee finds, in **Allegations 83a, 83b** and **83c**, regarding **Figures 2** and **4** in **Reference #247,** that there was duplication and manipulation and re-labeling of Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. Most of the published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. The Committee concludes, by a preponderance of the evidence that Figures 2 and 4 were fabricated and/or falsified but cannot make a determination of who is responsible for the research misconduct. The Committee concludes, in contrast to Dr. Hillman's insistence of independent work, that the Rb(vivo).jpg file or one of its fragments was shared between the Hillman and Dr. Sarkar laboratories. The Committee concludes that because of the pervasive use of the Rb(vivo).jpg images in Dr. Sarkar's laboratory, that Dr. Sarkar bears some responsibility. However, he is not a senior or corresponding author on Reference #247, his grants did not support the research, and there is insufficient evidence that Dr. Sarkar was involved in the research misconduct in Reference #247.

***Allegation 83d*:** Figures 4A and 4B in Paper 63 (**Reference #272**), 4-lane Rb image was re-used.

Allegation 83e: Figure 5D in Paper 63 (**Reference #272**), the Rb image was re-used.

Allegation 83f: Figure 6D in Paper 63 (**Reference #272**), the Rb image was re-used.

RESPONSE:

Dr. Sarkar and Dr. Wang wrote: "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control, and there are no re-use of bands. Therefore, these allegations are not correct, hence no further action would be required" (Wang-Response-1.pptx", slide 19). Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used ... We found the autoradiograms for Rb in response to other allegation #83" (Wang-Response-2.docx, p.2). Seven scans were submitted for 12 allegations in the four papers for which Dr. Wang is first author under Allegation 83. Dr. Sarkar and Dr. Wang wrote that the same scan applied to Allegations 83d and 83e (see Wang-Response-2.doc, p.2).

ANALYSIS:

See DIO4915 Image File G, slides 886-889.
Simple visual examination shows that the Rb bands in Figures 4A and 4B and 5D and 6D of Reference #272 are all copies of each other (DIO4915 Image File G, slide 886), duplicates of the "Allegation 83" image (DIO4915 Image File G, slide 871), and thereby also all derived from Rb(vivo).jpg lanes 1-4 (DIO4915 Image File G, slide 854). Dr. Sarkar and Dr. Wang wrote that the same scan applied to Allegations 83d and 83e (Wang-Response-2.doc, p.2), however, according to the text of Reference #272 and captions, the

experiments represented by these figures differ. The 4-lane Rb band in Figure 4A in Reference #272 is labeled for BxPC-3 cells whereas the 4-lane Rb band in Figure 4B is labeled for PANC-1 cells with a curcumin dose response. The caption for the 4-lane Rb band in Figure 5D states the BxPC-3 cells were treated with curcumin and/or Notch-1 siRNA, whereas Figure 6D states the BxPC-3 cells were treated with curcumin and/or Notch-1 cDNA. The response was confused as to which lanes in the scans were claimed to comprise the Rb bands in Figure 6D (DIO4915 Image File G, slide 889). The scan submitted in response does not match the published images (DIO4915 Image File G, slides 887-889). The submitted scans are not originals. There is no date or other information on the scan that links it to the experiments in Figures 4A, 4B, 5D or 6D.

CONCLUSION:

The Committee finds, in **Allegations 83d, 83e** and **83f**, clear evidence that the 4-lane Rb bands for **Figures 4A, 4B, 5D** and **6D** in **Reference #272,** are duplicated and manipulated and re-labeled. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figures 4A, 4B, 5D and 6D in Reference #272, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83g: Figures 6A and 6B in Paper 64 (**Reference #277**), 4-lane Rb image was re-used

Allegation 83h: Figure 7E in Paper 64 (**Reference #277**), 4-lane Rb image was re-used (stretched)

Allegation 83i: Figure 8D in Paper 64 (**Reference #277**), 4-lane Rb image was re-used (stretched)

Allegation 83j: Figure 9D in Paper 64 (**Reference #277**), 4-lane Rb image was re-used (stretched, a bit less)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used ... We found the autoradiograms for Rb in response to other allegation #83" (Wang-Response-2.docx, p.2). Also, "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control, and there are no re-use of bands. Therefore, these allegations are not correct, hence no further action would be required" (Wang-Response-1.pptx", slide 19). Multiple scans were submitted for 12 allegations in the four papers for which Dr. Wang is first author under Allegation 83. Dr. Sarkar and Dr. Wang wrote that the same scan applied to Allegations 83d and 83e (see Wang-Response-2.doc, p.2).

Dr. Sarkar and Dr. Wang also wrote that "83n, o, p, q. are same experiments as 83g, h, I, J" ("Wang-Response-2.docx," p.2).

ANALYSIS:

See DIO4915 Image File G, slides 890-895.
Simple visual examination shows that the Rb bands images in Figures 6A, 6B, 7E, 8D and 9D of Reference #277 are all copies of each other (DIO4915 Image File G, slide 890), duplicates of the "Allegation 83" image (DIO4915 Image File G, slide 871), and thereby also all derived from Rb(vivo).jpg lanes 1-4, or from the 6- or 7-lane fragments (DIO4915 Image File G, slide 854). Simple examination also shows that the Rb bands

images in Figure 6C of Reference #277 is also a copy of the same of same source bands, but flipped horizontally which makes it a duplicate of "Allegation 84" (DIO4915 Image File G, slides 849, 854 & 890) and is addressed under Allegation 84a. The text of and caption for Figures 6A, 6B and 6C indicate that the EMSA assays were done on BxPC-3, HPAC and PANC-1 cells, respectively, so the same Rb bands image cannot be valid for all three figures. BxPC-3 cells were used in Figures 7E, 8D and 9D. There are different treatments across these experiments with cells treated with Notch-1 siRNA or Notch-1 cDNA or doses of genistein which also mean the same control bands cannot be used. The scans submitted in response for Allegations 83 through 83j do not match the published images (DIO4915 Image File G, slides 891-894). The submitted scans are not originals (Wang-Response-1.pptx, slide 19). There is no date or other information on the scan that links it to the experiments in Figures 6A, 6B, 6C, 7E, 8D or 9D.

The response that Allegations 83g through 83j in Reference #277, here, and Allegations 83n through 83q in Reference #284 (see below) "are the same experiment" does not explain the re-use of the image within either publication, or between them. While there is a correspondence between the experiments (e.g., similar cells & treatments; DIO4915 Image File G, slides 895-899), the EMSA assay images all differ so cannot be the "same experiment". The images in Allegations 83g and 83o do not match. The captions in Figures 7E, 8D and 9D in Reference #277 say, variously, that there was no change in Rb levels that served as nuclear protein loading control, but there is no evidence that these Rb control bands were run for these experiments. Even if these figures in References #277 and #284 are the same experiments, Dr. Sarkar failed to cite the earlier publication (Reference #284; received by the Int. J. Cancer on 06/14/05 and accepted on 08/25/05) in the later publication (Reference #277; received by Mol Cancer Ther on 08/3/05 and accepted on 01/5/06).

CONCLUSION:

The Committee finds, in **Allegations 83g, 83h, 83i,** and **83j** clear evidence that the 4-lane Rb bands for **Figures 6A, 6B, 7E, 8D** and **9D** in **Reference #272,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figures 6A, 6B, 7E, 8D and 9D and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. By a preponderance of the evidence, the Committee also concludes that Dr. Sarkar recklessly plagiarized the Rb bands from Reference #284 into Reference #277 and that this also constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83k: In Figure 2A in Paper 65 (**Reference #278**), the Rb image was re-used (stretched)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote: "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control, and there are no re-use of bands. Therefore, these allegations are not correct, hence no further action would be required" (Wang-Response-1.pptx, slide 19). Dr. Sarkar and Dr. Wang also wrote that "since Rb bands are similar, it could have been inadvertently used ... We found the autoradiograms for Rb in response to other allegation #83" (Wang-Response-2.docx, p.2). Dr. Banerjee testified that he did not do the EMSA assays for this paper (Banerjee Transcript, V.2, p.564, ll. 23 to p.569, ll.13).

ANALYSIS:

See DIO4915 Image File G, slides 900-901.
Simple visual examination shows that the Rb bands images in Figure 2A of Reference #278 are copies of the "Allegation 83" source image (DIO4915 Image File G, slides 871 & 900), and thereby also all derived from Rb(vivo).jpg lanes 1-4, or from the 6- or 7-lane fragments (DIO4915 Image File G, slide 854). The 4-lane Rb band in Figure 2A is derived from either of the 6- or 7-lane Rb band (Allegation 82) which is derived from Rb(vivo).jpg. Lanes 3 & 4 are manipulated (flipped horizontally and stretched) lanes 2 & 3 from the 6-lane fragment and lanes 1 & 2 are lanes 4 & 5 (DIO4915 Image File G, slide 854). The same image was used to represent nuclear protein loading control for EMSA assays testing in multiple studies. Therefore, the Rb band images cannot validly serve even as an "extract control." The scan submitted is a duplicate, not an original scan (DIO4915 Image File G, slide 901; Wang-Response-1.pptx, slide 19). There is no date or other information on the scan to link it to the experiment in Figure 2. The Rb band indicated on the scan does not match the published Rb band (DIO4915 Image File G, slide 901).

CONCLUSION:

The Committee finds, in **Allegation 83k**, clear evidence that the 4-lane Rb bands for **Figure 2A** in **Reference #278,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 2A and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83L: In Figure 4C in Paper 66 (**Reference #280**), the Rb image was re-used (stretched).

RESPONSE:

Dr. Sarkar wrote that "allegation # 83L has no basis and there is nothing wrong in this publication ..." (Response Letter (2nd)-Feb. 4th-2014, p.3). Dr. Banerjee testified that he contributed and constructed Figures 3A, 3B, and 4 in Reference #280 (Banerjee Transcript, V.2, p.360, ll.9-15), on which he is a co-first author. He admits that the Rb bands in Figure 4C looks the same as the Rb bands in Figure 3A, but that "this must have been a mistake" (Banerjee Transcript, V.2, p.361, ll.3 to p.362, ll.1). He did not answer when asked where documentation of the Rb assays could be found in his lab notebooks to verify the experiments in each figure, and to determine what mistake had been made (Banerjee Transcript, V.2, p.362, ll. 2 to p.363, ll.13). Dr. Banerjee had no explanation of how this same Rb band appears again and manipulated in publications for which Dr. Wang was a first author, and also appear in Reference #280 for which Dr. Wang was not an author (Banerjee Transcript, V.2, p.363, ll.3 to p.364, ll.22). Dr. Banerjee stated that the experiments for Dr. Wang's papers and the experiments for this publication were happening at the same time (Banerjee Transcript, V.2, p.369, ll.17 to p.370, ll.16). Dr. Banerjee testified that Dr. Wang had access to his computer in 2004-05 because Dr. Wang did not have a computer when he joined the lab and again in 2006 when Dr. Wang's computer crashed (Banerjee Transcript, V.2, p.370, ll.17 to p.371, ll.20). Others also had access to the files on Dr. Banerjee's computer (e.g., Drs. Singh-Gupta and Raffoul from Dr. Hillman's lab; Banerjee Transcript, V.1, p.371, ll.15 to p.373, ll.14).

ANALYSIS:

See DIO4915 Image File G, slide 902.

Simple visual examination shows that the Rb bands image in Figure 4C of Reference #280 are copies of the "Allegation 83" source image (DIO4915 Image File G, slides 871 & 902), and thereby also derived from Rb(vivo).jpg lanes 1-4, or from the 6- or 7-lane fragments (DIO4915 Image File G, slide 854). The Rb band in Figure 4C of Reference #280 is clearly a manipulated copy of lanes derived ultimately from the Rb(vivo).jpg file. The responses by Drs. Sarkar and Banerjee do not explain the re-use of the Rb band images. No scan was submitted.

According to the caption, the 4-lane Rb band in Figure 4C is for an EMSA assay in tumor extracts from animals that were treated (or not) with genistein alone, cisplatin alone, or both treatments, in contrast to other experiments using this image from various *in vitro* cell models. The same Rb band image cannot validly be used for extracts from both *in vivo* (here) and *in vitro* studies, such as BxPC-3 cells in Figure 3A of this publication (see Allegation 84c, below). The Committee notes that the "supershift" panels in Figure 4C here in Reference #280, on which Dr. Wang is not an author, do not include a 2-lane Rb band.

CONCLUSION:

The Committee finds, in **Allegation 83L**, clear evidence that the 4-lane Rb bands for **Figure 4C** in **Reference #280,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 4C and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83m: The Rb image was re-used in Figure 4C in Paper 67 (**Reference #282**).

RESPONSE:

No specific response or scan was submitted.

ANALYSIS:

See DIO4915 Image File G, slide 903.
Simple visual examination shows that the Rb bands image in Figure 4C of Reference #282 are copies of the "Allegation 83" source image (DIO4915 Image File G, slides 871 & 903), and thereby also derived from Rb(vivo).jpg lanes 1-4, or from the 6- or 7-lane fragments (DIO4915 Image File G, slide 854). The Rb band in Figure 4C of Reference #282 is clearly a manipulated copy of lanes derived ultimately from the Rb(vivo).jpg file. The responses by Drs. Sarkar and Banerjee do not explain the re-use of the Rb band images. No scan was submitted. Dr. Sarkar is the corresponding author for Reference #282. The 4-lane Rb bands in Figure 4C is a manipulated (flipped horizontally and stretched) copy of the 6- or 7-lane Rb bands fragments derived from Rb(vivo).jpg file where lanes 3 and 4 are lanes 2 and 3 of the 6-lane Rb band, and lanes 1 and 2 in Figure 4C are lanes 4 and 5 (DIO4915 Image File G, slide 903). Also, lanes 2 and 3 of the Rb band in Figure 4C are copied into the Rb band in Figure 4D (see Allegation 86h). According to the caption, the 4-lane Rb band in Figure 4C shows "ERRP inhibits NF-κB DNA-binding activity *in vivo* in tumor xenografts," in contrast to the *in vitro* cell culture experiments where fragments of the Rb(vivo).jpg image are used elsewhere.

CONCLUSION:

The Committee finds, in **Allegation 83m**, clear evidence that the 4-lane Rb bands for **Figure 4C** in **Reference #282,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 4C and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83n: In Figure 2A in Paper 68 (**Reference #284**), the 4-lane Rb image was re-used (stretched)

Allegation 83o: In Figure 2B in Paper 68 (**Reference #284**), the 4-lane Rb image was re-used (stretched more than 2A)

Allegation 83p: In Figure 5B in Paper 68 (**Reference #284**), the 4-lane Rb image was re-used (stretched)

Allegation 83q: In Figure 5C in Paper 68 (**Reference #284**), the 4-lane Rb image was re-used (stretched more than 5B)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used ... We found the autoradiograms for Rb in response to other allegation #83" (Wang-Response-2.docx, p.2). Also, "we found the duplicate autoradiograms from the same set of replicate experiments showing RB control, and there are no re-use of bands. Therefore, these allegations are not correct, hence no further action would be required" (Wang-Response-1.pptx", slide 19). Multiple scans were submitted for 12 allegations in the four papers for which Dr. Wang is first author under Allegation 83. Dr. Sarkar and Dr. Wang wrote that the same scan applied to Allegations 83d and 83e (see Wang-Response-2.doc, p.2).

Dr. Sarkar and Dr. Wang wrote that "83n, o, p, q. are same experiments as 83g, h, I, J." (Wang-Response-2.docx, p.2). They also wrote that they "... found the duplicate autoradiograms from the same set of replicate experiments showing RB control, and there are no re-use of bands. Therefore, these allegations are not correct, hence no further action would be required" (Wang-Response-1.pptx, slide 19).

ANALYSIS:

See DIO4915 Image File G, slides 904-911.
Visual comparison shows that the Rb bands images in Figures 2A, 2B, 5B and 5C of Reference #284 are copies of each other (DIO4915 Image File G, slide 904), duplicates of the "Allegation 83" image (DIO4915 Image File G, slide 871), and thereby also all derived from Rb(vivo).jpg lanes 1-4, or from the 6- or 7-lane fragments (DIO4915 Image File G, slide 854). The Rb band images in Figures 2A, 2B, 5B and 5C in Reference #284 are clearly manipulated copies of fragments of the Rb(vivo).jpg image. The 4-lane Rb bands in Figures 2 and 5 in Reference #284 are manipulated (flipped horizontally and stretched) copies of the 6- and/or 7-lane Rb band of Allegation 82, derived itself from Rb(vivo).jpg, where lanes 3 and 4 are lanes 2 and 3 of the 6-lane Rb band (DIO4915 Image File G, slide 904). The captions to Figures 2 and 5 in Reference #284 say the "retinoblastoma protein level served as a nuclear protein loading control," but since these Rb bands are duplicates, this control assay could not have been run. The scan submitted is not an original scan (Wang-Response-1.pptx, slide 19). There is no date or other information on the scan that

links this scan to the experiment in Figure 2 or 5. The Rb band indicated on the scan does not match the published Rb bands (DIO4915 Image File G, slides 909-911).

The response that Allegations 83g through 83j in Reference #277, above, and Allegations 83n through 83q in Reference #284 (seen here) "are the same experiment" does not explain the re-use of the image within either publication, or between them. While there is a correspondence between the experiments (e.g., similar cells & treatments; DIO4915 Image File G, slides 895-899), the EMSA assay images all differ so cannot be the "same experiment". The images in Allegations 83g and 83o do not match. Even if these figures in References #277 and #284 are the same experiments, Dr. Sarkar failed to cite the earlier publication (Reference #284; received by the Int. J. Cancer on 06/14/05 and accepted on 08/25/05) in the later publication (Reference #277; received by Mol Cancer Ther on 08/3/05 and accepted on 01/5/06).

CONCLUSION:

The Committee finds, in **Allegations 83n, 83o, 83p** and **83q**, clear evidence that the 4-lane Rb bands for **Figures 2A, 2B, 5C** and **4D** in **Reference #284,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assays above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figures 2A, 2B, 5C and 4D and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 83r: In Figure 3, in Grant Application **1 R01 CA131151-01** (File: 2007, 02 01 – Sarkar Proposal 14114-001.pdf), the Rb image was re-used.

Allegation 83s: In Figures 3A and 3B in Grant Application **1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf), the Rb images were re-used.

Allegation 83t: In Figure 4E in Grant Application **1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf), the Rb image was re-used (stretched).

Allegation 83u: In Figure 5C in Grant Application **1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf), the Rb image was re-used (stretched)

Allegation 83v: In Figure 6D in Grant Application **1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf) Rb image was re-used.

RESPONSE:

Dr. Sarkar wrote that allegations "83r, 83s, t, u, v are our R01 applications. These allegations are same as the allegations mentioned above. We inserted the figures from our publication. **No errors**" (Wang-Response-2.docx, p.3; bold in original). No scans were submitted.

ANALYSES:

See DIO4915 Image File G, slides 912-914.
In Allegation 83r, simple examination of the 4-lane Rb bands in Figure 3 in Grant Application 1 R01 CA131151-01 is derived from Rb(vivo).jpg or one of its fragments: lanes 3 & 4 are lanes 2 & 3 of the 6-lane Rb, flipped horizontal, stretched horizontal, and stretched vertical; lanes 1 & 2 are lanes 4 & 5 flipped

horizontal; OR of the 7-lane Rb of Allegation 82 derived from rb(vivo).jpg: lanes 1-4 (DIO4915 Image File G, slide 912). According to the caption, the 4-lane Rb bands in Figure 3 show "effect of control siRNA (CS) and PDGF-D siRNA (PS) on NF-κB DNA" in contrast to other uses of the bands.

In Allegation 83s, Figures 3A and 3B in Grant Application 1 R01 CA131456-01 are the same as Figures 6A and 6B in Reference #277 which are addressed in Allegation 83g. The ANALYSIS and CONCLUSIONS for Allegation 83g above determined that the Rb bands in these figure are duplicated and manipulated and re-labeled fragments of Rb(vivo).jpg and therefore fabricated and/or falsified knowingly and intentionally and recklessly by Dr. Sarkar. Dr. Sarkar admits inserting this fabricated and/or falsified figure in his grant application.

For Allegation 83t, Figure 4E in Grant Application 1 R01 CA131456-01 is the same as Figure 5D in Reference #272 which is addressed in Allegation 83e. The ANALYSIS and CONCLUSIONS for Allegation 83e above determined that the Rb bands in this figure are duplicated and manipulated and re-labeled and therefore fabricated and/or falsified knowingly and intentionally and recklessly by Dr. Sarkar. Dr. Sarkar admits inserting this fabricated and/or falsified image in his grant application.

For Allegation 83u, Figure 5C in Grant Application 1 R01 CA131456-01 is the same as Figure 8D in Reference #272 which is addressed in Allegation 83i. The ANALYSIS and CONCLUSIONS for Allegation 83i above determined that the Rb bands in this figure are duplicated and manipulated and re-labeled and therefore fabricated and/or falsified knowingly and intentionally and recklessly by Dr. Sarkar. Dr. Sarkar admits inserting this fabricated and/or falsified image in his grant application.

In Allegation 83v, Figure 6D in Grant Application 1 R01 CA131456-01 is the same as Figure 9D in Reference #277 which are addressed in Allegation 83j. The ANALYSIS and CONCLUSIONS for Allegation 83j above determined that the Rb bands in these figure are duplicated and manipulated and re-labeled fragments of Rb(vivo).jpg and therefore fabricated and/or falsified knowingly and intentionally and recklessly by Dr. Sarkar. Dr. Sarkar admits inserting this fabricated and/or falsified figure in his grant application.

CONCLUSIONS:

The Committee concludes, in **Allegation 83r**, by a preponderance of the evidence, that Dr. Sarkar submitted NIH grant application **1 R01 CA131151-01** in which he recklessly included fabricated and/or falsified data in **Figure 3**, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

The Committee concludes, in **Allegation 83s**, by a preponderance of the evidence, that Dr. Sarkar submitted NIH grant application **1 R01 CA131456-01** in which he recklessly included fabricated and/or falsified data in **Figures 3A and 3B**, and that this is research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

The Committee concludes, in **Allegation 83t,** by a preponderance of the evidence, that Dr. Sarkar submitted NIH grant application **1 R01 CA131456-01** in which he recklessly included fabricated and/or falsified data in **Figure 4E**, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

The Committee concludes, in **Allegation 83u**, by a preponderance of the evidence, that Dr. Sarkar submitted NIH grant application **1 R01 CA131456-01** in which he recklessly included fabricated and/or

falsified data in **Figure 5C**, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

The Committee concludes, in **Allegation 83v**, by a preponderance of the evidence, that Dr. Sarkar submitted NIH grant application **1 R01 CA131456-01** in which he recklessly included fabricated and/or falsified data in **Figure 6D**, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 84a: In Figure 6C in Paper 64 (**Reference #277**), the 4-lane Rb bands image and flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated - Figure 6B flipped horizontal).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used ... We found the autoradiograms for Rb in response to other allegation #83" (Wang-Response-2.docx, p.2). Two scans were submitted without written comments (Wang-Response-1.pptx, slide 20).

ANALYSIS:

See DIO4915 Image File G, slides 918-919.
Simple visual examination shows that the Rb bands images in Figure 6C of Reference #277 (DIO4915 Image File G, slide 918) are copies of other bands in Figures 6A and 6B in Reference #277, and others (DIO4915 Image File G, slide 890), and duplicates of the "Allegation 84" source image (DIO4915 Image File G, slides 915-916), and thereby also all reversed copies of the "Allegation 83" source image, all of which are derived from Rb(vivo).jpg lanes 1-4 (DIO4915 Image File G, slide 854), flipped horizontally and stretched (DIO4915 Image File G, slide 918). As with other manifestations of the duplicated Rb bands, the bands in Allegation 84a (through 84g, as well) could also be more proximally derived from the 6- or 7-lane fragments (DIO4915 Image File G, slide 854). That is, the 4-lane Rb in Figure 6C in Reference #277 could be copies of either the 6-lane Rb bands flipped horizontal, stretched horizontal, and stretched vertical, or OR of the 7-lane Rb of the "Allegation 82" source image derived from Rb(vivo).jpg lanes 1-4 (flipped horizontal). According to the caption for Figure 6 in Paper 64 Reference #277, besides using the same image for three different cell lines, Figures 6A, 6B and 6C show the same treatments with Notch-1 siRNA and Notch-1 plasmid so that by flipping the Rb bands in Figure 6C relative to Figures 6A and 6, the order and direction of lanes in Figure 6C are reversed.

The two scans submitted are duplicates, not original scans (Wang-Response-2.docx, p.3; Wang-Response-1.pptx, slide 20). There is no date on the scans nor is there any way to link them to the same or a similar experiment (DIO4915 Image File G, slide 919). The text of Reference #277 and the caption for Figure 6 indicate that the experiments for Figure 6 were done at the same time although Drs. Sarkar and Wang do not claim that the lanes labeled BxPC-3 and HPAC on the scan for Allegation 84a are related to Allegation 83g and the scan submitted for Allegation 84a (Figure 6C) is completely different from the scan submitted for Allegation 83g (Figures 6A and 6B; DIO4915 Image File G, slide 891).

CONCLUSION:

The Committee finds, in **Allegation 84a**, clear evidence that the 4-lane Rb bands for **Figure 6C** in **Reference #277,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assay above them. These published Rb bands clearly

are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 6C and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 84b: In Figure 6B in **Reference #277**, the 4-lane Rb image were re-used and manipulated (flipped horizontal).

Note: This issue is already covered under Allegation 83g.

Allegation 84c: In Figure 3A in **Reference #280**, the 4-lane Rb image and/or flipped 3-lane versions, with just the 3 left lanes of was re-used and manipulated (stretched).

RESPONSE:

Dr. Sarkar wrote that "...there is nothing wrong as claimed under allegation #84c and #84d" (Response Letter (2nd) Feb. 4th-2014.docx, p.3). Dr. Sarkar and Wang wrote that "84c is for Mohammad RM (we have no record)" (Wang-Response-2.docx, p.3). No scan was submitted.

ANALYSIS:

See DIO4915 Image File G, slide 920.
Dr. Sarkar wrote this work is for another investigator but he is the senior/corresponding author and two of his NIH grants funded the work in part (1R01CA101870-02 & 5R01CA083695-04) and Dr. Banerjee is the co-first author. The Rb bands in Figure 3A of Reference #280 are clearly manipulated copies of lanes derived ultimately from the Rb(vivo).jpg file. The 4-lane Rb band in Figure 3A is comprised of the 6- and/or 7-lane Rb band of Allegation 82, which is derived from Rb(vivo).jpg, and where lanes 3 and 4 in Figure 3A are manipulated (flipped horizontally and stretched) copies of lanes 2 and 3 from the 6-lane fragment, and lanes 1 and 2 are manipulated copies of lanes 4 and 5 (DIO4915 Image File G, slide 920). According to the caption for the 4 lanes of Rb band in Figure 3A, shows the effects of pretreatment with genistein and/or cisplatin on NF-κB DNA-binding activity in BxPC-3 cells. It is the same Rb band used in Figure 4C of Reference #280 (Allegation 83L) as a control for *in vivo* work in tumors from mice, not BxPC-3 cells *in vitro* (DIO4915 Image File G, slide 902).

CONCLUSION:

The Committee finds, in **Allegation 84c**, clear evidence that the 4-lane Rb bands for **Figure 3A** in **Reference #280,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assay above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 3A and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 84d: In Figure 3C, in Grant Application **1 R01 CA131456-01** (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf), the Rb image and/or flipped 3-lane versions, was re-used and manipulated.

RESPONSE:

Dr. Sarkar wrote that "...there is nothing wrong as claimed under allegation #84c and #84d" (Response Letter (2nd) Feb. 4th-2014.docx, p.3). Dr. Sarkar and Dr. Wang wrote that "84d is for R01 application, which is an inserted figure from our publication" (Wang-Response-2.docx, p.3). No scan was submitted.

ANALYSIS:

See DIO4915 Image File G, slides 921-922.
In Allegation 84d, Figure 3C in Grant Application 1 R01 CA131456-01 is the same as Figure 6C in Reference #277 which are addressed in Allegation 84c. The ANALYSIS and CONCLUSIONS for Allegation 83c above determined that the Rb bands in these figure are duplicated and manipulated and re-labeled fragments of Rb(vivo).jpg and therefore fabricated and/or falsified knowingly and intentionally and recklessly by Dr. Sarkar. Dr. Sarkar admits inserting this fabricated and/or falsified figure in his grant application.

CONCLUSIONS:

The Committee concludes, in **Allegation 84d**, by a preponderance of the evidence, that Dr. Sarkar submitted NIH grant application **1 R01 CA131151-01** in which he recklessly included fabricated and/or falsified data in **Figure 3C**, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 84e: In Figure 3A in **Paper 32** (Reference #218), the far left 4-lane panel labeled "Colo-357", the 4-lane Rb band is a manipulated (squeezed horizontal) copy of lanes from Rb(vivo).jpg.

Allegation 84f: In Figure 3A in **Paper 32** (Reference #218), panel 2 from the left, labeled "Colo-357" (time course study), the 3-lane Rb band is a copy of a 4-lane Rb image and/or flipped 3-lane versions and manipulated (squeezed horizontal; 3-lane version, left 3 lanes only)

Allegation 84g: In Figure 3A in **Paper 32** (Reference #218), panel 3 from the left, labeled "Colo-357" (dose-response study), the 3-lane Rb band is a copy of a 4-lane Rb image re-used and manipulated (squeezed vertical; 3-lane version, left 3 lanes only)

RESPONSES:

Dr. Sarkar and Dr. Wang wrote that "since Rb bands are similar, it could have been inadvertently used. We found the autoradiograms for Rb" (Wang-Response-2.docx, p.3). Drs. Sarkar and Wang submitted one scan purported to contain the Rb bands for Allegations 84e, 84f, and 84g (Wang-Response-1.pptx, slide 21; DIO4915 Image File G, slides 924, 926, 927). They wrote that "since Rb bands are similar, it could have been inadvertently used. We found the autoradiograms for Rb" (Wang-Response-2.docx, p.3). The scan submitted is a duplicate, not an original scan (Wang-Response-1.pptx, slide 20).

ANALYSES:

See DIO4915 Image File G, slides 923-928.
Dr. Wang is the first author and Dr. Sarkar is the 9th of 10 authors. Dr. Sarkar's grant funded the work. Simple visual examination shows that the 4- and 3-lane Rb bands images in Figure 3A the three left panels) in Paper 32 (DIO4915 Image File G, slide 923) are copies of other each other and duplicates of the "Allegation 84" source image (DIO4915 Image File G, slides 915-916), and thereby also all reversed copies of the "Allegation 83" source image, all of which are derived from Rb(vivo).jpg lanes 1-4 (DIO4915 Image File G, slide 854), flipped horizontally and stretched (DIO4915 Image File G, slides 924-928). The

Committee finds that the published 4-lane Rb bands in the far left single panel with Colo-357 cells in Figure 3A in Paper 32 (a study treating Colo-357 cells with Bcl-2 siRNA or Bcl-2 cDNA plasmid), as well as the 3-lane Rb bands in panels 2 (a time-course study after 500 nM TW-37) and panel 3 (a TW-37 dose-response study) are all clearly manipulated fragments of either the same 6-lane or 7-lane version of the file Rb(vivo).jpg (DIO4915 Image File G, slides 925 & 926). The experiments and labels are different among these panels and also different from many other uses of this same Rb band image and so cannot be valid for all uses. The Committee finds no evidence that the 2- or 4-lane Rb bands in these panels corresponds to the assays above them. The scans submitted do not match any of the published bands (DIO4915 Image File G, slides 925, 927, 928). The caption to Figure 3A also states that "retinoblastoma protein level served as the nuclear protein loading control" which misrepresents the experimental procedures and the results because there is evidence that this control was done.

CONCLUSION:

The Committee finds, in **Allegations 84e, 84f** and **84g**, clear evidence that the 4- and 3-lane Rb bands for the 3 left panels of **Figure 3A** in **Paper 32,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 4-lane Rb bands correspond to the assay above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 3A and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 85a: In Figure 4A, in Paper 59 (**Reference #257**), the Rb image was re-used and manipulated (squeezed horizontal).

Allegation 85b: In Figure 4B, in Paper 59 (**Reference #257**), the Rb image was re-used and manipulated (flipped horizontal, squeezed vertical)

RESPONSE:

Dr. Sarkar wrote that "allegation #85 and likewise #86c is NOT my publication" (Response Letter (2nd) Feb. 4th-2014.docx, p.3). Dr. Banerjee stated that he did not do the EMSA assays for Reference #257 (Banerjee Transcript, V.3, p.564, ll.23 to p.569, ll.13).

ANALYSIS:

See DIO4915 Image File G, slides 929-930.
Dr. Sarkar is listed as the second of seven authors for Reference #257 and Dr. Banerjee and Dr. Wang are co-authors. Visual comparisons show that the 3-lane Rb bands images in Figure 4 in Reference #257 (DIO4915 Image File G, slide 930) are flipped copies of other each other and duplicates of the "Allegation 85" source image (DIO4915 Image File G, slide 929), which are derived from Rb(vivo).jpg lanes 1-3 (DIO4915 Image File G, slide 854), flipped horizontally and stretched (DIO4915 Image File G, slides 929), and are also direct copies of lanes 1-3 from the "Allegation 84" source image (Figure 4A) and lanes 2-4 from the "Allegation 84" source image (Figure 4B; DIO4915 Image File G, slides 929), which itself is a flipped copy of the "Allegation 83" source image (DIO4915 Image File G, slides 849).

According to the text (Reference #257, p.2751) and the caption for Figure 4, the same image was used to represent nuclear protein loading control for EMSA assays testing both *in vivo* and *in vitro* I3C treatment effects on NF-κB DNA-binding activity in *in vitro* MDA-MB-231 breast cancer cells (Figure 4A), and *in vivo*,

in tumors formed from MDA-MB-231 cells grown in bone marrow in SCID mice (Figure 4B). Therefore, the Rb band images cannot validly serve even as an "extract control."

CONCLUSION:

The Committee finds, in **Allegations 85a** and **85b**, evidence that the 3-lane Rb bands in **Figures 4A** and **4B** in **Reference #257,** are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 3-lane Rb bands correspond to the assay above them. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and of its "Allegation 84" fragment. However, the Committee finds insufficient evidence that Dr. Sarkar had any role in this publication, even though he is the 2nd author. Nevertheless, these figures appear to be similar to related products from Dr. Sarkar's laboratory, reflecting the pervasive duplication of Rb bands from his laboratory, including, apparently, work with collaborators.

Allegation 86a: **(Paper 3)** The 2-lane Rb image was re-used (and manipulated) in Figure 3A

Allegation 86b: **(Reference #231)** The 2-lane Rb image was re-used (and manipulated) in Figure 5A

Allegation 86c: **(Reference #257)** The 2-lane Rb image was re-used (and manipulated) in Figure 4C (stretched)

Allegation 86d: **(Reference #272)** The 2-lane Rb image was re-used (and manipulated) in Figure 4C (stretched)

Allegation 86e: **(Reference #277)** The 4-lane Rb image was re-used (and manipulated) in Figure 6B (squeezed horizontal)

Note: Figure 6B is a 4-lane Rb band and duplicates Allegation 83g; it is covered there.

Allegation 86f: **(Reference #277)** The 2-lane Rb image was re-used (and manipulated) in Figure 6D (stretched)

Allegation 86g: **(Reference #278)** The 2-lane Rb image was re-used (and manipulated) in Figure 2B (stretched)

Allegation 86h: **(Reference #282)** The 2-lane Rb image was re-used (and manipulated) in Figure 4D

Allegation 86i: **(Reference #284)** The 2-lane Rb image was re-used (and manipulated) in Figure 2C (stretched)

Allegation 86j: In Grant Application **1 R01 CA131456-01** (File: 2007, 02 01 – Sarkar Proposal 07050620.pdf), the 2-lane Rb image was re-used (and manipulated) in Figure 3D (flipped horizontal, stretched).

Allegation 86k: **(Paper 32)** The 2-lane Rb image was re-used (and manipulated) in Figure1D (right)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in general that in "Allegation #86 regarding the re-use of Rb and our response to all allegations from #86a through 86k as indicated below... All allegation #86 from #86a to 86k, we used same supershift figure to show that our EMSA system was working" (wang-Response-2, docx, p.3). The same thing was written in Wang-Response-1.pptx (slide 21). No specific comments or scans were submitted for any of the instances under "Allegation 86."

ANALYSES:

See DIO4915 Image File G, slides 932-941.
Simple visual examinations shows that the images all of the 2-lane Rb bands in Allegations 86a through 86d and in Allegations 86f through 86k, in each of the specific figures noted above, are manipulated duplicates of each other and are clearly manipulated copies of lanes derived ultimately from the Rb(vivo).jpg file (DIO4915 Image File G, slides 933-941). All of the 2-lane Rb bands in "Allegation 86" are also copied from lanes 2 & 3 of the 3-lane Rb of "Allegation 85", and/or from either the 6-lane or 7-lane Rb bands that were also derived from the Rb(vivo).jpg, itself a constructed file (DIO4915 Image File G, slides 849; 855; 931-932). The 2-lane Rb bands are variously manipulated by squeezing or stretching vertically and/or horizontally (DIO4915 Image File G, slides 933-941). All the 2-lane Rb bands under "Allegation 86" are from "supershift" assays, and in fact one of two "supershift" assays that were also duplicated in multiple publications (See Allegations 131 and 138). The same figures were used nominally to validate an assay in a variety of tissues including BxPC-3 cells (References #278 & #284), cells transfected with cDNA or siRNA (References #231 & #277 & the grant application), MDA-MB-231 cells (References #257), xenograft tissues (Reference #282) and various or unspecified pancreatic cell lines (Papers 3 & 32, & Reference #272). Finally, for each of these figures with this duplicated 2-lane Rb bands image, the captions report that "retinoblastoma (Rb) protein level served as nuclear protein loading control. This assay confirmed the specificity of NF-κB binding to the DNA consensus sequence" – or words to that effect. Since there is no evidence that the loading controls (or the "supershift" assays, for that matter – see Allegations 131 & 138), were run at all, these captions misrepresent what was done and the results.

CONCLUSIONS:

The Committee finds, in **Allegations 86a, 86b, 86c, 86d, 86f, 86g, 86h, 86i, 86j** and **86k**, clear evidence that the 2-lane Rb bands for **Figures 3A, 5A, 4C, 4C, 6D, 2B, 4D, 2C, 3D** and **1D,** respectively, in **Paper 3, References #231, #257, #272, #277, #278, #282, #284, grant 1R01CA131456-01** and **Paper 32,** also respectively, are duplicated and manipulated and re-labeled Rb bands. The Committee finds no evidence that the 2-lane Rb bands correspond to the "supershift" assays they accompany. There is no evidence that these loading control assays were run at all. These published Rb bands clearly are manipulated versions of Rb(vivo).jpg and/or one of its fragments. For Allegation 86j, Figure 3D in Grant Application 1 R01 CA131456-01 is the same as Figure 6D in Reference #277, which is already addressed here in Allegation 86f (DIO4915 Image File G, slides 936 & 941). Dr. Sarkar admits in general to inserting fabricated and/or falsified images from his publications into his grant applications. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in each of the figures indicated in each of these publications papers, and for Allegation 86j, Dr. Sarkar recklessly submitted fabricated and/or falsified data in support of his NIH grant application, and that in each instance this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

General CONCLUSION about Rb bands:

The identity of the Rb bands images across almost every instance in Allegations 82a through 86k is dramatic and clear. The diverse purposes for which the "Rb(vivo).jpg" image was used repeatedly include experiments and assays with different cell lines and/or different tissue types, and/or different transfections, and/or different drug treatments at varying doses, and/or different time courses. For many published figures in these allegations where Rb(vivo).jpg was copied, the caption states that "retinoblastoma (Rb) protein level was used as a nuclear protein loading control" (or words to that effect).

This means that in each instance, the published captions very likely misrepresent what was actually done in the particular experiment.

The comments of Dr. Sarkar, Dr. Wang and Dr. Banerjee indicate a profound lack of understanding of, and disregard for, loading and other experimental controls. The Committee finds, based on their testimonies and practices, that Dr. Sarkar and his team deems controls insignificant, not worth checking as figures are composed, and an annoyance imposed by reviewers and journal editors. Members of Dr. Sarkar's lab operated as if it did not matter which control band image was used since it was not "real data" and "never changed". This is obvious in the repeated re-use of Rb images, but also because the Rb(vivo).jpg source image is itself a fabrication, and ultimately because Dr. Sarkar recklessly failed to establish even basic standards of practice or oversight in his lab. The Committee could not determine who is responsible for fabricating Rb(vivo).jpg in the first place, but Dr. Wang and Dr. Banerjee and others, including people in collaborators' labs, used it or one of its fragments at some time, and Dr. Sarkar published it. The Investigation Committee finds that there is no way to verify that Westerns were ever run for Rb controls in Dr. Sarkar's lab. Dr. Sarkar admitted he did not know if the Rb Western blots had been run, and said only they should have been.

The Committee finds it is extraordinarily unlikely that Dr. Sarkar could not have known about so pervasive a re-use of Rb bands images in his publications and grant applications. In the absence of evidence that these Rb Western blots were done at all, the Committee also finds it highly unlikely that Dr. Sarkar could not have noticed that so many assays were not being done. The Committee concludes, by a preponderance of the evidence, that Dr. Sarkar did know about the re-use of Rb bands and that he recklessly participated in and permitted and probably enabled Rb bands to be copied and re-used. **Dr. Sarkar's responsibility is explicit in each of the many substantiated allegations involving duplicated and re-labeled Rb bands because he recklessly caused and/or enabled this falsification and fabrication to occur systematically in his publications and grant applications for years, and it is on this basis that the Committee concluded, in each of the instances detailed above, that Dr. Sarkar committed research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.**

Duplication and Manipulation of β-Actin Loading Control Bands:

Allegations groups 89-94

Note: Allegations 87 and **88**, also concerning duplicated β-actin bands, are addressed under Allegations 8 & 9 (Paper 4) and Allegations 12, 12a, 13 & 13a (Paper 5), so no determinations of further misconduct are made for Allegations 87 or 88.

General RESPONSES about β-actin control bands:

The Committee views Dr. Sarkar's testimony about loading control bands detailed above under "Duplication of Rb Bands" to be relevant to β-actin bands, too. Dr. Sarkar wrote that "since actin bands are similar, it could have been inadvertently used. We found the autoradiograms for actin" (Wang-Response-2.docx, p.2). Dr. Sarkar testified that a β-actin loading control (and others) should be "associated with a specific extract from some cell or some tissue" and that loading controls of different experiments can look similar, with slight variations, so it is important that every cell extract have its own loading control and that loading control lanes are not supposed to change (Sarkar Transcript, V.1, p.54, ll.14-15). His explanation for "similarly-looking [Beta-actin] bands" was that alterations made to β-actin bands in figures were for cosmetic purposes, where the result "may be a similarly-looking band, but that similarly-looking band is not an identical band" (Sarkar Transcript, V.2, p.308, ll.1-5). He would not stipulate what the limits of acceptable "cosmetic changes" are in his lab (Sarkar Transcript, V.2, p.316, ll.16 to p.317, ll.7).

Dr. Sarkar testified that he did not ask to see original data for β-actin bands because "it should be routine practice of a good lab to run those things" (Sarkar Transcript, V.2, p.490, ll.4-5 & 8-9; p.491, ll.1-6). He did not check lab notebooks for the experiments under these allegations, assumed that experiments were run correctly, and trusted the composite figures shown to him at lab meetings (Sarkar Transcript, V.2, p.490, ll.18-23). Dr. Sarkar testified that running loading controls on gels separate from those of other proteins happens in his lab and is common practice in the field (Sarkar Transcript, V.1, p.184, ll.25 to p.185, ll.11).

Dr. Wang's general testimony about Rb bands duplication is also relevant to β-actin bands (e.g., Wang Transcript, V.1, p.197, ll.25 to p.198, ll.8; V.1, p.247, ll.16 to p.248, ll.4). He testified he ran many β-actin loading controls (Wang Transcript, V.2, p.356, ll.15-19), but produced no identified data. Dr. Banerjee testified he usually runs a β-actin control for each experiment but not always, citing problems with stripping gels (Banerjee Transcript, V.1, p.127, ll.20 to p.128, ll.17). Dr. Banerjee acknowledged his inability to connect specific β-actin bands with their respective experiments and that the published β-actin bands were "representative" β-actins run on separate gels (Banerjee Transcript, V.1, p.211, ll.7 to p.213, ll.2).

General *ANALYSES*:

Dr. Sarkar's publications and grants applications where these β-actin band images in Allegations 89 to 94 are found, with involvement of others are:

Paper 3 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
Paper 19 (2007)	– Dr. Wang: first author; Dr. Banerjee co-author
Paper 32 (2008)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #231 (2007)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #263 (2006a)	– Dr. Banerjee and Dr. Wang, co-authors

Reference #272 (2006b)	– Dr. Wang: first-author; Dr. Banerjee co-author
Reference #277 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #278 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
Reference #280 (2006)	– Dr. Banerjee co-first author
Reference #284 (2006)	– Dr. Wang: first author; Dr. Banerjee co-author
1 R01 CA120008-01 (2005)	– Dr. Sarkar: PI
1 R01 CA131456-01 (2007)	– Dr. Sarkar: PI

Images submitted in response: Many images of films or scans purportedly depicting β-actin bands were submitted by Dr. Sarkar, Dr. Wang and/or Dr. Banerjee for Allegations 89 to 94 (i.e., DIO4915 Image File H, slides 946-947, 983, 990, 1008, 1015 & 1034). The images in the scans do not correspond to the images addressed in the allegations. Many of these scans were submitted as "duplicates" or "repeated" experiments, not originals. None of the submitted scans bear dates or file names or annotations about which experiment they are from or descriptions of where they can be found. This means there is no way to authenticate that they are actually scans of β-actin bands, or assuming they are, which experiments they were from.

There are a number of allegations and specific instances where the same β-actin band or bands were duplicated and manipulated (flipped, cropped stretched, squeezed, etc.) and re-labeled and re-used, in many instances across figures and publications, among the many publications from Dr. Sarkar's lab. These β-actin loading control images have six primary manifestations (numbered Allegations 89 through 94; see file: DIO4915 Image File H, slide 944), each manifestation being connected to several allegations listed below. These different manifestations appear similar and sometimes certain allegations initially attributed to one image was discovered during the detailed evaluations to more clearly involve another image (e.g., Allegations 94c, 94d & 94e). Each of these instances is clarified in these analyses and conclusions. (In the analyses of each manifestation that follow, one instance is selected arbitrarily as a "reference image" for describing the duplications and manipulations. When possible the earliest image published is used.)

***Allegation 89* (i.e., 89a through 89m):**

Reference Image: A single 4-lane β-actin image (DIO4915 Image File H, slide 944-945) was re-used and manipulated in the following figures. Manipulations in the allegations below are decribed relative to Figure 3C of Paper 68 (**Reference #284**). The labels and caption for Figure 3C of Reference #284 indicate a time course study for "... inhibition of Hes-1, cyclin D1 and Bcl-xL protein expression by 25 μmol/l genistein in BxPC-3 pancreatic cancer cells..." Other uses are for different experimental designs and each re-use constitutes a separate allegation (i.e., 89a, 89b, etc.).

Note: The β-actin reference image for Allegation 89 is from Figure 3C in Reference #284 and is the correct baseline image for Allegations 89a through 89m. This image replaces another β-actin image indicated previoiusly for Allegation 89 (DIO4915 Image File H, slide 945).

RESPONSE:

Dr. Sarkar wrote in "Wang-Response-2.docx" that "since actin bands are similar, it could have been inadvertently used. We found the autoradiograms for actin" (p.3). The autoradiograms for Allegations 89a to 89L are in "Wang-Response-2.docx" (pp. 2-3) and "Wang-Response-1.pptx" (slides 22-23).

***Allegation 89a*: (Paper 3)** The 4-lane β-actin image was re-used and manipulated in Figure 5A (squeezed horizontal, then widened).

ANALYSIS:

See DIO4915 Image File H, slides 948-949.
Visual comparison shows that the β-actin loading control bands image in Figure 5A of Paper 3 is the same image as Figure 3C of Reference #284 that has been squeezed horizontally and stretched vertically (DIO4915 Image File H, slide 948). In contrast to the time course in Figure 3C in Reference #284, the text, labels and caption for Figure 5A indicate an experiment where Notch-1 expression was down-regulated in siRNA-transfected BxPC-3 cells by "... lane 2, 5 μg/mL ERRP; lane 3, Notch-1 siRNA; lane 4, Notch-1 siRNA + plus 5 μg/mL ERRP." The scan submitted in the response (Wang-Response-1.pptx, slide 22) does not match the published image, has no date or any indication that this image corresponds to this specific experiment or that the treatments in each lane correspond to the β-actin image published in Figure 5A (DIO4915 Image File H, slide 949).

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 5A** of **Paper 3** in **Allegation 89a** is a re-labeled and manipulated copy of the β-actin bands image in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published a fabricated and/or falsified β-actin bands image in Figure 5A, and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

***Allegation 89b:* (Reference #263).** The 4-lane of the β-actin image was re-used and manipulated in Figure 1C.

RESPONSE:

In file "Wang-Response-2.docx" (p.2), Dr. Sarkar and Dr. Wang wrote that "since actin bands are similar, it could have been inadvertently used. We found the autoradiograms for actin."

ANALYSIS:

Dr. Sarkar and Dr. Wang responded that a duplication was inadvertent due to similar images. Indeed, analysis shows that these β-actin bands are not duplicates of the reference image for Allegation 89 (Figure 3C of Reference #284), but of similar bands in Figure 2A of Paper 4 (Reference 259).

CONCLUSION:

The Committee finds that Allegation 89b is about duplication of lanes from a 6-lane β-actin image in Figure 2A of Paper 4, and this is addressed under Paper 61 (**Reference 263**).

***Allegation 89c:* (Reference #272)** The 4-lane β-actin image was re-used and manipulated in Figure 3D under PANC-1 (background lightened)

ANALYSIS:

See DIO4915 Image File H, slides 951-953.

Simple visual comparison shows that the β-actin loading control bands image in Figure 3D of Reference #272 is the same image as Figure 3C of Reference #284 that has been squeezed horizontally and stretched vertically and with the background lightened (DIO4915 Image File H, slides 951-952). In contrast to the time course in Figure 3C in Reference #284, the text, labels and caption for Figure 3D in Reference #284 indicate a dose-response experiment in PANC-1 cells where "... inhibition of Notch-1, Hes-1, cyclin D1, and Bcl-XL protein expression is illustrated after 72 hours of curcumin treatment..." The scan submitted in the response (Wang-Response-1.pptx, slide 22) does not match the published image, has no date or any indication that this image corresponds to this specific experiment or that the treatments in each lane correspond to the β-actin image published in Figure 3D (DIO4915 Image File H, slide 953).

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 3D** of **Reference #272** in **Allegation 89c** is a re-labeled and manipulated copy of the β-actin bands image in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published a fabricated and/or falsified β-actin bands image in Figure 3D, and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89d: (**Reference #272**) The 4-lane β-Actin image was re-used and manipulated in Figure 5A.

ANALYSIS:

See DIO4915 Image File H, slides 951-953.
Simple visual comparison shows that the β-actin loading control bands image in Figure 5A of Reference #272 is the same image as Figure 3C of Reference #284 that has been squeezed horizontally and stretched vertically (DIO4915 Image File H, slide 951 & 955). In contrast to the time course in Figure 3C in Reference #284, the text, labels and caption for Figure 5A in Reference #272 indicate an experiment where Notch-1 expression was down-regulated in siRNA-transfected BxPC-3 cells by "... 2) 10 μmol/L curcumin, 3) Notch-1 siRNA, and 4) Notch-1 siRNA plus 10 μmol/L curcumin." Neither group of bands on the scan submitted in the Response (Wang-Response-1.pptx, slide 22) matched the published image. The scan gives no indication which of the two groups of bands are supposed to correspond to the β-actin bands published in Figure 5A, although the panel on the right was submitted also in response to Allegation 90a (below, and it does not match those bands, either). It is unclear that the treatments indicated on the scan correspond to the β-actin image published in Figure 5A (DIO4915 Image File H, slide 955). The scan has no date or any indication that this image corresponds to this specific experiment.

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 5A** of **Reference #272** in **Allegation 89d** is a re-labeled and manipulated copy of the β-actin bands image in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89e: (**Reference #277**) The 4-lane β-Actin image was re-used and manipulated in Figure 8A (corrected allegation).

RESPONSE:

In file "Wang-Response-2.docx" (p.4), Drs. Sarkar and Wang wrote that "It is a wrong sentence. Figure 1B of actin (Ref 277) in Figure 1B of MCT (Ref 277)."

ANALYSIS:

Drs. Sarkar and Wang are correct about a typographical error in Allegation 89e which should refer to the duplication in the β-actin bands in Figure 8A, not Figure 1B.

See DIO4915 Image File H, slides 956-957.
Visual comparison shows that the β-actin loading control bands image in Figure 8A of Reference #277 is the same image as Figure 3C of Reference #284 that has been squeezed horizontally and stretched vertically (DIO4915 Image File H, slide 956). In contrast to the time course in Figure 3C in Reference #284, the text, labels and caption for Figure 8A indicate an experiment where Notch-1 expression was down-regulated in siRNA-transfected BxPC-3 cells by "...25 μmol/L genistein; *3*, Notch-1 siRNA; and *4*, Notch-1 siRNA plus 25 μmol/L genistein." Also, Figure 8B in Reference #277 is exactly the same as Figure 5A in Reference #272 (see Allegation 89d; DIO4915 Image File H, slide 956). However, Figure 8B in Reference #277 uses combined Notch-1 siRNA and genistein treatments, whereas Figure 5A in Reference #272 uses Notch-1 siRNA and curcumin. No scan was submitted in response.

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 8A** of **Reference #277** in **Allegation 89e** is a re-labeled copy of the β-actin bands image from a different experiment in Figure 3C of Reference #284, and of Figure 5A in Reference #272. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 8A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89f: (**Reference #277**) The 4-lane β-Actin image was re-used and manipulated in Figure 7B (under CyclinD1)

RESPONSE:

In file "Wang-Response-2.docx" (p.4), Drs. Sarkar and Wang wrote that "it is same experiment as Figure 3C (Ref 284, allegation 89);" also in "Wang-Response-1.pptx," slide 22: "Same experiments."

Dr. Wang testified that the β-actin under Cyclin D1 in Figure 7B in Reference #277 was intended to be the same β-actin bands as in Figure 3C of Reference #284. The manuscripts for References #284 and #277 were submitted to the journals at the same time and the journals were not told (Wang Transcript, V.1, p.248, ll.25 through p.250, ll. 2). Dr. Wang said he did not know if Dr. Sarkar was aware of the same figure being published in two separate papers (Wang Transcript, V.1, p.246, ll.18 through p.250, ll. 5).

ANALYSIS:

See DIO4915 Image File H, slides 958-961.
Dr. Wang admitted that the images were identical and testified they were meant to be. There are no citations or other indications in the publications that these data of figures we being published in other

papers. Simple visual comparison confirms the β-actin loading control bands image the Cyclin D1 panel of Figure 7B of Reference #277 is the same β-actin image as Figure 3C of Reference #284 that has been squeezed vertically and appears very thin (DIO4915 Image File H, slides 958 & 959). In contrast to Figure 3C in Reference #284, which has three sets of protein bands with the one β-actin row, Figure 7B has four panels with different β-actin bands images. Yet, the Cyclin D1 row in Figure 7B is a different image than the Cyclin D1 bands in Figure 3C (DIO4915 Image File H, slide 960). This is addressed under Allegation 79. No scan was submitted in response.

CONCLUSION:

The Committee finds that the β-actin bands image in the Cyclin D1 panel of **Figure 7B** of **Reference #277** in **Allegation 89f** is a re-labeled and manipulated copy of the β-actin bands image in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 7B, and of plagiarism by copying data without citation and submitting the same data for publication simultaneously to more than one journal, and that in each instance this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89g: (**Reference #278**) The 4-lane β-actin image was re-used and manipulated in Figure 3B (lanes 2&3, squeezed horizontal)

ANALYSIS:

See DIO4915 Image File H, slides 962-964.
Visual analysis shows that the images of the β-actin bands in the two left lanes labeled "CS" and "NS" in Figure 3B of Reference #278 are the same image as lanes 2 and 3 labeled "24" and "48" in Figure 3C of Reference #284. The copied images are stretched vertically to make them appear thicker (DIO4915 Image File H, slides 962 & 963). Like Figure 3C in Reference #284, the text, labels and caption for Figure 3B indicate an experiment using "Notch-1 siRNA-transfected ... BxPC-3 cells."

The scan submitted in the response (Wang-Response-1.pptx, slide 22) does not match the published image, has no date or any indication that this image corresponds to this specific experiment or that the treatments in each lane correspond to the β-actin image published in Figure 3B (DIO4915 Image File H, slide 964). None of the three pairs of bands on the submitted scan match the published β-actin bands under the "CS" and "NS" labels. The scan has no lanes labeled "CS and "NS". (The "CP" and "NP" lanes on the right side of Figure 3B do not match the lanes with those labels in the submitted scan either.)

CONCLUSION:

The Committee finds that the β-actin bands image in the "CS" and "NS" lanes of **Figure 3B** of **Reference #277** in **Allegation 89g** is a re-labeled and manipulated copy of lanes 2 and 3 from the β-actin bands image from a different experiment in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89h: (**Reference #278**) The 4-lane β-actin image was re-used and manipulated in Figure 4B (squeezed horizontal a lot). (**Note**: The original allegation had a typographical error which referred to Figure 4A, which contains no Western blot images.)

ANALYSIS:

See DIO4915 Image File H, slides 965-966.
Visual comparison shows that the β-actin loading control bands image in Figure 4B of Reference #278 is the same image as Figure 3C of Reference #284 that has been squeezed horizontally (DIO4915 Image File H, slide 965). In contrast to the time course with genistein in Figure 3C in Reference #284, the labels and caption for Figure 4B indicate an experiment where "VEGF expression was up-regulated by cDNA transfection and down-regulated by Notch-1 siRNA transfection... in transfected BxPC-3 cells" by treatments of: "CS, control siRNA; NS, Notch-1 siRNA; CP, control plasmid; NP, Notch-1 plasmid." The scan submitted in the Response (Wang-Response-1.pptx, slide 22) does not match the published image, has no date or any indication that this image corresponds to this specific experiment published in Figure 4B (DIO4915 Image File H, slide 966). Three lanes are labeled "CS" on the scan so it is unclear which is intended to be what was published. Regardless, none of the lanes in scan match the published β-actin bands.

CONCLUSION:

The Committee finds that the β-actin bands image in the "CS" and "NS" lanes of **Figure 4B** of **Reference #278** in **Allegation 89h** is a re-labeled and manipulated copy of the β-actin bands image from a different experiment in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 4B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89i: (**Reference #278**) The 4-lane β-Actin image was re-used and manipulated in Figure 5A (lanes 2&3, stretched slightly vertical).

ANALYSIS:

See DIO4915 Image File H, slides 967-968.
Visual analysis shows that the images of the β-actin bands in the two lanes in the left panel labeled "Control siRNA" and "MMP-9 siRNA" in Figure 5A of Reference #278 are the same image as lanes 2 and 3 labeled "24" and "48" in Figure 3C of Reference #284. The copied images are stretched slightly vertically to make them appear thicker (DIO4915 Image File H, slide 25). In contrast to the time course with genistein in Figure 3C in Reference #284, the labels and caption for Figure 5A indicate an experiment where "down-regulation of MMP-9 or VEGF by siRNA transfection showed low-expression of MMP-9 or VEGF protein in ICN-transfected BxPC-3 cells" by treatment with or "MMP-9 siRNA." The two scans submitted in the response (Wang-Response-1.pptx, slide 22) do not match the published images. The scans do not indicate a date or which bands are intended to represent the published β-actin lanes in Figure 5A. Three lanes are labeled "CS" and two "MS" (see Wang-Response-1.pptx, slide 22). Neither image matches the published β-actin bands (DIO4915 Image File H, slide 968).

CONCLUSION:

The Committee finds that the β-actin bands image in the two lanes in the left panel labeled "Control siRNA" and "MMP-9 siRNA" in **Figure 5A** of **Reference #278** in **Allegation 89i** is a re-labeled and manipulated copy of lanes 2 and 3 from the β-actin bands image from a different experiment in Figure 3C of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5A, and that this constitutes research

misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89j: (**Reference #284**) The 4-lane β-Actin image was re-used and manipulated in Figure 3C

RESPONSE:

In file "Wang-Response-1.pptx" (slide 22), Drs. Sarkar and Wang wrote: "Same experiments" and in "Wang-Response-2.docx" (p.4), that "It is the figure for allegation 89 (Ref 284)."

ANALYSIS:

See DIO4915 Image File H, slides 969-970 & 972.
As detailed above at the beginning of the section on Allegation 89, the β-actin bands in Figure 3C are the reference for other uses of this image (DIO4915 Image File H, slides 969 & 970). Reference #284 was submitted for publication first. It is consistent with the evidence and analyses this image was used repeatedly, usually after manipulation and re-labeling, as addressed in Allegations 89a, 89c, 89d, 89e, 89f, 89g, 89h, 89i, 89k, 89L and 89m. It is also possible that other versions of this image were copied directly, but that amounts to the same duplication. No evidence was presented to verify that this β-actin bands image published in Figure 3C is actually from that experiment.

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 3C** of **Reference #284** for **Allegation 89j** is the apparent source image of all the other specific allegations under Allegation 89. While it is possible that this apparently earliest published version of this manifestation of duplicated β-actin bands among Dr. Sarkar's publications that are under investigation may be the correct image for this paper, the Committee finds no evidence – and no original film scan was submitted – that the β-actin bands in Figure 3C are original loading control images for this experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3C, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89k: Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**) The 4-lane β-actin image was re-used and manipulated in Figure 6A (lanes 3 & 4 of Figure 3C).
(**Note**: The original allegation referred to lanes 2 & 3 of Figure 3C, flipped horizontal.)

RESPONSE:

In file "Wang-Response-1.pptx" (slide 22), Drs. Sarkar and Wang wrote: "Same experiments" and "Fig 6A and 6B are the same experiments" and in "Wang-Response-2.docx" (p.4), that it is the "same experiments in 89k and 89l."

ANALYSIS:

See DIO4915 Image File H, slides 971-975.
Visual comparison shows that the β-actin loading control bands image in Figure 6A of Reference #284 labeled "CS" and "NS" is the same image as lanes 3 and 4 of Figure 3C of Reference #284, squeezed horizontally and stretched vertically (DIO4915 Image File H, slides 971-973). In contrast to the time course with genistein in Figure 3C, where lanes 3 and 4 are labeled "48" and "72" hours, the caption for Figure 6A

indicates an experiment where BxPC-3 pancreatic cancer cells are treated with "Notch-1 siRNA" ("NS" column) or not ("CS" column). The scan submitted in "Wang-Response-1.pptx" (slide 22) does not match the published image. The scan does not indicate a date (DIO4915 Image File H, slide 974).

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 6A** of **Reference #284** labeled "CS" and "NS" is a manipulated copy of lanes 3 and 4 of Figure 3C of Reference #284, in **Allegation 89k**, representing two different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 6A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89L: (**Reference #284**) The 4-lane β-actin image was re-used and manipulated in **Figure 6B** (lanes 3 & 4 of Figure 3C, squeezed vertical, stretched horizontal, flipped horizontal). (Note: The original allegation referred to lanes 2 & 3 of Figure 3C, flipped horizontal.)

RESPONSE:

In file "Wang-Response-1.pptx" (slide 22), Drs. Sarkar and Wang wrote: "Same experiments" and "Fig 6A and 6B are the same experiments" and in "Wang-Response-2.docx" (p.4), that it is the "same experiments in 89k and 89l."

ANALYSIS:

See DIO4915 Image File H, slides 971, 975-976, 978.
Visual comparison shows that the β-actin loading control bands image in Figure 6B of Reference #284 labeled "CS" and "NS" is the same image as lanes 3 and 4 of Figure 3C of Reference #284, but flipped horizontal and squeezed vertical and altering their orientation (DIO4915 Image File H, slides 975-977). The same as in Allegation 89k with Figure 6A, in contrast to the time course with genistein in Figure 3C, where lanes 3 and 4 are labeled "48" and "72" hours, the caption for Figure 6B indicates an experiment where BxPC-3 pancreatic cancer cells are treated with "Notch-1 siRNA" ("NS" column) or not ("CS" column). While Drs. Sarkar and Wang write that Figures 6A and 6B are from the same experiments, the text indicates different experiments with the results in Figure 6A collected before those in Figure 6B. The text portrays a progression of separate studies determined by prior results but all presented together with one β-actin loading control image (see: text of Reference #284, pp.1932-1933). The scan submitted in "Wang-Response-1.pptx" (slide 22) does not match the published image. The scan does not indicate a date (DIO4915 Image File H, slide 977).

CONCLUSION:

The Committee finds that the β-actin bands image in **Figure 6B** of **Reference #284** labeled "CS" and "NS" is a manipulated copy of lanes 3 and 4 of Figure 3C of Reference #284, in **Allegation 89L**, representing two different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 8A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 89m: **APPLICATION: 1 R01 CA131456-01** File Name: 2007, 02 01 – Sarkar Proposal 07050620.pdf (PI: F.H. Sarkar) Figure 7 uses the same figures/images as Figure 6B from Wang, Z., et al., International J. Cancer **118,** 1930–1936 (2006e) (**Reference #284**; see Allegation **89L**) and Figure 7B from Wang, Z., et al., Molecular Cancer Ther 5(3):483–93 (2006c) (**Reference #277**; see Allegation **89f**)

RESPONSE:

In file "Wang-Response-2.docx" (p.4), that "89m, same as 89l and 89f."

ANALYSES:

See *ANALYSIS* sections for Allegation 89L and Allegation 89m above and in "DIO4915 Image File H" (slide 978).

CONCLUSION:

The Committee finds that the β-actin in **Figure 7** of **Grant Application 1 R01 CA131456-01** in **Allegation 89m** is identical to lanes 3 and 4 of the β-actin used in Figure 3C of Reference #284. The *ANALYSES* and *CONCLUSIONS* for Allegations 89k and 89L apply equally to Allegation 89m. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified results in Figure 7 of this Grant Application, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 90 **(i.e., 90a, 90b & 90c):**

Reference Image: A single 4-lane β-actin image (DIO4915 Image File H, slides 944, 981 & 982) was re-used and manipulated in the following figures. Manipulations described in the allegations below are relative to **Figure 3A** of Wang, Z., et al., *International J. Cancer* **118,** 1930–1936 (2006e) (**Reference #284***).* Thus each occurrence constitutes an allegation, while their label identification (90a, 90b, and 90c) indicates their connection to the β-actin image of Allegation 90). The labels and caption for Figure 3A of Reference #284 indicate a time course for "...inhibition of Notch-1 protein expression by [25 μM] genistein in BxPC-3 pancreatic cancer cells. The figures shown are representatives of 3 independent experiments..." Other uses are for different experimental designs and each re-use constitutes a separate allegation (i.e., 90a, 90b & 90c; DIO4915 Image File H, slide 982).

RESPONSE:

Dr. Sarkar wrote in "Wang-Response-1.pptx" (slide 23): "Same experiment" and an autoradiogram was submitted (slide 23).

Allegation 90a: **(Reference #272)** The 4-lane β-Actin image was re-used and manipulated in Figure 6A (flipped horizontal).

ANALYSIS:

See DIO4915 Image File H, slides 984-986.
Simple visual comparison shows that the β-actin loading control bands image in Figure 6A of Reference #272 is the same image as Figure 3A of Reference #284 that has been flipped horizontal which, for example, what was lane 1 in Figure 3A is lane 4 in Figure 6A, lane 2 is lane 3, etc. (DIO4915 Image File H,

slide 984). In contrast to the time course with 25 µM genistein in BxPC-3 cells in Figure 3A in Reference #284, the text, labels and caption for Figure 6A in Reference #272 indicate an experiment where "... intracellular Notch-1 was increased in Notch-1 cDNA-transfected BxPC-3 cells compared with control transfected cells" with lanes labeled "control, 2) control plus 10 µmol/L curcumin ... 3) Notch-1 cDNA, and 4) Notch-1 cDNA plus 10 µmol/L curcumin." The scan submitted in response does not match the published image (Wang-Response-1.pptx, slide 23) and is identical to the right panel submitted in response to Allegation 89d (above; DIO4915 Image File H, slides 985 & 986). There is no date on the scan and no indication that this scan corresponds to the specific experiment in Figure 6A.

CONCLUSION:

The Committee finds in **Allegation 90a** that the β-actin bands image in **Figure 6A** of **Reference #272** is a re-labeled and manipulated copy of Figure 3A of Reference #284, representing two very different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 6A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 90b: **(Reference #277)** The 4-lane β-Actin image was re-used and manipulated in Figure 7B (under Notch-1)

RESPONSE:

Dr. Sarkar wrote in "Wang-Response-1.pptx" (slide 23): "Same experiment" and an autoradiogram was submitted (slide 23).

ANALYSIS:

See DIO4915 Image File H, slide 987.
Visual comparison shows that the β-actin loading control bands image in Figure 7B of Reference #277 is the same image as Figure 3A of Reference #284 but the β-actin bands in Figure 7B have been squeezed vertically to appear thinner (DIO4915 Image File H, slide 987). In contrast to the time course with 25 µM genistein for Notch-1 expression in Figure 3A in Reference #284, Figure 7B in Reference #277 has four panels with different β-actin bands images. The response indicates that the duplication is because the two figures are the "same experiment" but neither figure is cited as being used in the other publication. No scan was submitted.

CONCLUSION:

The Committee finds in **Allegation 90b** that the β-actin bands image in **Figure 7B** of **Reference #277** is a manipulated copy of Figure 3A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 7B, and by plagiarizing findings by not citing Figure 7B of Reference #284, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 90c: **(Reference #284)** The 4-lane β-Actin image was re-used and manipulated in Figure 3A.

RESPONSE:

Dr. Sarkar wrote in "Wang-Response-1.pptx" (slide 23): "Same experiment" and an autoradiogram was submitted (slide 23).

ANALYSIS:

See DIO4915 Image File H, slide 988.
As detailed above at the beginning of the section on Allegation 90, the β-actin bands in Figure 3A in Reference #284 are the reference for other uses of this image (DIO4915 Image File H, slides 981, 982, 988). Reference #284 was submitted for publication first. It is consistent with the evidence and analyses this image was re-used, and after manipulation and/or re-labeling, as addressed in Allegations 90a and 90b. It is also possible that other versions of this image were copied directly, but that amounts to the same duplication. No evidence was presented to verify that this β-actin bands image published in Figure 3A is actually from that experiment. The response indicates that the duplication is because the two figures are the "same experiment" but neither figure is cited as being used in the other publication. No scan was submitted.

CONCLUSION:

The Committee finds in **Allegation 89j** that the β-actin bands image in **Figure 3A** of **Reference #284** is a possible source image addressed in Allegations 90a and 90b. While it is possible that this apparently earliest published version of this manifestation of duplicated β-actin bands, among Dr. Sarkar's publications that are under investigation, may be the correct image for this publication, the Committee finds no evidence – and no original was submitted – that the β-actin bands in Figure 3A are indeed original loading control images for this experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3A, and by plagiarizing findings by not citing Figure 3A of Reference #284, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

***Allegation 91* (i.e., 91a through 91g):**

Reference Image: A single 4-lane β-actin image (DIO4915 Image File H, slide 989) was re-used and manipulated in the following figures. Manipulations described in the allegations below are relative to Figure 5A of Wang, Z., et al., *International J. Cancer* 118, 1930–1936 (2006e), Paper 68 (**Reference #284**). Their label identification (91a, 91b, etc.) indicates their connection to the β-actin image of Allegation 91. The labels and caption for Figure 5A of Reference #284 indicate treatments with Notch-1 cDNA with or without combined 25 μM genistein in Notch-1 cDNA transfected BxPC-3 cells. The caption also states that the "results are expressed as percentage of control of Notch-1/β-actin" (p.1934). Other uses are for different experimental designs and each re-use constitutes a separate allegation (i.e., 91a, 91b, etc.). (Note: The original allegation had a typographical error which referred to Figure 3C.)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 24) that "we are providing original autoradiogram. All are correct and there are no errors" (DIO4915 Image File H, slide 48).

***Allegation 91a*: (Paper 3)** The β-actin image was re-used and manipulated in Figure 5C (squeezed horizontal).

ANALYSIS:

See DIO4915 Image File H, slides 991-992.
Visual comparison shows that the β-actin loading control bands image in Figure 5C of Paper 3 (Reference #262) is the same image as Figure 5A of Reference #284 which has been squeezed horizontal so that the lanes appear shorter (DIO4915 Image File H, slide 991). In contrast to treatments with Notch-1 cDNA with or without 25 μM genistein in Figure 5A in Reference #284, the text, labels and caption for Figure 5C indicate a different experiment with treatments with Notch-1 cDNA with or without 5 μg/mL ERRP. The scan submitted in response does not match the published β-actin bands image (DIO4915 Image File H, slide 992). There is no date on the scan and no indication that this scan corresponds to the specific experiment.

CONCLUSION:

The Committee finds in **Allegation 91a** that the β-actin bands image in **Figure 5C** of **Paper 3** is a manipulated and re-labeled copy of Figure 5A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5C, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

***Allegation 91b*: (Paper 19)** The β-actin image was re-used and manipulated in Figure 5B (lanes 1-4 of 6 lanes)

ANALYSIS:

See DIO4915 Image File H, slides 993-996.
Visual comparison shows that the lanes 1 to 4 of the β-actin loading control bands image in Figure 5B of Paper 19 (Reference #236) is the same image as Figure 5A of Reference #284 which has been squeezed horizontal and stretched vertical to appear longer and thinner (DIO4915 Image File H, slides 993-995). In contrast to treatments with Notch-1 cDNA with or without 25 μM genistein in BxPC-3 cells in Figure 5A in Reference #284, the text, labels and caption for Figure 5B indicate a different experiment with FoxM1 siRNA or not in BxPC-3 cells (lanes 1 & 2) and HPAC cells (lanes 3 & 4). The scan submitted in response does not match the published β-actin bands image (DIO4915 Image File H, slide 996). There is no date on the scan and no indication that this scan corresponds to the specific experiment.

CONCLUSION:

The Committee finds in **Allegation 91b** that the β-actin bands image in lanes 1 to 4 of **Figure 5B** of **Paper 19** is a manipulated and re-labeled copy of Figure 5A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

***Allegation 91c*: (Reference #277)** The β-actin image was re-used and manipulated in Figure 5 (lanes 1- 4 of 6 lanes)

ANALYSIS:

See DIO4915 Image File H, slides 997-998.
Visual comparison shows that the lanes 1 to 4 of the β-actin loading control bands image in Figure 5 of Reference #277 is the same image as Figure 5A of Reference #284 which has been squeezed horizontal and stretched vertical to appear longer and thinner (DIO4915 Image File H, slides 993-995). In contrast to treatments with Notch-1 cDNA with or without 25 μM genistein in BxPC-3 cells in Figure 5A in Reference #284, the text, labels and caption for Figure 5 indicate a different experiment with Notch-1 siRNA or not in BxPC-3 cells (lanes 1 & 2) and HPAC cells (lanes 3 & 4). In addition, the full 6-lane β-actin of Figure 5 is also the same 6-lane β-actin used in Figure 5B of Paper 19 which tested for FoxM1 siRNA, not Notch-1 siRNA. It is not clear if the 6-lane bands image is the source of the 4-lane image; it is possible that lanes 5 and 6 are pasted in. The scan submitted in response does not match the published β-actin bands image (DIO4915 Image File H, slide 998). There is no date on the scan and no indication that this scan corresponds to the specific experiment.

CONCLUSION:

The Committee finds in **Allegation 91c** that the β-actin bands image in lanes 1 to 4 of **Figure 5** of **Reference #277** is a manipulated and re-labeled copy of Figure 5A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 91d: **(Reference #278)** The β-actin image was re-used and manipulated in Figure 1C (β-actin under Notch-1, lanes 2&3 stretched horizontal).

Note: Figure 1C in Reference #278 also appears as Figure 9C in Grant Application 1 R01 CA131456-01 (File Name: 2007, 02 05 – Sarkar Proposal 07050620.pdf).

ANALYSIS:

See DIO4915 Image File H, slides 999-1001.
Visual analysis shows that the β-actin loading control bands image in Figure 1C of Reference #278 (Paper 65) is the same image as lanes 2 and 3 from the β-actin bands in Figure 5A of Reference #284 which has been squeezed horizontal and substantially on the vertical and thus appear longer and thinner (DIO4915 Image File H, slides 999-1000). In contrast to treatments with 25 μM genistein (lane 2) and Notch-1 cDNA (lane 3 in BxPC-3 cells in Figure 5A in Reference #284, the text, labels and caption for Figure 1C indicate a different experiment where the two lanes in Figure 1C represent control plasmid ("CP") and Notch-1 cDNA plasmid ("NP"), respectively. The scan submitted in response does not match the published β-actin bands image (DIO4915 Image File H, slide 1001). There is no date on the scan and no indication that this scan corresponds to the specific experiment.

CONCLUSION:

The Committee finds in **Allegation 91d** that the 2-lane β-actin bands image in **Figure 5** of **Reference #278** is a manipulated and re-labeled copy of lanes 2 and 3 of Figure 5A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 91e: **(Reference #278)** The β-actin image was re-used and manipulated in Figure 5A (β-actin under VEGF, lanes 2 & 3)

ANALYSIS:

See DIO4915 Image File H, slides 1002-1003.
Visual analysis shows that the β-actin loading control bands image in the VEGF panel (on right) of Figure 5A of Reference #278 is the same image as lanes 2 and 3 from the β-actin bands in Figure 5A of Reference #284 which has been squeezed horizontal and substantially on the vertical and thus appear longer and thinner (DIO4915 Image File H, slide 1002). In contrast to treatments with 25 μM genistein (lane 2) and Notch-1 cDNA (lane 3 in BxPC-3 cells in Figure 5A in Reference #284, the text, labels and caption for Figure 5A indicate a different tumor cell invasion experiment where the two lanes in Figure 5A represent control or VEGF siRNA transfection "in ICN-transfected BxPC-3 cells" respectively. The scan submitted in response does not match the published β-actin bands image (DIO4915 Image File H, slide 1003). There is no date on the scan and no indication that this scan corresponds to the specific experiment.

CONCLUSION:

The Committee finds in **Allegation 91e** that the 2-lane β-actin bands image in the VEGF panel of **Figure 5A** of **Reference #278** is a manipulated and re-labeled copy of lanes 2 and 3 of Figure 5A of Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 91f: **(Reference #280)** The β-actin image was re-used and manipulated in Figure 3B.

RESPONSE:

Dr. Banerjee testified that he contributed to and constructed Figures 3A, 3B, and 4 in Reference #280 (Banerjee Transcript, V.2, p.360, ll.9-15). He stated that the experiments for Dr. Wang's papers and the experiments for this publication were happening at the same time (Banerjee Transcript, V.2, p 369, ll.17 through p.370, ll.16). Dr. Banerjee testified that Dr. Wang had access to Dr. Banerjee's computer in 2004-2005 because Dr. Wang did not have a computer when he joined the lab and again in 2006 when Dr. Wang's computer crashed (Banerjee Transcript, V.2, p.370, l.17 through p.371, l.8).

ANALYSIS:

See DIO4915 Image File H, slides 1004-1005.
Simple visual comparison shows that the β-actin loading control bands image in Figure 3B of Reference #280 is the same image as Figure 5A of Reference #284 but the β-actin bands in Figure 3B have been squeezed vertically to appear thinner (DIO4915 Image File H, slide 1004 & 1005). In contrast to treatments of Notch-1 cDNA with or without 25 μM genistein in BxPC-3 cells in Figure 5A in Reference #284, the text, labels and caption for Figure 3B in Reference #280 represent a different experiment with a dose-response to genistein alone (0, 10, 25, and 50 μM). No scan of an original image was submitted.

CONCLUSION:

The Committee finds in **Allegation 91f** that the 4-lane β-actin bands image in **Figure 3B** in **Reference #280** is a manipulated and re-labeled copy of the same β-actin bands image in Figure 5A in Reference #284. By

a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 3B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 91g: **(Reference #284)** The β-actin image was re-used and manipulated in Figure 5A.

ANALYSIS:

See DIO4915 Image File H, slide 1006.
As detailed above at the beginning of the section on Allegation 91, the β-actin bands in Figure 5A in Reference #284 are the reference image for other uses of this image (DIO4915 Image File H, slides 991 & 1006). Visual analysis shows that the 4-lane version of this β-actin image, as well as lanes 2 and 3 alone, have been used and altered in other publications (Allegations 91a to 91f). Reference #284 was submitted for publication first. It is consistent with the evidence and analyses that this image was re-used, and after manipulation and/or re-labeling, as addressed in Allegations 91a through 91f. It is also possible that other versions of this image were copied directly, but that amounts to the same duplication. No evidence was presented to verify that this β-actin bands image published in Figure 5A is actually from that experiment. No scan was submitted.

CONCLUSION:

The Committee finds in **Allegation 91g** that the β-actin bands image in **Figure 5A** of **Reference #284** is a possible source for the image duplications addressed in Allegations 90a and 90b. While it is possible that this apparently earliest published version of this manifestation of duplicated β-actin bands, among Dr. Sarkar's publications that are under investigation, may be the correct image for this publication, the Committee finds no evidence – and no original data were submitted – that the β-actin bands in Figure 5A are indeed original loading control images for this experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 92 **(i.e., 92a, 92b & 92c):**

Reference Image: A single 6-lane β-actin image (DIO4915 Image File H, slides 1007-1008) was re-used in whole or in part, re-labeled and manipulated in the following figures. Manipulations described in the allegations below are relative to the lower panel of Figure 1D in Wang, Z., et al., *Molecular Cancer Ther* 5(3):483–493 (2006c) **(Reference #277)**. Their label identification (92a, 92b & 92c) indicates their connection to the reference β-actin image of Allegation 92. The labels and caption for Figure 1D of Reference #277 indicate treatments with Notch-1 cDNA transfection ("NP") or control ("CP") in BxPC-3, HPAC and PANC-1 cell lines. Other uses are for different experimental designs and each re-use constitutes a separate allegation (i.e., 92a, 92b & 92c).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 25) that "these are right, there are no errors" and "we found the duplicate autoradiograms for actin for IJC Figure 4A. There are no errors" (DIO4915 Image File H, slide 1008).

Allegation 92a: **(Reference #277)** The 6-lane β-actin image was re-used and manipulated in Figure 1D (lower panel).

ANALYSIS:

See DIO4915 Image File H, slide 1009.
The β-actin bands in Figure 1D in Reference #277 are the reference image for other uses of this image (DIO4915 Image File H, slides 1009 & 1011). Visual analysis shows that the 6-lane version of this β-actin image, as well as lanes 1 through 4 alone, were used and altered in Allegations 92b to 92c). The 6-lane version in References #277 was submitted for publication after the 4-lane version in Reference #284 (Allegation 92b) and the grant application (Allegation 92c) was submitted before both manuscripts. It is consistent with the evidence and analyses that this image was re-used, and after manipulation and/or re-labeling, in Allegations 92a, 92b and 92c. It is possible that other versions of this image were copied directly, but that amounts to the same duplication. No evidence was presented to verify that this β-actin bands image published in Figure 1D is actually from that experiment. No scan was submitted. Visual analysis shows that the 6-lane image was used in a grant application and lanes 1-4 of this β-actin in Figure 1D of Reference #277 (bottom group) was used another paper to support the results of other experiments using different cell lines, different proteins, and different amounts of proteins (Allegations 92b & 92c).

CONCLUSION:

The Committee finds in **Allegation 92a** that the β-actin bands image in **Figure 1D** of **Reference #277** is the same image duplicated and addressed in Allegations 90b and 90c. The Committee finds no evidence – and no original data were submitted – that the β-actin bands in Figure 5A are indeed original loading control images for this experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified data in Figure 1DA, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 92b: **(Reference #284)** The 6-lane β-actin image was re-used and manipulated in Figure 4A (using lanes 1-4)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 25) that "these are right, there are no errors" and "we found the duplicate autoradiograms for actin for IJC Figure 4A. There are no errors" (DIO4915 Image File H, slide 1008).

ANALYSIS:

See DIO4915 Image File H, slides 1009-1011.
Visual comparison shows that the β-actin loading control bands image in Figure 4A of Reference #284 is the same image as the β-actin bands in Figure 1D of Reference #277 but the β-actin bands in Figure 4A have been stretched horizontally appear longer (DIO4915 Image File H, slide 1010 & 1011). In contrast to treatments with Notch-1 cDNA transfection ("NP") or control ("CP") in BxPC-3 and HPAC cell lines in lanes 1 to 4 in Figure 1D in Reference #277, the text, labels and caption for Figure 4A in Reference #284 represent a different experiment with combinations of treatments of Notch-1 siRNA with or without 25 μM genistein in only BxPC-3 cells. The scan submitted in response does not match the published β-actin

bands image (DIO4915 Image File H, slide 1011). There is no date on the scan and no indication that this scan corresponds to the specific experiment published in Figure 4A.

CONCLUSION:

The Committee finds in **Allegation 92b** that the 4-lane β-actin bands image in **Figure 4A** of **Reference #284** is a manipulated and re-labeled copy of lanes 1 to 4 of Figure 1D of Reference #277 representing a different experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 4A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

***Allegation 92c*: APPLICATION: 1 R01 CA120008-01** (File Name: 2005, 05 20 – Sarkar Proposal 05083189.pdf)
The 6-lane β-actin image was re-used and manipulated in Figure 5 (squeezed horizontal)

ANALYSIS:

See DIO4915 Image File H, slides 1012-1013.
Visual comparison shows that the β-actin loading control bands image in Figure 5 of R01 CA120008-01 is the same image as in Figure 1D of Reference #277 but relatively squeezed horizontal and stretched vertical to make the lanes appear much shorter and thicker (DIO4915 Image File H, slide 1012-1013). In contrast to treatments with Notch-1 cDNA transfection ("NP") or control ("CP") in BxPC-3, HPAC and PANC-1 cell lines in Figure 1D in Reference #277, the caption for Figure 5 in R01 CA120008-01 represent a different experiment with various combinations of treatments of Notch-1 siRNA with or without 25 μmol/L genistein in only BxPC-3 cells.

CONCLUSION:

The Committee finds in **Allegation 92c** that the β-actin bands image in **Figure 5** of **R01 CA120008-01** is a manipulated and re-labeled duplication of the lower panel β-actin bands image in Figure 1D of Reference #277 representing a different experiment. While it is possible that this apparently earlier version of this manifestation of duplicated β-actin bands may be the correct image for the grant application, the Committee finds no evidence – and no original data were submitted – that the β-actin bands in Figure 5 are indeed original loading control images for this experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 5, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

***Allegation 93* (i.e., 93a to 93g):**

Reference Image: A single 6-lane β-actin image (DIO4915 Image File H, slide 1014) was re-used in whole or in part, re-labeled and manipulated in the following figures. Manipulations described in the allegations below are relative to the β-actin bands in the upper panel of Figure 1D in Wang, Z., et al., *Molecular Cancer Ther* 5(3):483–493 (2006c) (Reference #277*)*. Their label identification (93a, 93b, etc.) indicates their connection to the reference β-actin image of Allegation 93. The labels and caption for the upper panel of Figure 1D of Reference #277 indicate treatments with Notch-1 siRNA transfection ("NS") or control ("CS") in BxPC-3, HPAC and PANC-1 cell lines. Other uses are for different experimental designs and each re-use constitutes a separate allegation (i.e., 93a to 93g).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 26) that "We were unable to locate the original autoradiograms for actins. However, we found the duplicate autoradiograms from the same set of replicate experiments showing actin expression. Thus, no further action would be required" (DIO4915 Image File H, slide 1015).

Allegation 93a: **(Paper 3)** The 6-lane β-actin image was re-used and manipulated in Figure 2C (lanes 1-5)

ANALYSIS:

See DIO4915 Image File H, slides 1016-1018.
Visual comparison shows that the β-actin loading control bands image in Figure 2C of Paper 3 is the same image as the upper panel β-actin bands image in Figure 1D of Reference #277, but the β-actin bands in Figure 2C have been stretched horizontally appear longer (DIO4915 Image File H, slide 1015-1017). The allegation had stated that lanes 1 to 5 were duplicated but the analyses shows that all 6 lanes were copied. In contrast to treatments with Notch-1 siRNA transfection ("NS") or control ("CS") in BxPC-3, HPAC and PANC-1 cell lines in Figure 1D in Reference #277, the caption for Figure 2C in Paper 3 represents a different experiment without treatment "... (control) ["C"] and with recombinant ERRP (5 μg/mL) for 72 hours" ["T"]. The scan submitted in response (Wang-Response-1.pptx, slide 26) does not match the published β-actin bands image (DIO4915 Image File H, slide 1018). There is no date on the scan and no indication that this scan corresponds to the specific experiment published in Figure 2C.

CONCLUSION:

The Committee finds in **Allegation 93a** that the β-actin bands image of **Figure 2C** of **Paper 3** is a manipulated and re-labeled copy of in the upper panel Figure 1D of Reference #277 representing a different experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 2C, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 93b: **(Paper 3)** The 6-lane β-actin image was re-used and manipulated in Figure 2D (squeezed horizontal and darkened).

ANALYSIS:

See DIO4915 Image File H, slides 1016 & 1021.
Visual comparison shows that the 5-lane β-actin loading control bands image in Figure 2D of Paper 3 is the same image as lanes 1 through 5 of the upper panel β-actin bands image in Figure 1D of Reference #277, but the β-actin bands in Figure 2D have been squeezed horizontal and stretched vertical to appear shorter and much thicker (DIO4915 Image File H, slide 1019 & 1021). In contrast to treatments with Notch-1 siRNA transfection ("NS") or control ("CS") in BxPC-3, HPAC and PANC-1 cell lines in Figure 1D in Reference #277, the caption for Figure 2D in Paper 3 represent a different experiment "with the indicated concentrations of ERRP, Erbitux, or Herceptin before stimulation with 7 μmol/L TGF-α or 5 μmol/L HB-EGF..." Notch-1 expression was assessed after various combinations of TGF-α or HB-EGF, or TGF-α or HB-EGF plus ERRP or Erbitux or Herceptin. The caption to Figure 2D in Paper 3 also states that 3 cell lines are used as in Figure 1D, but neither the caption nor the text states which cell lines are represented in Figure 2D. The scan submitted in response (Wang-Response-1.pptx, slide 26) does not match the published β-

actin bands image (DIO4915 Image File H, slide 1020). There is no date on the scan and no indication that this scan corresponds to the specific experiment published in Figure 2C. Even the simple numbering of lanes on the submitted "duplicate autoradiogram" – 2 to 6 – does not match the published labels – 1 to 5.

CONCLUSION:

The Committee finds in **Allegation 93b** that the 5-lane β-actin bands image of **Figure 2D** of **Paper 3** is a manipulated and re-labeled copy of in the upper panel Figure 1D of Reference #277 representing a different experiment. Without clear information on which cell type(s) were used in Figure 2D, there is no way to judge the impact of this duplication on the conclusions of the publication. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 2D, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 93c: (**Paper 19**) The 6-lane β-actin image was re-used and manipulated in Figure 1D (upper panel; FoxM1 CS/PS line)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 26) that "93c and 93d are same experiments" (DIO4915 Image File H, slide 1022).

ANALYSIS:

See DIO4915 Image File H, slides 1022-1026.
Visual comparison shows that the β-actin loading control bands image in Figure 1D of Paper 19 is the same image as the upper panel β-actin bands image in Figure 1D of Reference #277, but the β-actin bands in Paper 19 have been stretched horizontally appear longer (DIO4915 Image File H, slide 1022). The allegation had stated that lanes 1 to 5 from Reference #277 Figure were duplicated but the analysis shows that all 6 lanes were copied into Paper 19. In contrast to treatments with Notch-1 siRNA transfection ("NS") or control ("CS") in BxPC-3, HPAC and PANC-1 cell lines in Figure 1D in Reference #277, the caption for Figure 1D in Paper 19 represents a different experiment with "FoxM1 expression in PC cell lines. *CS*, control siRNA; *FS*, FoxM1 siRNA; *CP*, control plasmid; *FP*, FoxM1 cDNA plasmid ... FoxM1 protein levels were down-regulated by siRNA and up-regulated by FoxM1 cDNA plasmid in three PC cells, respectively." The scan submitted in response (Wang-Response-1.pptx, slide 26) does not match the published β-actin bands image (DIO4915 Image File H, slide 1024). There is no date on the scan. The lane labels written on the scan correspond to the experiment published in Figure 1D in Paper 19 but there is no indication that this scan corresponds to the specific experiment. The same scan was submitted in response to Allegation 91b regarding β-actin bands in Figure 5B of Paper 19, as well as for Allegations 93c and 93d. It is not known which image(s) Dr. Sarkar meant were supposed to be the correct β-actin bands (DIO4915 Image File H, slides 990 & 1015), and neither set matched the published images in either Figures 1D or 5B of Paper 19.

CONCLUSION:

The Committee finds in **Allegation 93c** that the 6-lane β-actin bands image of **Figure 1D** of **Paper 19** is a manipulated and re-labeled copy of in the upper panel Figure 1D of Reference #277 representing a different experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1D, and that this constitutes research

misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 93d: **(Paper 19)** *The 6-lane β-actin image was re-used and manipulated in* Figure 4C.

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 26) that "93c and 93d are same experiments" (DIO4915 Image File H, slide 1027).

ANALYSIS:

See DIO4915 Image File H, slides 1027-1028.
As testified, the visual comparison shows that the β-actin loading control bands image in Figure 4C of Paper 19 is the same image as the upper panel β-actin bands image in Figure 1D of Paper 19, but the β-actin bands in Figure 4C are relatively darker (DIO4915 Image File H, slide 1027). The claim that they are the same experiment is inconsistent within the text since Figure 1C is presented in a section titled "Down-regulation of FoxM1 expression by siRNA inhibited cell growth" (p. 8295) whereas Figure 4C is in a section titled "Down-regulation of FoxM1 decreased cell population in the S phase" (p. 8296). Even if "93c and 93d are same experiments," the same analysis in Allegation 93c contrasting Figure 1D in Paper 19 to Figure 1D in Reference #277 applies to Allegation 93d (DIO4915 Image File H, slide 1027). The scan submitted in response (Wang-Response-1.pptx, slide 26) does not match the published β-actin bands image (DIO4915 Image File H, slide 1028). There is no date on the scan. The lane labels written on the scan correspond to the experiment published in Figure 1D in Paper 19 but there is no indication that this scan corresponds to the specific experiment.

CONCLUSION:

The Committee finds in **Allegation 93d** that the 6-lane β-actin bands image of **Figure 4C** of **Paper 19** is a manipulated and re-labeled copy of the upper panel in Figure 1D of Reference #277 representing a different experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 4C, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 93e: **(Reference #263)** The 6-lane β-Actin image was re-used and manipulated in Figure 1B (same as lanes 1-4, stretched).

ANALYSIS:

See DIO4915 Image File H, slides 1029-1031.
Visual comparison shows that the 4-lane β-actin loading control bands image in Figure 1B of Reference #263 is the same image as lanes 1 through 4 of the upper panel β-actin bands image in Figure 1D of Reference #277, but the β-actin bands in Figure 1B have been squeezed horizontal and stretched vertical to appear shorter and much thicker (DIO4915 Image File H, slides 1029 & 1030). In contrast to treatments with Notch-1 siRNA transfection ("NS") or control ("CS") in BxPC-3, HPAC and PANC-1 cell lines in Figure 1D in Reference #277, the caption for Figure 1B in Reference #263 represent a different experiment with four different cell lines – PC-3, DU145, LNCaP and C4-2B cells. (Note that the β-actin bands image in Figure 1B in Reference #263 also duplicates lanes 1-4 of the β-actin bands in Figure 2D in Paper 3, also with

different cell lines (see Allegation 93b). The scan submitted in response (Wang-Response-1.pptx, slide 26) does not match the published β-actin bands image (DIO4915 Image File H, slide 1031). There is no date on the scan. The lane labels written on the scan correspond to the experiment published in Figure 1B in Reference #263 but there is no indication that this scan corresponds to this specific experiment.

CONCLUSION:

The Committee finds in **Allegation 93e** that the 4-lane β-actin bands image of **Figure 1B** of **Reference #263** is a manipulated and re-labeled copy of lanes 1 to 4 in the upper panel in Figure 1D of Reference #277 and representing a different experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1B, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 93f: **(Reference #277)** The 6-lane β-Actin image was re-used and manipulated in Figure 1D (top)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 26) "Right figure for actin, no errors."

ANALYSIS:

See DIO4915 Image File H, slides 1029 & 1032.
As detailed above at the beginning of the section on Allegation 93, the β-actin bands in the upper panel of Figure 1D in Reference #277 are the reference image for other uses of this image (DIO4915 Image File H, slides 1014 & 1032). Visual analysis shows that the 6-lanes and lanes 1-4 and lanes 1-5 of this β-actin image in Figure 1D of Reference 277 are re-used and manipulated in other papers to support the results of other experiments using different cell lines, different proteins, and different amounts of proteins (Allegations 93a to 93e). It is consistent with the evidence and analyses that this image was re-used, and after manipulation and/or re-labeling, as addressed in Allegations 93a through 93e. It is also possible that other versions of this image were copied directly, but that amounts to the same duplication. No evidence was presented to verify that this β-actin bands image published in Figure 1D is actually from that experiment. No original scan was submitted.

CONCLUSION:

The Committee finds in **Allegation 93f** that the β-actin bands image in the upper panel of **Figure 1D** of **Reference #277** is a possible source for the image duplications addressed in Allegations 93a to 93e. While it is possible that this version of this manifestation of duplicated β-actin bands, among Dr. Sarkar's publications that are under investigation, may be the correct image for this publication, the Committee finds no evidence – and no original data were submitted – that the β-actin bands in Figure 1D are indeed original loading control images for this experiment. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1D, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103. By a preponderance of the evidence, the Committee also concludes that Dr. Sarkar plagiarized his prior findings by not citing Figure 1D of Reference #277 in its re-use, and that this is research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 93g: (**Paper 19**) The 6-lane β-actin image was re-used and manipulated in Figure 1B (using lanes 1-4).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 26) "we disagree."

ANALYSIS:

The allegation should have stated Figure 1A. Visual examination shows Figure 1A is not a duplication of the upper panel β-actin bands image in Figure 1D of Reference #277.

CONCLUSION:

The Committee agrees with Dr. Sarkar and Dr. Wang. There is no research misconduct in **Allegation 93g**.

Allegation 94 **(i.e., 94a to 94f)**:

Reference Image: A single 7-lane β-actin image (DIO4915 Image File H, slides 944, 1033 & 1035) was re-used in whole or in part, re-labeled and manipulated in the following figures. Manipulations described in the allegations below are relative to the β-actin bands in the upper panel of Figure 1A of Wang, Z., et al., *Cancer Res* 67: 8293-8300 (2007a) (**Paper 19**). Their label identification (94a, 94b, etc.) indicates their connection to this reference β-actin bands image of Allegation 94. The labels, text and caption for Figure 1A of Paper 19 indicate "...baseline expression of FoxM1 was determined in a panel of human PC cell lines that included AsPC-1, BxPC-3, COLO-357, HPAC, L3.6pl, MIAPaCa, and PANC-1" cells indicating "... FoxM1 was frequently but differentially expressed in different human PC [pancreatic] cell lines ..." (p.8295). Other uses are for different experimental designs and each re-use constitutes a separate allegation (i.e., 94a to 93f).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 27) that "We were unable to locate the original autoradiograms; however we found the duplicate autoradiograms from the same set of replicate experiments showing similar results. Because 94a, 94b, 94f are same experiments, we used the same actin" (DIO4915 Image File H, slide 1034).

Allegation 94a: (**Paper 19**) The 7-lane β-actin image was re-used and/or manipulated in Figure 1A (lane 1 is duplicated and flipped as lane 7; cut line between lanes 1 & 2).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 27) that "We disagree, should be the same."

ANALYSIS:

See DIO4915 Image File H, slides 1035-1037.
Visual comparison shows that the 7-lane β-actin loading control bands image in Figure 1A of Paper 19 is a composite constructed with a cut and pasted duplicate blot: the band in lane 7 (associated with PANC-1 cells) is copied and re-labeled into lane 1 (associated with As PC-1 cells). The allegation had stated that

the image in lane 1 was flipped but analysis shows it was not. The band in lane 7 matches the band in lane 1 exactly and there is a clear cut mark between lanes 1 and 2 (DIO4915 Image File H, slides 1035 & 1036). Figure 1A is the reference image for other duplications under Allegation 94. Though the response claims that "94a, 94b, 94f are same experiments" (i.e., Figures 1B, 2C & 1C of Paper 19), there is no justification given for using "... the same actin." The scan submitted in response (Wang-Response-1.pptx, slide 27) does not match the published β-actin bands image (DIO4915 Image File H, slide 1037). There is no information whatsoever on the scan image and no way to determine it is relevant to Figure 1A or Allegation 94a at all.

CONCLUSION:

The Committee finds in **Allegation 94a** that the 7-lane β-actin bands image of **Figure 1A** of **Paper 19** is a composite constructed by duplicating the band in lanes 1 and 7. As detailed below, this figure is re-used for other experiments in other publications. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 94b: (**Reference #231**) The 7-lane β-actin image was re-used and/or manipulated in Figure 2C (top: β-actin for PDGF-D; cut line between lanes 1 & 2)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 27) that "should be same."

ANALYSIS:

See DIO4915 Image File H, slides 1038-1040.
Visual comparison shows that the 7-lane β-actin loading control bands image in Figure 2C of Reference #231 is the same image as the β-actin bands image in Figure 1A of Paper 19, (DIO4915 Image File H, slide 1038). In contrast to treatments Figure 1A of Paper 19 representing "...baseline expression of FoxM1 ... [in] human PC cell lines that included AsPC-1, BxPC-3, COLO-357, HPAC, L3.6pl, MIAPaCa, and PANC-1" cells, Figure 2C of Reference #231 presents "...baseline expression of PDGF-D ... in a panel of human pancreatic cells." (p. 11379). There is no evidence that the PDGF-D and FoxM1 in Paper 19 were determined on the same Western blot. There is no citation between papers that the experiment was reported in the other.
Even so, the 7-lane β-actin loading control bands image in **Figure 2C** of **Reference #231** shows that same composite construction with the same clear cut mark between lanes 1 and 2 and the same duplication of the bands in lanes 7 and 1 demonstrated in Allegation 94a (DIO4915 Image File H, slide 1038). The scan submitted in response (Wang-Response-1.pptx, slide 27) does not match the published β-actin bands image (DIO4915 Image File H, slide 1039). It is the same image submitted for Allegation 94a. There is no information whatsoever on the scan image and no way to determine that both FoxM1 and PDGF-D were determined from the same Western as Figure 1A of Paper 19, as claimed, or that this scan is relevant to Figure 2C or Allegation 94b at all.

CONCLUSION:

The Committee finds in **Allegation 94b** that the 7-lane β-actin bands image of **Figure 2C** of **Reference #231** is the same composite, cut and pasted image as Figure 1A in Paper 19 where lanes 1 and 7 are copies of

the same band. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 2C, and of plagiarism by failing to cite the prior use of the image, and that in each instance this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 94c: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007b) **(Reference #231)** The 7-lane β-actin image was re-used and/or manipulated in Figure 2C (middle panel: lanes 1&2 flipped horizontal; lanes 4-8 widened horizontal and blurred).

Allegation 94d: Wang, Z., et al., Cancer Res **67**:11377-11385 (2007b) **(Reference #231)** The 7-lane β-actin image was re-used and/or manipulated in Figure 2C (lanes 3-6 switch to lanes 1-4; lanes 1 & 2 become lanes 5 & 6).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 27) regarding both Allegation 94c and 94d that they "Disagree."

ANALYSIS:

See DIO4915 Image File H, slide 1041.
Drs. Sarkar and Wang are correct. Allegations 94c and 94d stated that the 6-lanes of β-actin blots in the middle panel of Figure 2C in Reference #231 were re-arranged copies of the bands in lanes 2 to 7 in Figure 1A of Paper 19. Visual evaluation shows this is not so (DIO4915 Image File H, slide 1040). However, the analysis does show clearly that the blots in lanes 3 to 6 in the β-actin row in the middle panel of Figure 2C in Reference #231 are re-labeled copies of the blots in lanes 1 to 4 in the β-actin row in the bottom panel of Figure 2C in Reference #231 (DIO4915 Image File H, slide 1041). In contrast to the middle panel where alternate lanes are labeled "CS" for "control siRNA" and "PS" for "PDGF-D siRNA," alternate lanes in the bottom panel are labeled "CP" for "control plasmid" and "PP" for "PDGF-D cDNA plasmid." Also in contrast to the middle panel where the labels for lanes 3 and 4 and lanes 5 and 6 are "HPAC" and "Colo-357" cell lines, respectively, in the bottom panel the labels for the identical images in lanes 1 and 2 and lanes 3 and 4 are "BxPC-3" and "Colo-357" cell lines, respectively. The original source(s) of these images is not known.

CONCLUSION:

The Committee finds for **Allegation 94c and 94d** that the 6-lane β-actin bands in the middle panel of Figure 2C in Reference #231 were not copied from Figure 1A of Paper 19. However, the Committee finds that lanes 2 to 6 of the β-actin bands in the middle panel of **Figure 2C** in **Reference #231** are re-labeled copies of lanes 1 to 4 of the β-actin bands in the bottom panel of Figure 2C in Reference #231, representing different experiments. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 2C, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 94e: **(Reference #231)** The 7-lane β-actin image was re-used and/or manipulated in the upper panel in Figure 4A (same β-actin as 2C bottom).

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 27) that "should be the same as 2C middle."

ANALYSIS:

See DIO4915 Image File H, slides 1042-1043.
As for Allegation 94c, Allegations 94e refers not to duplication of reference image Figure 1A of Paper 19 but to the 6-lane β-actin blots in the bottom panel of Figure 2C in Reference #231 (DIO4915 Image File H, slide 1042). Simple visual comparison shows that the 6-lane β-actin bands image the upper panel of Figure 4A in Reference #231 is identical to the 6-lane β-actin bands image the bottom panel of Figure 2C in the Reference #231 (DIO4915 Image File H, slide 1043). In contrast to the bottom panel in Figure 2C where alternate lanes are labeled "CP" for "control plasmid" and "PP" for "PDGF-D cDNA plasmid," alternate lanes in the upper panel of Figure 4A lanes are labeled "CS" for "control siRNA" and "PS" for "PDGF-D siRNA." Also in contrast to the bottom panel of Figure 2C where the labels for the 3 pairs of lanes are "BxPC-3" and "Colo-357" and "MiaPaCa" cell lines, the cells lines in Figure 4A are "BxPC-3" and "HPAC" and "Colo-357" cell lines, respectively, describing a different experiment. In contrast to text reporting the purpose of the bottom panel of Figure 2C "was to investigate the "overexpression of PDGF-D by cDNA transfection promoted cell growth and inhibited apoptosis" (pp. 11379-11380)," the text reported that the purpose of the upper panel of Figure 4A was to investigate "whether Notch-1 was down-regulated by PDGF-D siRNA in pancreatic cancer cell lines."
In contrast to the response that states the β-actin bands in the upper panel of Figure 4A in Reference #231 "should be the same as 2C middle," this is not the case: the bottom panel of Figure 2C, a manipulated copy of the middle panel (see Allegation 94c), is the same. Further, the text states that the purpose of the middle panel of Figure 2C is to investigate "down-regulation of PDGF-D expression by siRNA inhibited cell growth and induced apoptosis" (p. 11379), so this also conflicts with the purpose of the upper panel of Figure 4A noted above.

CONCLUSION:

The Committee finds for **Allegation 94e** that the 6-lane β-actin bands in the upper panel of **Figure 4A** in **Reference #231** are re-labeled copies of the 6-lane β-actin bands in the bottom panel of Figure 2C in Reference #231. The Committee also finds that the response submitted by Drs. Sarkar and Wang is wrong, indicating they do not know where the β-actin bands images come from and casting additional doubt on the verity of the data in these figures. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in the upper panel of Figure 4A, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 94f: (**Paper 32**) The 7-lane β-actin image was re-used and/or manipulated in Figure 1C (β-actin for Bcl-2; lane 1 is lane 7)

RESPONSE:

Dr. Sarkar and Dr. Wang wrote in "Wang-Response-1.pptx" (slide 27) that "should be same."

ANALYSIS:

See DIO4915 Image File H, slides 1044-1045.
Visual comparison shows that the 7-lane β-actin loading control bands image in Figure 1C of Paper 32 is the same image as the β-actin bands image in Figure 1A of Paper 19 (DIO4915 Image File H, slide 1044). In contrast to treatments Figure 1A of Paper 19 representing "...baseline expression of FoxM1 ... [in] human PC cell lines that included AsPC-1, BxPC-3, COLO-357, HPAC, L3.6pl, MIAPaCa, and PANC-1" cells, Figure 1C of Paper 32 presents "...baseline expression of Bcl-2 ... in a panel of human pancreatic cells." (p. 11379). There is no evidence that Bcl-2 in Paper 32 (or PDGF-D from Allegation 94b) and FoxM1 in Paper 19 were all determined on the same Western blot. There is no citation between papers that the experiment was reported in the other. Even so, the 7-lane β-actin loading control bands image in Figure 1C of Paper 32 shows that same composite construction with the same clear cut mark between lanes 1 and 2 and the same duplication of the bands in lanes 7 and 1 demonstrated in Allegation 94a and 94b (see DIO4915 Image File H, slides 1035 & 1036).

The scan submitted in response (Wang-Response-1.pptx, slide 27) does not match the published β-actin bands image (DIO4915 Image File H, slide 1045). It is the same image submitted for Allegations 94a and 94b. There is no information whatsoever on the scan image and no way to determine that both FoxM1 and Bcl-2 (and PDGF-D from Allegation 94b) were determined from the same Western as Figure 1A of Paper 19, as claimed, or that this scan is relevant to Figure 1C or Allegation 94f at all.

CONCLUSION:

The Committee finds in **Allegation 94f** that the 7-lane β-actin bands image of **Figure 1C** of **Paper 32** is the same composite, cut and pasted image as Figure 1A in Paper 19 where lanes 1 and 7 are copies of the same band, and that **Figure 6D** is a re-labeled copy of lanes 3 to 6 of Figure 1A from Paper 19. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly published fabricated and/or falsified results in Figure 1C and Figure 6D in Paper 32, and that in each instance this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

General CONCLUSION about β-actin control bands:

The Committee's general conclusion about the functional disregard that Dr. Sarkar, Dr. Wang, Dr. Banerjee and other lab members have for loading controls like β-actin is detailed under the section on Rb bands duplication (above). β-actin (and Rb) bands are deemed insignificant or irrelevant compared to "actual data" or "real data," and are used interchangeably within and across figures and experimental conditions. The Committee finds that this disregard contributes, in part, to the careless, lax and inaccurate recordkeeping, particularly by Dr. Wang and Dr. Banerjee in these instances, and to a effectively arbitrary selection of elements used to construct control band images for published figures.

Similarly to the duplication of Rb bands, the Committee finds it is extraordinarily unlikely that Dr. Sarkar could not have known about so pervasive a re-use and manipulation and re-labeling of β-actin bands images in his publications and grant applications. The Committee concludes by a preponderance of the evidence that Dr. Sarkar did know and recklessly participated in and permitted and enabled β-actin bands to be copied and re-used. **Dr. Sarkar's responsibility is explicit in each of the many substantiated allegations involving duplicated β-actin bands because he recklessly caused and/or enabled this falsification and fabrication to occur systematically in his publications and grant applications for years, and it is on this basis the Committee concludes that Dr. Sarkar committed research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.**

NIH Grant Applications and Progress Reports

Several allegations from NIH Grant Applications and Progress Reports are addressed in this section although there are other instances of grants addressed elsewhere in this report.
There is also one patent application.

General RESPONSE:

Dr. Sarkar testified regarding grants (Sarkar Transcript, V.1, p.60, ll.11 to p.115, ll.19; V.2, p.292, ll.9 to p.491, ll.25) that he no longer ("until a few years ago") verified experiments because his "main thing spent in writing grants. That is the major thing which takes 80% of my time is spent in writing grants" and that the data for the grants and papers "is being generated by the other scientists in the lab" (Sarkar Transcript, V.1, p.60, ll.11 to p.61, ll.9). Dr. Sarkar testified that when given a composite figure for a manuscript or grant, he does not compare the raw data of the films/gels to the figure (Sarkar Transcript, V.1, p.102, ll.8-22). He also mentioned that "over the past many years I had the professional grant writer who has been editing my grants and suggesting" (Sarkar Transcript, V.1, p.115, ll.16-19). He stated that the people in his lab are listed as key personnel in grants, not as PI's or co-investigators (Sarkar Transcript, V.1, p.75, ll.19 to p.76, ll.17). As testified by several people in the lab (e.g., Li Transcript, V.1, p.43, ll.15-18; Banerjee Transcript, V.1, p.161, ll.5-10; V.1, p.165, ll.14-15), Dr. Sarkar writes the grants himself though lab members contribute figures and may assist in writing sections.

Dr. Sarkar testified that, upon reflection, one of his mistakes was his "scientific thirst for knowledge" that was the driving force behind his many grant submissions (Sarkar Transcript, V.2, p.292, ll.9-23). Dr. Sarkar testified that "...the second mistake which I have done is that in order to accomplish a lot of activities and keeping myself busy with multiple grants, writing and submitting grants..." in all three funding cycles every year for "... the last ten, fifteen years, there was not a single cycle when I never--I did not submit any grant. Every cycle I submitted grants" (Sarkar Transcript, V.2, p.292, ll.12-19). Asked if getting more grants was a reason for manipulating figures, Dr. Sarkar said there was no reason for him to do so (Sarkar Transcript, V.2, pp.300-301). He agreed that "being the PI on a grant that supports the work make you responsible for the contents of that paper" and "data which has been used for my manuscripts, that goes in the grant, that means I am responsible for it" (Sarkar Transcript, V.2, p.322, ll.15-18).

Dr. Sarkar defended the co-authors and collaborators on papers (Sarkar Transcript, V.2, p.325, ll.22 to p.328, ll.8), and said that the grounds for listing someone as a co-author "varies. You cannot cut one cloth for every individual ... these are circumstance-driven..." (Sarkar Transcript, V.2, p.327, ll.3-12). Dr. Sarkar testified that "any kind of contribution" can earn co-authorship (Sarkar Transcript, V.1, p.91, ll.19-20), including giving authorships to show collaborations needed for grants: "... the last part, which is critically important, for an institution to write program project grants ... investigators has to have a proven track record of publishing together for P01. If they are not publishing together, then those PIs cannot submit program project grants. So we have to foresee the future and work towards it ... , I put the name of the co-author so that we can build our portfolio towards the objectives of the program project grant" (Sarkar Transcript, V.1, p.91, ll.25 to p.92, ll.14). He was asked about how he determines co-authors on his papers (Sarkar Transcript, V.2, p.323, l.17 to p.324, l.12), and when the term "ghost authorship" was defined (Sarkar Transcript, V.2, p.324, ll.13-23), he said "the collaboration do exist. In all my cases, wherever I am an author, the collaboration does exist" (Sarkar Transcript, V.2, p.323, l.17 to p.324, l.12).

When asked if he knew "that when you receive an NIH grant that you are signing a form that requires data management and recordkeeping," Dr. Sarkar answered, "Yes. I'm aware of it, and I tried to do the best that I could, but not routinely looking through their notebooks or looking through their data on a daily

basis." When shown a composite figure by members of his lab, he testified "then I trust that figure" (Sarkar Transcript, V.2, p.491, ll.11-25).

Application 1R01CA120008-01 (File Name: 2005, 05 20 – Sarkar Proposal 05083189.pdf) Targeting notch signaling for pancreatic cancer therapy (Submitted: 05/20/2005)

Allegation 95: Figure 3 in the application appears to be made of the same image as in Figure 7B from **Reference #277**. However, the band labeled Jagged-1 in the NIH grant application (Figure 3C) is labeled Cyclin D1 in Figure 7B of Reference #277. This re-use of the same image with a different label is falsification of data.

ANALYSIS:

See DIO4915 Image File I, slides 1049-1050.
A visual analysis shows that the three panels of Figure 3 (labeled A, B, and C) in grant 2005, 05 20 – Sarkar Proposal 05083189 are composed of three of the panels in Figure 7B of Reference #277. However, the image in the top band in Figure 3C panel is labeled Jagged-1 while in Figure 7B it is labeled Cyclin D1. Additionally, this image is labeled Hes-1 in Figure 3C in Reference #284 (DIO4915 Image File I, slide 1050).

CONCLUSION:

The Committee finds, in **Allegation 95**, that the image used in Figure 3C in grant 2005, 05 20 – Sarkar Proposal 05083189 is a re-labeled duplication of the bands labeled Cyclin D1 in Figure 7B of Reference #277 and labeled Hes-1 in Figure 3C in Reference #284. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 3C to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

For Application **1 R01 CA120008-01**, see also:

Allegation 81f: Figure 5 (upper group)
Allegation 81g: Figure 5 (lower group)
Allegation 92c: Figure 5A, 6-lane β-actin band

Application R01 CA131151-011 (File: 2007, 02 01 – Sarkar Proposal 14114-001.pdf): A novel and targeted approach to inhibit invasion and angiogenesis (Submitted: 02/01/2007)

Allegation 97: In Figure 14B (page 50), the DMSO control and 10 μM B-DIM images are the same image cropped differently. Note identical pattern of spots in top right quadrant of the DMSO control panel and the center left region of the 10 μM B-DIM panel. This duplicate use of the same image with different labels is falsification of data.
Note: See also **Allegation 3** where these duplicated images are used in Paper 2.

ANALYSIS:

See DIO4915 Image File I, slide 1052.

See the *ANALYSIS* section of Allegation 3. In this instance, the same image has been used for both a control as well as the 10 μM B-DIM treatment condition, but cropped in a way to make the image appear to have fewer cells (DIO4915 Image File I, slide 1052).

CONCLUSION:

The Committee finds, in **Allegation 97**, that in this grant application this is another instance of the image duplication and re-labeling in Figure 14B that was addressed in Allegation 3 regarding Paper 2. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 14B to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 98: In Figure 18 (page 53), there is blurring/masking over of lane 1 of the lower PARP band; and pasting in over lane 4 (B-DIM+Er) of the EGFR band. These manipulations indicate fabrication and/or falsification of data." Figure 18 in the NIH grant application is the same figure as the left half of Figure 3 in Allegation 59 from **Reference #217**.

ANALYSIS:

See DIO4915 Image File I, slide 1053.
Dr. Sarkar provided no response regarding Allegation 98. See the *ANALYSIS* and *CONCLUSION* sections of Allegation 59 where the fabrication and/or falsification in Figure 18 was demonstrated when it was published as the BxPC-3 panel in Figure 3 in Reference #217. The allegation regarding R01 CA131151-011 of masking the image in lane 1 of the PARP experiment shown in this figure was investigated and was substantiated under Allegation 59. The visual artifacts observed in this image could have resulted from either intentional masking or from normal replication and processing of the images. Original data for this experiment was not produced by Dr. Sarkar, nor was it identified by the Investigation Committee. Poor record keeping made it impossible to validate this particular experiment which highlights significant issues associated with data management and the inability to adhere to standards for laboratory notebooks and record keeping.

CONCLUSION:

The Committee finds that there was masking of lane 1 in the PARP band and pasting over of lane 4 in Figure 3C in grant 2005, 05 20 – Sarkar Proposal 05083189. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 3C to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

For Application **R01 CA131151-011**, see also:

Allegation 4:
Allegation 83r: Rb image was re-used Figure 3 (page 48)

Application 1 R01 CA131456-01 (File: 2007, 02 05 – Sarkar Proposal 07050620.pdf) Chemoprevention of pancreatic tumor progression (Submitted: 02/05/2007)

For Application **R01 CA131151-011**, see:

Allegation 80g:
Allegation 81e:
Allegation 83s: Rb image was re-used Figures 3A and 3B
Allegation 83t: Rb image was re-used Figure 4E (stretched)
Allegation 83u: Rb image was re-used Figure 5C (stretched)
Allegation 83v: Rb image was re-used Figure 6D
Allegation 84d: The 4-lane Rb image and/or flipped 3-lane versions, with just the 3 left lanes of the 4-lane image were re-used (and manipulated) in Figure 3C
Allegation 86j: *The 2-lane Rb image was re-used (and manipulated) in* Figure 3D (flipped horizontal, stretched)
Allegation 89m: Figure 7 uses the same figures/images as Figure 6B from Reference #284 (see Allegation 89L) and Figure 7B Reference #277

PROGRESS REPORT 5R01CA101870-5 (File: 2007, 03 22 - Sarkar Proposal 07060904.pdf) Targeting Akt/NF-kappa beta for pancreatic cancer therapy (Submitted 03/22/2007).

Allegation 99: In Figure 1 (top panel, p.7), several lanes appear to be blurred out or masked with an overlay, specifically for the "Bcl-2" band (lanes 1, 3 & 4); Her-2-neu" (lane 4); COX-2 (lanes 1 & 3); EGFR (lanes 3 & 4); and PhosphoAKT (lane 2). These manipulations indicate data falsification or fabrication. Also, the β-actin band is spliced together between lanes 1 & 2, 2 & 3 and 4 & 5). These splices are not seen in the other bands indicating the controls were not from same blots and so is fabrication."

RESPONSE:

There was no specific response regarding Allegation 99, although Dr. Sarkar's general response was that he inserted published figures into progress reports.

ANALYSIS:

See DIO4915 Image File I, slide 1056.
The six-lane Figure 1 in this progress report is identical to the seven-lane Figure 2A of Reference #258 except that lane 5 in the published version depicting COlo-357 cells is excised and missing in ths later progess report. The *ANALYSES* of Allegation 70 regarding the Bcl-2, Her-2 Neur, Cox-2, EGFR and PhosphoAkt bands in Figure 2A of Reference #258 (DIO4915 Image File D, slides 616-625) pertain to Allegation 99 as well (DIO4915 Image File I, 1056) and demonstrate the substantiated fabrication and/or falsification in the bands in Figure 1. The additional cutting out of what was lane 5 (COLO-357 cells) in Figure 5 of Reference #258 and splicing together lanes 4 and 6 to create Figure 1 is unexplained. There is no explanation why the same figure published in November, 2006 was not used in the progress report in May, 2006, especially when a pdf of Reference #258 as published, including the 7-lane version of the figure, is appended to the progess report.

CONCLUSION:

The Committee finds, in **Allegation 99**, that Figure 1 was falsified and/or fabricated as in Allegation 70, as well as by cutting out lane 5 and splicing the remaining lanes together without comment. The Committee concludes that Dr. Sarkar recklessly submitted the fabricated and/or falsified data in **Figure 1** to NIH and

that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 100: Figure 5 in Progress Report 5R01CA101870-5 is almost the same as Figure 5 in Allegations 71a, 71b & 71c (Reference #258), with all the same concerns listed in those 3 allegations. The β-actin bands in Figure 5E in progress report differ from the publication, Reference #258.

RESPONSE:

Dr. Sarkar submitted responses to Allegation 71a, 71b and 71c (above). Regarding Allegation 100 for the progress report, he wrote: "... the use of different actin bands in figure 5E in progress report than in published paper is from duplicate blot. While creating the scans for progress report we might have used the other duplicate actin autoradiogram. The duplicate actin autoradiogram is scanned below. The overall conclusion remains same" (Shadan-Response.docx, p.20). A scan was submitted labeled as "MiaPaCa B-actin" and dated 6/24/05.

ANALYSIS:

See DIO4915 Image File I, slides 1057-1060.
The *ANALYSIS* sections of Allegations 71a and 71b for Figures 5A, 5C and 5E in Reference #258 is relevant to Allegation 100 because the BxPC-3 panel from Reference #258 is duplicated as Figure 5 in the progress report. The Committee determined that the BxPC-3 panel has gray boxes in the EGFR and EGFR-p-Try rows pasted in or largely blurred or masked. In addition, a visual comparison shows that the β-actin bands in Figure 5E of the progress report are different from the β-actin bands published in Figure 5E of Reference #258. Reference#258 was published November 1, 2006, 7 months before Dr. Sarkar submitted the progress report on May 22, 2007. There is no explaination for why the progress report would have different loading control bands than in the publication which is credited in the progress report as "Citation ID 2" (p.2). The "original" scan submitted by Dr. Sarkar matches the β-actin bands in the progress report, although there is no explanation for why Dr. Sarkar had two sets of loading control images for the same experiment. Dr. Sarkar's guess that a duplicate was used does not address why only the one β-actin row is different or why the version published earlier in Reference #258 was not used in the progress report. The evidence suggests that the figure used in the progress report was an original version and that the published version had been manipulated to alter the loading control bands in Figure 5E. Finally, Reference #258 is appended to the progress report (pp.14-25) so that all of the substantiated instances of fabrication and/or falsification found in Figure 2A (see Allegation 70) and Figure 5 (see Allegations 71a & 71b) were also submitted by Dr. Sarkar to NIH, together with the conflicting images elsewhere in the progress report and addressed here in Allegation 100.

CONCLUSION:

The Committee concludes, in **Allegation 100**, that **Figure 5** in progress report "2007, 03 22 - Sarkar Proposal 07060904.pdf" has all of the substantiated instances of fabrication and/or falsification demonstrated in Figures 5A, 5C and 5E in Allegations 71a and 71b in Reference #258. The Committee also finds that the β-actin bands in the progress report and in Reference #258 are different but Dr. Sarkar offer no explanation and the Committee did not determine which bands, if any, are the authentic loading controls. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 5 to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 101: The survivin bands in Figures 5C and 5E in Progress Report 5R01CA101870-5 may be the same with different exposures and rotated 180° horizontally. The PhosphoAkt (Figure 5A, column 4) appear to be different (different images and/or cropped differently) from Reference #258.

RESPONSE:

Dr. Sarkar wrote that the allegation was confusing and responded that "the survivin in figure 5c in paper #258 is same as in Progress report. The survivin in figure 5C is different than in figure 5E as can be seen from original autoradiograms which are scanned. The phosphoAkt in paper #258 and progress report are same, may be cropped differently" (Shadan-Response.docx, p.20). Two scans were submitted by Ms. Ali, one labeled "phosphate BxPC3" (dated 3/29/05) and another labeled both "survivin HPAC" and "survivin MiaPaCa" (with no date). Dr. Sarkar wrote that the two figures were "cropped differently" and "the Rb bands in the published manuscript are from the same autoradiogram as in progress report" (Shadan-Response.docx, p.20).

ANALYSIS:

See DIO4915 Image File I, slides 1061-1068.
Visual comparison of the survivin bands in Figures 5C and 5E shows that Dr. Sarkar is correct that they are not the same image as alleged (DIO4915 Image File I, slide 1062). Submitted scans appear to be the source images for the survivin bands in both the published article and the progress report.
Other bands differ between the figures in Reference #258 and in the progress report. The scan labeled for the phosphoAkt bands matches the progress report but not the bands in Reference #258, although Ms. Ali claimed that "phosphoAkt in paper #258 and progress report are same" (DIO4915 Image File I, slide 1064). Also, the Rb bands in Figures 5B, 5D and 5F in the progress report are clearly different from Rb bands published in Figure 5 in Reference #258 (DIO4915 Image File I, slide 1065). The Rb bands in the submitted scans match the bands in the progress report but not the publication. There is no explanation for why the bands in the May 2007 progress report were changed from what had been published in November, 2006 (DIO4915 Image File I, slides 1061-1068). The confusion about matching Rb bands to their respective experiments at least reflects the poor recordkeeping in Dr. Sarkar's lab and casted doubt on the authenticity of the scans submitted and of the data in both the publication and the progress report.

CONCLUSION:

The Committee concludes that the Rb bands in Figures 5B, 5D and 5F in progress report 5R01CA101870-5 are different from the Rb bands in Figures 5B, 5D and 5F of Reference #258, but the EMSA assays appear to be the same. The "original" scans submitted by Dr. Wang for the Rb bands in Allegation 71c did not mention Allegation 100, however, those scans match better than the Rb bands in Allegation 71. Clearly what Dr. Sarkar submitted as Figure 5 in the progress report body was altered from what was published and from what was submitted in Reference #258 in the appendix of the same progress report. The Committee cannot determine if this is a mistake, or a knowing or intentional or reckless misrepresentation since it is unclear what the impact using different control bands is on the interpretation of the results. The Committee finds insufficient evidence that these manipulation constitute research misconduct by Dr. Sarkar. The falsified and/or fabricated data in Reference #258 is addressed elsewhere. There is insufficient evidence that there was research misconduct involving these specific survivin, phosphoAkt and Rb bands in Figure 5 in the progress report.

The Committee finds, however, that the unanswered questions about which bands were included in Figure 5 in the progress report and in Reference #258, and which bands should have been used, reflects at

least confusion by Dr. Sarkar, perhaps poor records keeping, but more likely the disregard for control data, and serves as further evidence for the arbitrary use of control bands in Dr. Sarkar's laboratory.

Allegation 102: In Figure 8 in progress report 5R01CA101870-5, the Akt band in the bottom right appears to be the same image used in the β-actin bands at the top left (rotated 180° clockwise) and the top right (flipped horizontally). These duplications, manipulations and re-labeling indicate data fabrication and/or falsification.

RESPONSE:

Dr. Sarkar submitted that "the actin blot for the above 2 images are same being obtained from same cell extract and equally loaded for to perform western immunobloting. The total Akt representation was a inadvertent error made while composing the fig. We have earlier submitted the corrected fig to the committee and to Journal office" (Banerjee-Response.pptx, slide 7).

ANALYSIS:

See DIO4915 Image File I, slides 1069-1072.
A visual comparison confirms the β-actin band in the top left panel has been flipped vertical, stretched vertical, enlarged, and squeezed horizontal to produce lanes 1 and 2 of the β-actin band in the top right panel of progress report 5R01CA101870-5, and the β-actin band in the top left panel, besides these alterations, has been flipped horizontal to produce lanes 3 and 4 of the β-actin band in the top right panel. These are presented as different experiments. A visual analysis confirms that the β-actin band in the top right panel has been flipped horizontal and re-used and re-labeled as the Akt lane in the lower right panel. The same image is presented as different proteins and different experiments. Dr. Sarkar writes this is an error made when assembling the figure (DIO4915 Image File I, slides 1069-1072). The rearrangement of lanes of one β-actin row to construct another β-actin and the manipulations required to produce the so-called Akt band indicate deliberate re-use and re-labeling of bands and cast doubt on the results of these experiments.

CONCLUSION:

The Committee concludes, in **Allegation 102**, that the β-actin bands in the top left panel has been significantly altered to produce the β-actin bands in the top right panel, and that the β-actin band in the top right panel was flipped horizontal and re-labeled as Akt bands in the lower right panel. These three panels represent different experiments and/or proteins and therefore cannot validly share the same loading control bands. The analysis indicates a deliberate rearrangement of lanes and therefore not an "inadvertent error." By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly misrepresented the results by submitting falsified and/or fabricated data in Figure 8 in his progress report to NIH and that this constitutes research misconduct, as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

For **progress report 5R01CA101870-5,** see also:
Figure 3: see ***Allegation 17***
Figure 7: see ***Allegation 11***
Figure 15: see ***Allegations 3 & 97,*** 2007, 10 31 - Sarkar Proposal 08010127: Figure 14

PROGRESS REPORT 5R01CA131151-2 (File: 2009, 04 10 - Sarkar Proposal 09071199.pdf) A novel and targeted approach to inhibit invasion and angiogenesis (Submitted 04/16/2009).

Allegation 103: In Figure 1, certain lanes are blurred or masked with an overlay. Specifically, the EGFR band (lane 5), Bcl-2 band (lane 7), and Mcl-1 band (lane 7). These manipulations indicate falsification (DIO4915 Image File I, slide 1074).

RESPONSE:

Dr. Sarkar submitted in response that "... the encircled proteins are reportedly absent in representative cell lines ... the absence of EGFR, Bcl-2 and Mcl-1 proteins as depicted ... is very well known in literature and reproducible results have consistently been shown by multiple researchers in my lab and elsewhere ... hence no question of masking or blurring of the figure/pictures. No further action would be required" (Banerjee-Response.pptx, slide 8; DIO4915 Image File I, slide 1075).

ANALYSIS:

See DIO4915 Image File I, slides 1074-1079.
A visual examination of Figure 1 in progress report 5R01CA131151-2 finds insufficient evidence that that the L3.6 cell blot (lane 5) in the EGFR bands has been smudged or erased (DIO4915 Image File I, slide 1076). A close examination finds clear edges and masking on the PANC-1 cell blot (lane 7) in the Mcl-1 bands (DIO4915 Image File I, slide 1076), and evidence of smudging or erasing or pasting into the PANC-1 cell blot (lane 7) of the Bcl-2 bands. The same Bcl-2 band at a darker exposure appears in Figure 1C of Paper 32. When this version of the Bcl-2 bands is enlarged, the masking and cut-and-paste of lane 7 is more clearly apparent (DIO4915 Image File I, slides 1077-1078). Also, the β-actin bands in Figure 1 are the same image that appears in Allegations 94a (Figure 1A of Paper 19), 94b (Figure 2A of Reference #231), and 94f (Figure 1C of Paper 32; DIO4915 Image File I, slide 1079). The Fox-M1 protein bands from Figure 1A of Paper 19 (Allegation 94a) is also reproduced in Figure 1 of the progress report. It is highly unlikely that the same β-actin bands are the correct loading control for the 16 proteins reported in 2 publications and this progress report.

CONCLUSION:

The Committee finds in **Allegation 103** that **Figure 1** in progress report **5R01CA131151-2** was manipulated to reduce apparent protein expression levels in bands where expression in certain cell lines was not expected (i.e., the Mcl-1 & Bcl-2 bands in PANC-1 cells). Dr. Sarkar submitted no original scans and none were found to confirm the claim that these bands or the β-actin bands are authentic. The Committee concludes it is likely that Dr. Sarkar or his lab member(s) manipulated the bands in the publications and the progress report to produce "...reproducible results [that] have consistently been shown by multiple researchers in my lab." By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 1 to NIH in his progress report, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 104: In Figure 7, in the DIM 72-hour gel, the slope of the β-actin band (rising left to right) differs from the other bands: falling for p-Akt and Bax bands; straight for the XIAP, IAP pan and Survivin bands. None of the protein bands align with the loading control actin band. This indicates fabrication since a single loading control cannot have been used for all these data (DIO4915 Image File I, slide 1080).

RESPONSE:

Dr. Sarkar submitted in response that "...while scanning, the film got shifted and thus the alignment may have become disturbed. In our original published Ms this discrepancy is not observable. The published figure is pasted below. The loading control in this figure was run as separate gel, using identical amount of protein obtained from different samples" (Banerjee-Response.pptx, slide 8; DIO4915 Image File I, slide 1081).

ANALYSIS:

See DIO4915 Image File I, slides 1080-1082.
A visual examination of Figure 7 finds that the Bax, p-Akt, and β-actin bands are set at angles and do not align with the XIAP, IAP pan, and survivin bands, indicating that the proteins were not assessed together. Dr. Sarkar claims that the Bax, p-Akt, and β-actin bands "got shifted" during scanning but that does not explain why the figure would be constructed out of alignment. Yet all the rows are outlined indicating that they come from different blots. The figure Dr. Sarkar submitted as the published version of Figure 7 in the progress report has rows that align but the p-Akt and β-actin bands do not match. Further, since the publication is not cited in either the progress report or the response to the Committee, and since none of the 5 "publications and manuscripts" listed in the progress report (file: 2009, 04 10 - Sarkar Proposal 09071199, p.18) include either version of Figure 7, there is no evidence that the submitted figure explains the mis-aligned rows of bands.

CONCLUSION:

The Committee finds in **Allegation 104**, in **Figure 7** in progress report **5R01CA131151-2** that the misaligned bands indicate clearly that Figure 7 is a composite of multiple Westerns with no relationship to the loading control bands, although the fact that there are separate blots is indicated by outlining the rows. The facts that the supposed "published" version of Figure 7 did not match what was submitted to NIH, and that no information was provided to indicate where it had been published, and that none was found, raises serious concerns about the authenticity of both Figure 7 and the unverified figure submitted to the Committee. The Committee concludes that it is highly unlikely that Figure 7 is authentic. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 7 to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 105: In Figure 9B, the Caspase-3 has 9 lanes here rather than 8, like all the other bands, indicating data fabrication. The PARP lanes are spliced together and left 2 lanes of the lower PARP band appear to be masked by an overlay, indicating data falsification.

RESPONSE:

Dr. Sarkar wrote in response that "the published figure in our article do not show these discrepancies" (Banerjee-Response.pptx, slide 10; DIO4915 Image File I, slide 1084). Further: "the PARP sample (and a few others) was repeated and the results were included before sending out the Ms. As regards 9 lanes in Caspase fig, the first two lanes are control samples (same extract in duplicate) and inadvertently included while composing the figure." A "Published figure" labeled as "Figure 3" and a scan labeled "PARP (from publication; scanned fig, original full blot cannot be found)" (Banerjee-Response.pptx, slide 10).

ANALYSIS:

See DIO4915 Image File I, slides 1083-1087.
Simple visual examination of Figure 9B shows that the Caspace-3 band has 9 lanes instead of 8 (DIO4915 Image File I, slide 1083 & 1085), which Dr. Sarkar claims was inadvertent but does not indicate which of the two "control" lanes was supposed to be included. Examination of the PARP bands in Figure 7 confirms that lanes 1 and 2 of the bottom row (cleaved) are masked out and that lanes 3-5 of the bottom row are pasted in (DIO4915 Image File I, slides 1083 & 1086). Lanes 3-5 of the bottom row do not align with lanes 3-5 of the top row. The "Published figure" Dr. Sarkar submitted as evidence of the source for Figure 9B, and a scan labeled "PARP" do not match Figure 9B, although Dr. Sarkar wrote that scan was original for the "Published figure." The full blot was not found. In fact, besides PARP, the Caspase-3, cleaved Caspase, XIAP, Bax, C-IAP and survivin bands in Figure 9B do not match the "Published figure" (DIO4915 Image File I, slide 1087). The C-IAP bands are labeled C-IAP (pan) in the "Published figure." The Mcl-1 bands is the same image but is flipped vertically. The β-actin bands are the same in both Figures but squeezed vertical in the "Published figure." The 3 far-right PARP and Caspase-3 bands in Figure 9B, that is, the "DIM" treatment conditions, are much lighter than in the "Published figure" whereas the cleaved PARP and Caspase bands are much darker. If the "Published figure" is correct as claimed, then Figure 9B in the progress report exaggerates the impact of DIM on expression of PARP and Caspase-3, as well as on Bax (lane 2; DIO4915 Image File I, slide 1087). The last treatment listed for the "Published figure" is Oxaliplatin (63 μM; 48h); in contrast, the Oxaliplatin treatment in Figure 9B is "12.5 nM", orders of magnitude less that in the "Published figure." If the "Published figure" is correct as claimed, then Figure 9B in the progress report under-estimates the failure of Oxaliplatin to affect protein expression (DIO4915 Image File I, slide 1087). Further, since the publication is not cited in either the progress report or the response to the Committee, and since none of the 5 "publications and manuscripts" listed in the progress report (file: 2009, 04 10 - Sarkar Proposal 09071199, p.18) include either version of Figure 9B, there is no evidence that the submitted figure is correct as claimed, or that it is relevant to addressing the allegations about Figure 9B.

CONCLUSION:

The Committee finds, in **Allegation 105**, in progress report **5R01CA131151-2** that **Figure 9B** was manipulated by masking lanes in the PARP bands. The Caspase-3 bands were not correct. Neither the "PARP" scan nor the so-called "Published figure" submitted by Dr. Sarkar match Figure 9B. Compared to the submitted "Published figure," the results portrayed in the progress report exaggerate the effects of DIM on PARP, Caspase-3 and Bax expression. The fact that several bands in the supposed "Published figure" version of Figure 9B did not match what was submitted to NIH as Figure 9B, and that nothing indicating where the "Pubished figure" was published was provided to the Committee or found, all raises serious concerns about the authenticity of both Figure 9B and the unverified scan, and the figure submitted to the Committee. Therefore, by a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 9B to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

Allegation 106: Figure 10C is made to appear as one gel but cells are spliced together (see also Allegation 34a involving Figure 4C in **Paper 18**) (DIO4915 Image File I, slide 1088).

RESPONSE:

Dr. Sarkar referred to his response to Allegation 34a. He wrote that: "... the depicted proteins in each row have been spliced and presented as a composite picture. Given, the gel running conditions for Western immunoblotting, it is impossible to run the presented 7 proteins together as single gel. The figure was composed after obtaining each proteins from separate runs and presented as one figure" (Banerjee-Response.pptx, slide 11). This is consistent with the response for Allegation 34a (Banerjee-Response.pptx, slide 4). Dr. Banerjee testified that he constructed the figure and should have indicated with demarcating lines that this figure was a composite (Banerjee Transcript, V.2, p.434; DIO4915 Image File I, slide 1089).

ANALYSIS:

See DIO4915 Image File I, slides 1088-1089.
Regarding Allegation 34a, Drs. Sarkar and Banerjee admitted that the image was a composite, due to the limits of Western blotting. Simple visual examination of Figure 10C in the progress report shows cut marks where bands were pasted in (DIO4915 Image File I, slide 1088), inconsistent with publication standards for composite figures. No original scans for Figure 10C were submitted.

CONCLUSION:

As for Allegation 34a, for **Allegation 106**, in the right hand panel of **Figure 10C** in progress report **5R01CA131151-2** appears to be derived by inappropriately splicing together different film images without demarcation. Technically, while this is improper, the Committee finds that there was no intent to deceive in this instance because it was felt that any reader familiar with Western blots would readily recognize that this panel is a composite of separate film images. The Committee concludes there is insufficient evidence of research misconduct in this instance.

Allegation 107: Figure 12A appears to be horizontally spliced together across most lanes, indicating fabrication.

RESPONSE:

Dr. Sarkar wrote that "to reduce dead space (due to long running of the gel, the bands were moved up, without compromising integrity of the results" (Banerjee-Response.pptx, slide 8).

ANALYSIS:

See DIO4915 Image File I, slides 1090-1092.
Visual examination confirms, as admitted, that in Figure 12A in the progress report, approximately half of the top portion of the EMSA assay was removed/cropped. The scan submitted is a different exposure for the assay than what appears in Figure 12A. Due to the removal of the section of the scan, the ending and spacing of gradations in the lanes of the assay (especially lanes 1 and 5) are lost (DIO4915 Image File I, slide 1090-1091).

CONCLUSION:

The Committee finds in **Allegation 107** that **Figure 12A** in progress report **5R01CA131151-2** is manipulated by excising the middle half of the EMSA assay. Contrary to Dr. Sarkar's claim that this editing was done "without compromising integrity of the results," the area removed contained important data related to

the density and length of the gradations in the lanes of the assay. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 12A to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

For **progress report 5R01CA131151-2,** see also:

Figure 2: ***Allegation 34***
Figure 1: ***Allegation 103***
β-actin bands in ***Allegations 94a, 94b & 94f***

NIH APPLICATION 2R01CA083695-05 (PI: F.H. Sarkar; Proposal #08060947): Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer (file: 2006, 10 26 - Sarkar Proposal 07010062.pdf) (Submitted: 10/26/2006)

Allegation 144: All of Figure 8A (p.42), depicting changes in AR, PSA and β-actin protein levels over 72 hours after treatment with "Isoflavone (20μM)" appears to be identical to the image in the top panel of Figure 2B in **Paper 4** (see Allegation 8), in which the treatment is labeled "10μM B-DIM."

RESPONSE:

Dr. Sarkar wrote that "... because the effect of B-DIM on AR and PSA is so similar to the effect of isoflavone, the figure of B-DIM effect on AR and PSA was mistakenly used in the isoflavone grant application." Dr. Sarkar's response cited prior findings about the effects of isoflavone on AR and PSA expression and said it was a mistake to use the B-DIM figure. Dr. Sarkar claimed that the "error" had no impact since "AR-PSA regulation was not focus of the grants" (Response to Allegation #4-Sept. 2014.pdf, p.25), but his NIH application abstract contradicts this because he wrote: "... we hypothesize that soy isoflavone will function as an inhibitor of AR signaling ... we further hypothesize that soy isoflavone will inhibit tumor growth in animals and that the exposure of tumors to isoflavone in vivo will result in the down regulation of genes downstream of AR signaling..." (file: 2006, 10 26 - Sarkar Proposal 07010062.pdf, p.2). He also said they "... did examine the effects of isoflavone on the expression level of AR and PSA..." and submitted a figure labeled "Isoflavone" with "original scans" (DIO4915 Image File I, slide 1097). (Response to Allegation #4-Sept. 2014.pdf). See also the *RESPONSE* section in **Allegation 8.**

ANALYSIS:

See DIO4915 Image File I, slides 1096-1097.
Close comparison of Figure 8A titled "Isoflavone" in the application and the top panel of Figure 2B labeled "10 μM B-DIM" in Paper 4 confirms that they are identical images (DIO4915 Image File I, slide 1096). Paper 4 was published a week before the application was submitted in 2006. Dr. Sarkar admits that the images are identical. The undated figure Dr. Sarkar submitted shows "similar" effects but is apparently not an "original" intended for the grant application. There is no explanation of how the figure published in Paper 4 got to be re-labeled "Isoflavone" (and captioned "20 μM") by mistake. No information was provided or found (e.g., in notebooks of files), showing the isoflavone data or experiments were done before the application was submitted. No file was found anywhere with a figure matching the "Isoflavone" figure submitted by Dr. Sarkar in response. Also, there is a substantiated allegation of research misconduct involving copying and re-labeling the loading control bands in Figure 2B of Paper 4 (Allegation 8), and that applies to Figure 8A here also.

CONCLUSION:

The Committee finds, in **Allegation 144,** in NIH application **2R01CA083695-05,** that the image for **Figure 8A** (top panel) of File: 2006, 10 26 - Sarkar Proposal 07010062s is a re-labeled copy of Figure 2B in Paper 4 that may exaggerate the effects of Isoflavone on AR expression by using B-DIM data and thereby overstate the justification for the then-proposed research. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar knowingly and intentionally submitted fabricated and/or falsified data in Figure 8A to NIH, and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

NIH Grant Applications and Progress Reports using Figures with Substantiated Allegations

Each re-use of the figures listed below, for which allegation(s) have been substantiated above by a preponderance of the evidence, is an additional instance where Dr. Sarkar recklessly submitted fabricated and/or falsified data to NIH. In each instance this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

These are listed by year of submission.

2006

1. APPLICATION: 1 R01 CA124744-01 (file: 2006, 10 26 – Sarkar Proposal 07010061)
   - **Figure 4A, 4B – see *Allegations 8 and 9***

     Also appears in/as:

     2007, 10 31 – Sarkar Proposal 08010113 / Fig 2A and 2B

     2008, 07 03 – Sarkar Proposal 08091398 / Fig 7A and 7B

2. PROGRESS REPORT: **5R01CA108535-3** (file: 2006, 04 14 – Sarkar Proposal 06071099)
   - **Figure 4A, 4B – see *Allegations 8 and 9***

     Also appears in/as:

     2006, 10 26 – Sarkar Proposal 07010061 / Fig 4A and 4B

     2007, 10 31 – Sarkar Proposal 08010113 / Fig 2A and 2B

     2008, 07 03 – Sarkar Proposal 08091398 / Fig 7A and 7B

3. APPLICATION: **1 R01 CA124512-01** (File: 2006, 01 26 - Sarkar Proposal 06040451.pdf)
   - **Figures 1C – *see Allegation 81i***
   - **Figure 1D – *see Allegations 5, 81c, 81d, 92a, 93f***
   - **Figure 3 – *see Allegations 5a, 38, 74, 91c***
   - **Figures 4A-4D – see *Allegations 83g, 84a, 86h***
   - **Figure 5B – *see Allegations 79, 89f, 90b***
   - **Figures 5E, 8C, 9D – see *Allegations 83h, 83i, 83j***
   - **Figures 9C - *see Allegation 80a***
   - **Figure 10 - *see Allegations 79a, 81j, 89m***
   - **Figure 12A, 12C - *see Allegations 75, 91d***
   - **Figure 13B - *see Allegations 75, 81k***
   - **Figure 14A - *see Allegations 75, 89i***
   - **Figure 15 - *see Allegations 75, 89i, 91e, 134***

4. APPLICATION: **1 R01 CA131151-01** (file: 2007, 02 01– Sarkar Proposal 14114-001)
   - **Figure 2 –** ***see Allegations 63, 64, 94c***
     Also appears in/as:
     2007, 10 31 – Sarkar Proposal 08010127 / Fig 2
     2007, 10 31 – Sarkar Proposal 08010127 / Fig 20A (top) – as portion of image
   - **Figure 11 –** ***see Allegation 4***

5. APPLICATION: **1 R01 CA132794-01** (file: 2007, 05 29 – Sarkar Proposal 07081203)
   - **Figure 1A –** ***see Allegation 94a***
     Also appears in/as:
     2007, 06 08 – Sarkar Proposal 07081147 / Figs 1A
     2008, 02 26 – Sarkar Proposal 08050727 / Figs 1A
     2008, 10 30 – Sarkar Proposal 09010137 / Fig 6B (part)
   - **Figure 1D –** ***see Allegations 35, 37, 82b, 93c***
     Also appears in/as:
     2007, 06 08 – Sarkar Proposal 07081147 / Figs 1D
     2008, 02 26 – Sarkar Proposal 08050727 / Figs 1D
   - **Figure 4C –** ***see Allegation 35, 35a, 93d***
     Also appears in/as:
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 4C
     2008, 02 26 – Sarkar Proposal 08050727 / Fig 4C
   - **Figure 5B – see** ***Allegations 38, 38a, 91b***
     Also appears in/as:
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 5B
     2008, 02 26 – Sarkar Proposal 08050727 / Fig 5B
   - **Figure 6C – see** ***Allegation 36***
     Also appears in/as:
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 6C
     2008, 02 26 – Sarkar Proposal 08050727 / Fig 6C
   - **Figure 7– see** ***Allegation 131, 82, 86***
     Also appears in/as:
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 7
     2008, 02 26 – Sarkar Proposal 08050727 / Fig 7
   - **Figure 8C, 8D – see** ***Allegations 80e, 80g, 83, 90b***
     Also appears in/as:
     2007, 02 05 – Sarkar Proposal 07050620 / Fig 4B – as Bcl-Xl
     2007, 06 08 – Sarkar Proposal 07081203 / Fig 8C and 8D
     2008, 02 26 – Sarkar Proposal 08050727 / Fig 8C and 8D

6. APPLICATION: **1 R21 CA133558-01** (File: 2007, 06 08 – Sarkar Proposal 07081147)
   - **Figure 1A –** ***see Allegations 94a***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203/ Figs 1A
     2008, 02 26 – Sarkar Proposal 08050727 / Figs 1A
     2008, 10 30 – Sarkar Proposal 09010137 / Fig 6B (part)
   - **Figure 1D –** ***see Allegations 35, 37, 82b, 93c***
     Also appears in/as:

2007, 05 29 – Sarkar Proposal 07081203/ Figs 1D
2008, 02 26 – Sarkar Proposal 08050727 / Figs 1D

- **Figure 4C – see *Allegation 35, 35a, 93d***
  Also appears in/as:
  2007, 05 29 – Sarkar Proposal 07081203/ Figs 4C
  2008, 02 26 – Sarkar Proposal 008050727 / Fig 4C
- **Figure 5B – see *Allegation 38, 38a, 91b***
  Also appears in/as:
  2007, 05 29 – Sarkar Proposal 07081203/ Fig 5B
  2008, 02 26 – Sarkar Proposal 008050727 / Fig 5B
- **Figure 6C – see *Allegation 36***
  Also appears in/as:
  2007, 05 29 – Sarkar Proposal 07081203 / Fig 6C
  2008, 02 26 – Sarkar Proposal 08050727 / Fig 6C
- **Figure 7 – see *Allegation 131, 82, 86***
  Also appears in/as:
  2007, 05 29 – Sarkar Proposal 07081203 / Fig 7
  2008, 02 26 – Sarkar Proposal 08050727 / Fig 7
- **Figure 8C, 8D – see *Allegations 80g, 83, 90b***
  Also appears in/as:
  2007, 02 05 – Sarkar Proposal 07050620 / Fig 4B – as Bcl-Xl
  2007, 05 29 – Sarkar Proposal 07081203 / Fig 8C and 8D
  2008, 02 26 – Sarkar Proposal 08050727 / Fig 8C and 8D

7. APPLICATION: **1 R01 CA124744-01A2** (File: 2007, 10 31 – Sarkar Proposal 08010113)
   - **Figure 2A, 2B – see Allegations 8 and 9**
     Also appears in/as:
     2006, 04 14 – Sarkar Proposal 06071099 / Fig 10 (right panel) & Fig 11 (right panel)
     2006, 10 26 – Sarkar Proposal 07010061 / Fig 4A and 4B
     2008, 07 03 – Sarkar Proposal 08091398 / Fig 7A and 7B

8. APPLICATION: **1 R01 CA131151-01A1** (File: 2007, 10 31 – Sarkar Proposal 08010127)
   - **Figure 2 – see *Allegations 63, 64, 94c***
     Also appears in/as:
     2007, 02 01– Sarkar Proposal 14114-001 / Fig 2
     2007, 10 31 – Sarkar Proposal 08010127 / Fig 20A (part)
   - **Figure 3 – see *Allegations 83r***
     Also appears in/as:
     2007, 02 01– Sarkar Proposal 14114-001 / Fig 3
   - **Figure 11 – see *Allegation 4***
     Also appears in/as:
     2007, 02 01– Sarkar Proposal 14114-001 / Fig 11
   - **Figure 14 – see *Allegation 97***
     Also appears in/as:
     2007, 02 01– Sarkar Proposal 14114-001 / Fig 14
     2007, 03 22 – Sarkar Proposal 07060892 / Fig 15
   - **Figure 18 – see *Allegation 59***
     Also appears in/as:
     2007, 02 01– Sarkar Proposal 14114-001 / Fig 18

- **Figure 20A – see *Allegations 64, 94d***
  Also appears in/as:
  2007, 02 01– Sarkar Proposal 14114-001 / Fig 2 (used portion of image)
  2007, 10 31 – Sarkar Proposal 08010127 / Fig 2 (used portion of image)
- **Figure 21A – see *Allegations 131, 82e, 86b***

2008

9. APPLICATION: **1 R01 CA132794-01A1** (File: 2008, 02 26 – Sarkar Proposal 08050727)
   - **Figure 1A– *see Allegations 94a***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203/ Figs 1A
     2007, 06 08 – Sarkar Proposal 07081147 / Figs 1A
     2008, 10 30 – Sarkar Proposal 09010137 / Fig 6B (part)
   - **Figure 1D – *see Allegations 35, 37, 82b, 93c***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203/ Figs 1D
     2007, 06 08 – Sarkar Proposal 07081147 / Figs 1D
   - **Figure 4C– see *Allegations 35, 35a, 93d***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203 / Fig 4C
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 4C
   - **Figure 5B– see *Allegations 38, 38a, 91b***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203 / Fig 5B
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 5B
   - **Figure 6C– see *Allegations 36***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203 / Fig 6C
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 6C
   - **Figure 7– see *Allegations 131, 82, 86***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203 / Fig 7
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 7
   - **Figure 8C, 8D – see *Allegations 80g, 83, 90b***
     Also appears in/as:
     2005, 05 20 – Sarkar Proposal 05083189 / Fig 3A
     2007, 02 05 – Sarkar Proposal 07050620 / Fig 4B – as Bcl-Xl
     2007, 05 29 – Sarkar Proposal 07081203 / Fig 8C & 8D
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 8C & 8D
   - **Figure 15B, 15C – see *Allegations 82, 86, 94a***
     Also appears in/as:
     2007, 05 29 – Sarkar Proposal 07081203 / Fig 1A
     2007, 06 08 – Sarkar Proposal 07081147 / Fig 1A
     2009, 04 10 – Sarkar Proposal 09071199/ Fig 1
     2008, 10 30 – Sarkar Proposal 09010137 / Fig 6B
   - **Figure 16B & 16C – see *Allegations 91, 86***

10. PROGRESS REPORT: **5 R01 CA83695-6** (file: 2008, 04 07 – Sarkar Proposal 08060947)
- **Figure 6B – see *Allegation 58***

11. APPLICATION: **2 R01 CA108535-05** (file: 2008, 07 03 – Sarkar Proposal 08091398)
- **Figure 7A, 7B – see *Allegations 8 and 9***

  Also appear in/as:

  2006, 04 14 – Sarkar Proposal 06071099 / Fig 10 (right panel) & Fig 11 (right panel)
  2006, 10 26 – Sarkar Proposal 07010061 / Fig 4A and 4B
  2007, 10 31 – Sarkar Proposal 08010113 / Fig 2A and 2B

12. APPLICATION: **2 R01 CA101870-06** (file: 2008, 10 30 – Sarkar Proposal 09010137)
- **Figure 1A, 1C – see *Allegations 75, 89, 91***
- **Figure 2 – see *Allegations 75, 89, 91***
- **Figure 1D, 2 – see *Allegation 134***

  Also appears in/as:

  2005, 05 06 – Sarkar Proposal 05073153 / Fig 13A and 13B
  2007, 10 31 – Sarkar Proposal 08010113 / Fig 2A and 2B
- **Figure 6B – see *Allegation 94***

  Also a portion of image appears in:

  2007, 06 08 – Sarkar Proposal 07081147 / Fig 1A
  2007, 05 29 – Sarkar Proposal 07081203 / Fig 1A
  2008, 02 26 – Sarkar Proposal 08050727 / Fig 15B
  2009, 04 10 – Sarkar Proposal 09071199 / Fig 1

2009

13. APPLICATION: **2 R01 CA108535-05A1** (file: 2009, 02 20 - Sarkar Proposal 09050718.pdf)
- **Figure 3 – *see Allegations 8 and 9***

  Also appears in/as:

  2006, 04 14 – Sarkar Proposal 06071099 / Fig 10 (right panel) & Fig 11 (right panel)
  2006, 10 26 – Sarkar Proposal 07010061 / Fig 4A and 4B
  2007, 10 31 – Sarkar Proposal 08010113 / Fig 2A and 2B
  2008, 07 03 – Sarkar Proposal 08091398 / Fig 7A and 7B

14. PROGRESS REPORT: **5R01CA131151-2** (file: 2009, 04 10 - Sarkar Proposal 09071199.pdf)
- **Figure 2 – *see Allegation 82***

  Also appears in/as:

  2009, 12 03 – Sarkar Proposal 10030359 / Fig 2
- **Figure 12 – *see Allegation 107***

2010

15. APPLICATION: **1 R01 CA 154321-01** (file: 2010, 01 21 – Sarkar Proposal 10040486)
Title: Prevention of Tumor Progression by a Novel Approach
- **Figure 10 – *see Allegations 23 & 23a***

  Also appears in/as:

  2010, 10 22 - Sarkar Proposal 11010149 / Fig 3
  2010, 01 21 - Sarkar Proposal 10040486 / Fig 7

16. APPLICATION: **1 R01 CA 131151-3** (file: 2010, 04 13 – Sarkar Proposal 10070978)
Title: R01: A novel and targeted approach to inhibit invasion and angiogenesis (progress report)

- **Figure 3 – *see Allegation 59***

- **Figure 11A – *see Allegation 30***
- **Figure 13 – *see Allegation 33***
- **Figure 15A – *see Allegation 31***

17. PROGRESS REPORT: **5R01CA83695-8** (file: 2010, 04 13 - Sarkar Proposal 10070979)

- **Figure 4B – *see Allegation 140***

2011

18: PROGRESS REPORT: **5R01CA131151-4** (file: 2011, 04 08 - Sarkar Proposal 11071040)

- **Figure 5 – *see Allegation 137***

2012

No repeated uses were discovered.

2013 & 2014

Recent NIH Grant Submissions

Dr. Sarkar submitted five grant proposals as PI to NIH during the Investigation. None of these applications included figures for which there are substantiated allegations. However, four of them cited publications in which there are one or more substantiated allegations. These are:

1 R01 CA174704-01A1	– **Papers 2, 4 & 16** (cited as nos. 74, 20 & 16, respectively)
1 R01 CA187469-01	– **Papers 2, 4, 15, 18 & 41** (cited as nos. 78, 45, 6, 88 & 42, respectively)
R01CA164318	– **Papers 5, 6, 9, 14, 15, 16 & 18; and References #186 & #196** (cited as 69, 85, 79, 75, 6, 71, 11, 70 & 50, respectively)
1 R01 CA190330-01	– **Papers 5, 6, 9, 10, 14, 15, 16 & 18; and References #186 & #196** (cited as 71, 90, 82, 84, 78, 6, 73, 10, 72 & 52, respectively)

The Committee did not evaluate how these citations were used in support of the proposed research and made no determination whether these involved research misconduct.

Patent Application WO 2011/126544 A2 (file: 10-967 PCT_US2011_000561): Thymoquinone analogs for the treatment of pancreatic cancer. (Filed: March 28, 2011; International Publication Date: October 13, 2011).

Allegation 108: In Figure 5A (p.25), there is reason to believe that that image is manipulated by stretching, rotating, flipping and/or pasting in of images, that alter presentation of Western blot data for Caspace-3, PARP and Bcl-2 bands. (Compare to **Allegation 51** in **Reference #149**.)

RESPONSE:

No response specific to the patent application. Allegation 51 was addressed in "Banerjee 04 – Exhibit 155Ad – Allegation-II response-SB.pptx". This document provides scanned films that show the experimental images that were used in the composition of the Figure 5A (cf., DIO4915 Image File C, slides 509-515).

ANALYSIS:

See DIO4915 Image File I, slide 1099.
A visual examination confirms that Figure 5A in the patent application **WO 2011/126544 A2** is the same image as Figure 5A in Reference #149. The same substantiated alterations and manipulations of the image are present for Figure 5A in the patent application as are listed under **Allegation 51**. See the *ANALYSIS* section of **Allegation 51**. (DIO4915 Image file I, slide 1099).

CONCLUSION:

The Committee finds, in **Allegation 108,** that, as admitted for Allegation 51 by Dr. Sarkar, the PARP, caspase and Bcl-2 bands in **Figure 5A** in the patent application **WO 2011/126544 A2** were manipulated by cutting and pasting to select particular lanes, and by re-sizing other bands. Scans submitted for Allegation 51 did not confirm the authenticity of the figure. By a preponderance of the evidence, the Committee concludes that Dr. Sarkar recklessly submitted fabricated and/or falsified data in Figure 5A to support this patent application and that this constitutes research misconduct as described in the WSU Policy and Procedure Regarding Research Misconduct 2010-01 and 42 CFR Part 93.103.

VI.

Summary of Findings And Recommendations

VI. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Table 3:

		Allegations with		Contains falsified and/or fabricated data for which Dr. Sarkar is responsible					
		No Misconduct	Substantiated Misconduct						Recommendation
Publications - Sequence starts based on "Paper" numbers up to Paper 42									
Paper 1 Reference #179	Ahmad, A., Wang, Z., Kong, D., Ali, S., Li, Y., Banerjee, S., Ali, R., Sarkar, F.H. Breast Cancer Res Treat 122, 337-346, (2010)	1, 2, 44							**Submit Erratum**
Paper 2 Reference #245	Kong, D., Li, Y., Wang, Z., Banerjee, S., Sarkar, F.H. Cancer Res 67, 3310-3319, (2007)		3, 4	X					Retract Paper
Paper 3 Reference #262	Wang, Z., Sengupta, R., Banerjee, S., Li, Y., Zhang, Y., Rahman, K.M.W., Aboukameel, A., Mohammad, R., Majumdar, A.P.N., Abbruzzese, J.L., Sarkar, F.H. Cancer Res, 66, 7653-7660, (2006a)	5b, 6	5, 5a, 7, 80a, 80b, 82a, 86a, 89a, 91a, 93a, 93b, 132, 138	X					Retract Paper
Paper 4 Reference #259	Bhuiyan, M.M.R., Li, Y., Banerjee, S., Ahmed, F., Wang, Z., Ali, S., Sarkar, F.H. Cancer Res, 66, 10064-10072, (2006)	10, 87	8, 9, 11	X					Retract Paper
Paper 5 Reference #255	Banerjee, S., Zhang, Y., Wang, Z., Mingxin, C., Chiao, P.J., Abbruzzese, J.L., Sarkar, F.H. Int. J. Cancer, 120, 906-917, (2006)		12, 12a, 13, 13a, 88	X					Retract Paper
Paper 6 Reference #050	Wang, Z., Ali, S., Banerjee, S., Bao, B., Li, Y., Azmi, A.S., Korc, M., Sarkar, F.H. J Cell Physiol, 228(3), 556-562 (2013)		14	X					Retract Paper
Paper 7 Reference #061	Soubani, O., Ali, A.S., Logna, F., Ali, S., Philip, P.A., Sarkar, F.H. Carcinogenesis, 33(8):1563-1771 (2012)	15, 15a	16	X					Retract Paper
Paper 8 Reference #241	Li, Y., Wang, Z., Kong, D., Murthy, S., Dou, Q.P., Sheng, S., Reddy, G.P.V., Sarkar, F.H. J Biol Chem, 282, 21542-21550, (2007)	17							No further action; Acceptable erratum already published

Paper 9 Reference #077	Ali, S., Ahmad, A., Aboukameel, A., Bao, B., Padhye, S., Philip, P.A., Sarkar, F.H. Cancer Lett, 319, 173-181, (2012)		18, 19, 20, 20a	X					Retract Paper
Paper 10 Reference #079	Ali, S., Banerjee, S., Logna, F., Bao, B., Philip, P.A., Korc, M., Sarkar, F.H. J Cell Physiol, 227, 3373-3380, (2012)	22, 22a, 22b	21, 21a	X					Retract Paper
Paper 11 Reference #287	Prasad, A., Bao, B., Beck, F.W.J., Kucuk, O., Sarkar, F.H. Free Rad Biol Med, 37, 1182-1190, (2004)	22c							No action
Paper 12 Reference #151	Ali, S., Ahmad, A., Banerjee, S., Padhye, S., Dominiak, K., Schaffert, J.M., Wang, Z., Philip, P.A., Sarkar, F.H. Cancer Res, 70, 3606-3617, (2010)		23, 23a	X					Retract Paper
Paper 13 Reference #152	Ahmad, A., Wang, Z., Kong, D., Ali, R., Ali, S., Banerjee, S., Sarkar, F.H. Breast Cancer Res Treat, 126, 15-25, (2011)	24b, 25	24, 24a	X					**Submit Erratum**
Paper 14 Reference #122	Ali, S., Almhanna, K., Chen, W., Philip, P.A., Sarkar, F.H. Am J Trans Res, 3, 28-47, (2011)		26, 26a	X					Retract Paper
Paper 15 Reference #072	Kong, D., Heath, E., Chen, W., Cher, M., Powell, I., Heilbrun, L., Li, Y., Ali, S., Sethi, S., Hassan, O., Hwang, C., Gupta, N., Chitale, D., Sakr, W.A., Menon, M., Sarkar, F.H. Am J Trans Res, 4, 14-23, (2012)		27	X					Retract Paper; the published erratum should also be Retracted
Paper 16 Reference #130	Banerjee, S., Kong, D., Azmi, A.S., Wang, Z., Ahmad, A., Sethi, S., Sarkar, F.H Int. J. Cancer, 128, 1240-1250, (2010)	28a	28b, 28c, 28d, 28e, 29	X					Retract Paper
Paper 17 Reference #162	Ali, S., Banerjee, S., Schaffert, J.M., El-Rayes,B.F., Philip, P.A., Sarkar, F.H. J Cellul Biochem, 110, 171-181, (2010)		30, 31, 32, 33	X					Retract Paper
Paper 18 Reference #188	Banerjee, S., Wang, Z., Kong, D., Sarkar, F.H. Cancer Res, 69, 5592-5600, (2009)	34a	34	X					Retract Paper
Paper 19 Reference #236	Wang, Z., Banerjee, S., Kong, D., LI, Y., Sarkar, F.H. Cancer Res, 67, 8293-8300, (2007a)	35, 36	35a, 37, 38, 38a, 82b, 91b, 93c, 93d, 93g, 94a	X					Retract Paper
Paper 20 Reference #097	Li, Y., Kong, D., Wang, A., Ahmad, A., Bao, B., Padhye, S., Sarkar, F.H. Cancer Prev Res, 4, 1495-1506, (2011)	39, 136							**Submit Erratum**

Paper 21 Reference #106	Bao, B., Wang, Z., Ali, S., Kong, D., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Miele, L., Sarkar, F.H. J Cellul Biochem, 112, 2296-2306 (2011)	41, 42	40						**Submit Erratum**
Paper 22 Reference #086	Bao, B., Wang, Z., Ali, S., Ahmad, A., Azmi, A.S., Sarkar, S.H., Banerjee, S., Kong, D., Li, Y., Thakur, S., Sarkar, F.H. Cancer Prev Res, 5, 355-364, (2012)	43							No action
Paper 23 Reference #085	Bao, B., Ali, S., Banerjee, S., Wang, Z., Logna, F., Azmi, A.S., Kong, D., Ahmad, A., Li, Y., Padhye, S., Sarkar, F.H. Cancer Res, 72, 335-345, (2012)	43							No action
Paper 24 Reference #182	Ahmad, A., Kong, D., Wang, Z., Sarkar, S.H., Banerjee, S., Sarkar, F.H. J Cell Biochem, 108, 916-925 (2009)	44 (see also Paper 1)							**Submit Erratum**
Paper 25 Reference #046	Xia, J., Li, Y. [Youlian], Yang, Q., Mei, C., Chen, Z., Bao, B., Ahmad, A., Miele, L., Sarkar, F.H., Wang, Z. Intern. J., Molecular Sci, 13, 9627-9641 (2012)		45						Retract Paper
Paper 26 Reference #083	Singh-Gupta, V., Banerjee, S., Yunker, C., Rakowski, J.T., Jiner, M.C., Konskiu, A.A., Sarkar, F.H., Hillman, G.G. Cancer Letters, 318, 86-92 (2012)	46							**Submit Erratum**
Paper 27 Reference #285	Levi, E., Mohammad, R., Kodali, U., Marciniak, D., Reddy, S., Abroukameel, A., Sarkar, F.H., Kucuk, O., Rishi, A.K., Majumdar, A.P.N. Anticancer Research 24: 2885-2892 (2004)	110							No action
Paper 28 Reference #270	Li Y., Kucuk, O., Hussain, M., Abrams, J., Cher, M.L., Sarkar, F.H. Cancer Res. 66(9): 4816-25 (2006)		111	X					Retract Paper
Paper 29 Reference #194	Wang, Z., Azmi, A.S., Ahmad, A., Banerjee, S., Wang, S., Sarkar, F.H., Mohammad, R. Cancer Res. 69(7):2757-65 (2009)	112, 113							No action
Paper 30 Reference #286	Ali, S., El-Rayes, B.F., Heilbrun, L.K., Sarkar, F.H., Ensley, J.F., Kucuk, O., Philip, P.A. Clin Cancer Res. 10(13):4412-6 (2004)	114							No action
Paper 31 Reference #216	Thakur, A., Sun, Y., Bollig, A., Wu, J., Biliran, H., Banerjee, S., Sarkar, F.H., Liao, D.J., Clin Cancer Res. 14(14):4427-36 (2008)	115, 116							No action
Paper 32 Reference	Wang, Z., Song, W., Aboukameel, A., Mohammad, M., Wang, G., Banerjee, S., Wang,		82f, 82g, 82h, 82i, 84e, 84f, 84g,	X					Retract Paper

#218	S., Kang, D., Wang, S., Sarkar, F.H., Mohammad, R. Int J Cancer. 123(4):958-66 (2008)		86k, 94f, 117, 132, 138						
Paper 33 Reference #202	Singh-Gupta, V., Zhang, H., Banerjee, S., Kong, D., Raffoul, J.J., Sarkar, F.H., Hillman, G.G. Int J Cancer. 124(7):1675-84 (2009)	118							No action
Paper 34 Reference #173	Jaiswal, A.S., Banerjee, S., Panda, H., Bulkin, C.D., Izumi, T., Sarkar, F.H., Ostrov, D.A., Narayan, S. Mol Cancer Res. 7(12):1973-83 (2009)	119, 120							No action
Paper 35 Reference #011	Wang, S., Wu, Y., Hou, Y., Guan, X., Castelvetere, M.P., Oblak, J.J., Banerjee, S., Filtz, T.M., Sarkar, F.H., Chen, X., Jena, B.P., Li, C. Transl Oncol 6(2):216-225. (2013)	123							No action
Paper 36 Reference #191	Giri, B., Gomes, A., Sengupta, R., Banerjee, S., Nautiyal, Y., Sarkar, F.H., Majumdar, A.P.N. Anticancer Res 29(1):395-402 (2009)	124, 125, 126							No action
Paper 37 Reference #204	Solomon, L.A., Ali, S., Banerjee, S., Munkarah, A.R., Morris, R.T., Sarkar, F.H. J Ovarian Res 1(1):9 (2009)	127							**Submit Erratum**
Paper 38 Reference #271	Raffoul, J.J., Wang, Y., Kucuk, O., Forman, J.D., Sarkar, F.H., Hillman, G.G. BMC Cancer 26(6):107- (2006)	128							No action
Paper 39 Reference #198	Ali, S., Varghese, L., Pereira, L., Tulunay-Ugur, O.E., Kucuk, O., Carey, T.E., Wolf, G.T., Sarkar, F.H. Cancer Letters 278: 201-209 (2009)		129	X					Retract Paper
Paper 40 Reference #291	Ma, J., Zhang, Q., Chen, S., Fang, B., Yang, Q., Chen, C., Miele, L., Sarkar, F.H., Xia, J., Wang, Z. PLoS One. 8(7):e69485 (2013)		130, 135						Retract Paper
Paper 41 Reference #292	Li, Y., Ahmed, F., Ali, S., Philip, P.A., Kucuk, O., Sarkar, F.H. Cancer Res 65(15): 6934-6942 (2005)		131	X					Retract Paper
Paper 42 Reference #026	Patzkó, Á., Bai, Y., Saporta, M.A., Katona, I., Wu, X., Vizzuso, D., Feltri, L.M., Wang, S., Dillon, L.M., Kamholz, J., Kirschner, D., Sarkar, F.H., Wrabetz,L., Shy, M.E. Brain 135:3551–3566 (2012)	133							Acceptable erratum published
Paper 69	Wang, Z., Banerjee, S., Ahmad, A., Li, Y., Azmi,		137	X					Retract Paper

Reference #099	A.S., Gunn, J.R., Kong, D., Bao, B., Ali, S., Gao, J., Mohammad, R.M., Miele, L., Korc, M., Sarkar, F.H. PLoS ONE 6(6): e20537, (2011)								
Paper 43 **Reference #107**	Bao, B., Wang, S., Ali, S., Kong, D., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Miele, L., Sarkar, F.H. Cancer Letters 307(1): 26–36 (2011)		47, 48	X					Retract Paper
Paper 71 **Reference #111**	Bao B, Ali S, Kong D, Sarkar SH, Wang Z, Banerjee S, Aboukameel A, Padhye S, Philip PA, Sarkar FH. PLoS One. 6(3):e17850. DOI: 10.1371/journal.pone.0017850 (2011)		139						**Submit Erratum**
Paper 44 **Reference #118**	Maitah, M.A., Ali, S., Ahmad, A., Gadgeel, S., Sarkar, F.H. PLoS ONE 6 (1): e16068 (2011)		49	X					Retract Paper
Paper 45 **Reference #120**	Kanwar, S.S., Yu, Y., Nautiyal, J., Patel, B.B., Padhye, ,S., Sarkar, F.H., Majumdar, A.P.N. Pharm Res 28:827-838 (2011)	50							No action
Paper 46 **Reference #139**	Wang, Z., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Kong, D., Wojewod, C., Miele, L., Sarkar, F.H. Journal of Cellular Biochemistry 112:78–88 (2011)	121, 122	140, 145	X					Retract Paper
Paper 47 **Reference #149**	Banerjee, S., Azmi, A.S., Padhye, S., Singh, M.W., Baruah, J.B., Philip, P.A., Sarkar, F.H., Mohammad, R.M. Pharm Res 27: 1146–1158 (2010)		51	X					Retract Paper
Paper 72 **Reference #167**	Wang Z, Li Y, Banerjee S, Kong D, Ahmad A, Nogueira V, Hay N, Sarkar FH. J Cell Biochem. 109(4):726-736. (2010)		140	X					Retract Paper
Paper 48 **Reference #177**	Majumdar, A.P.N., Banerjee, S., Nautiyal, J., Patel, B.B., Patel, V., Du, J., Yu, Y., Elliott, A.A., Levi, E., Sarkar, F.H., Nutrition and Cancer, 61(4), 544–553 (2009)	52, 53							No action
Paper 49 **Reference #186**	Banerjee, S., Kaseb, A.O., Wang, Z., Kong, D., Mohammad, M., Padhye, S., Sarkar, F.H., Mohammad, R.M. Cancer Res 69:5575-5583 (2009).		109	X					Retract Paper
Paper 50 **Reference #193**	Ali, S., Al-Sukhun, S., El-Rayes, B.F., Sarkar, F.H., Heilbrun, L.K., Philip, P.A., Life Sciences 84 766–771 (2009)	54							No action

There is NO allegation 55									
Paper 51 **Reference #196**	Gadgeel, S.M., Ali, S., Philip, P.A., Wozniak, A., Sarkar, F.H. Cancer 115:2165–2176 (2009)		56	X					Retract Paper
Paper 52 **Reference #213**	Li, Y., Wang, Z., Kong, D., Li, R., Sarkar, S.H., Sarkar, F.H. J Biological Chem 283(41) 27707–27716 (2008)	57, 58							No action
Paper 53 **Reference #217**	Ali, S., Banerjee, S., Ahmad, A., El-Rayes,B.F., Philip, P.A., Sarkar, F.H. Mol Cancer Ther 7, 1708-1719 (2008)		59, 60	X					Retract Paper
Paper 54 **Reference #226**	Wang, Z., Yu, B.W., Rahman, K.M.W., Ahmad, F., Sarkar, F.H. Mol Cancer Ther 7(2): 341–349 (2008)	61, 62, 62b							No action
Paper 55 **Reference #231**	Wang, Z., Kong, D., Banerjee, S., Li, Y., Adsay, N.V., Abbruzzese, J., Sarkar, F.H. Cancer Res 67:11377-11385 (2007b)		63, 64, 82e, 86b, 94c, 94d, 94e, 131	X					Retract Paper
Paper 56 **Reference #234**	Gadgeel, S.M., Ali, S., Philip, P.A., Ahmed, F., Wozniak, A., Sarkar, F.H. Cancer 110: 2775–2784 (2007)		65, 66	X					Retract Paper
Paper 57 **Reference #244**	Banerjee, S., Hussain, M., Wang, Z., Saliganan, A., Che, M., Bonfil, D., Cher, M., Sarkar, F.H. Cancer Res 67(8):3818–3826 (2007)	67							**Submit Erratum**
Paper 58 **Reference #247**	Raffoul, J.J, Banerjee, S., Singh-Gupta, V., Knoll, Z.E., Fite, A., Zhang, H., Abrams, J., Sarkar, F.H., Hillman, G.G. Cancer Res 67(5): 2141-2149 (2007)	68, 69	83a, 83b, 83c						Retract Paper
Paper 59 **Reference #257**	Rahman, K.M.W., Sarkar, F.H., Banerjee, S., Wang, Z., Liao, D.J., Hong, X., Sarkar, N.H. Mol Cancer Ther 5: 2747-2756 (2006)	85a, 85b	86c, 131	X					Retract Paper
Paper 60 **Reference #258**	El-Rayes, B.F., Ali, S., Ali, I.F., Philip, P.A., Abbruzzese, J., Sarkar, F.H. Cancer Res 66:10553-10559 (2006)	71c	70, 71a, 71b	X					Retract Paper
Paper 61 **Reference #263**	Zhang, Y., Wang, Z., Ahmed, F., Banerjee, S., Li, Y., Sarkar, F.H. International J. Cancer 119: 2071-2077 (2006a)	72	73, 89b, 93e	X					Retract Paper
Paper 62 **Reference #267**	Barve, V., Ahmed, F., Adsule, S., Banerjee, S., Kulkarni, S., Katiyar, P., Anson, C.E., Powell, A.K., Padhye, S., Sarkar, F.H. J. Med. Chem 49, 3800-3808 (2006)	Allegation 71b is addressed under Reference #258							No action

Paper 63 **Reference #272**	Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. Cancer 106:2503–2513 (2006b)		83d, 83e, 83f, 86d, 89c, 90a, 138	X					Retract Paper
Paper 64 **Reference #277**	Wang, Z., Zhang, Y., Li, Y., Banerjee, S., Liao, J., Sarkar, F.H. Molecular Cancer Ther 5(3):483–493 (2006c)	84b	74, 80c, 81b, 81c, 81d, 81i, 83g, 83h, 83i, 83j, 84a, 86e, 86f, 89e, 89f, 90b, 91c, 92a, 93f, 138	X					Retract Paper
Paper 65 **Reference #278**	Wang, Z., Banerjee, S., Li, Y., Rahman, K.M.W., Zhang, Y., Sarkar, F.H. Cancer Res 66(5): 2778-274 (2006d)		75, 81h, 81k, 83k, 86g, 89g, 89i, 91d, 91e, 131, 134	X					Retract Paper
Paper 66 **Reference #280**	Mohammad, R.M, Banerjee, S., Li, Y., Aboukameel, A., Kucuk, O., Sarkar, F.H. Cancer 106:1260–1268 (2006)	76	80b, 80f, 83L, 84c, 91f	X					Retract Paper
Paper 67 **Reference #282**	Zhang, Y., Banerjee, S., Wang, Z., Xu, H., Zhang, L., Mohammad, R., Aboukameel, A., Adsay, N.Z., Che, M., Abbruzzese, J.L., Majumdar, A.P.N., Sarkar, F.H. Cancer Res 66(2): 1025-1032 (2006b)	77, 77a, 78	83m, 86h	X					Retract Paper
Paper 68 **Reference #284**	Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. Inter. J. Cancer 118, 1930–1936 (2006e)		79, 79a, 80d, 80e, 81a, 81j, 83n, 83o, 83p, 83q, 86i, 89g, 89h, 89i, 89j, 89k, 89L, 90c, 91f, 91g, 92b, 138	X					Retract Paper
Paper 70 Reference #293	Rahman, K.M.W., Ali, S., Aboukameel, A., Sarkar, S.H., Wang, Z., Philip, P.A., Sakr, W.A., Raz, A. Mol Cancer Ther 6(10), 2757-2765 (2007)	None: This paper does not involve Dr. F.H. Sarkar							
Paper 73 **Reference #296**	Bao B, Ali S, Ahmad A, Li Y, Banerjee S, Kong D, Aboukameel A, Mohammad R, Van Buren E, Azmi AS, Sarkar FH. Stem Cells Dev. 23(16):1947-1958 (2014)	141							No action
Paper 74 **Reference #297**	Bao B, Azmi A, Aboukameel A, Ahmad A, Bolling-Fischer A, Sethi S, Ali S, Li Y, Kong D, Banerjee S, Back J, Sarkar FH. J Biol Chem. (2014) 289:14520-14533	142							No action
Paper 75 **Reference #301**	Lian F, Li Y, Bhuiyan M, Sarkar FH. Nutr Cancer. 33(2):125-131 (1999)	143							No action

Grant Applications and Progress Reports									
R01 CA120008	2005, 05 20 – Sarkar Proposal 05083189.pdf Targeting notch signaling for pancreatic cancer		81f, 81g, 92c, 95	X					
No allegation 96									
R01 CA131151-01	2007, 02 01 – Sarkar Proposal 14114-001.pdf A novel and targeted approach to inhibit invasion and angiogenesis		83r, 97, 98	X					
R01 CA131456	2007, 02 05 – Sarkar Proposal 07050620.pdf Chemoprevention of pancreatic tumor progression		80g, 81e, 83s, 83t, 83u, 83v, 84d, 86j, 89m	X					
Progress Report R01 CA101870	2007, 03 22 - Sarkar Proposal 07060904.pdf Targeting Akt/NF-kappa beta for Pancreatic Cancer Therapy	101	99, 100, 102	X					
Progress Report: R01 CA131151-02	2009, 04 10 - Sarkar Proposal 09071199.pdf A novel and targeted approach to inhibit invasion and angiogenesis	106	103, 104, 105, 107	X					
R01 CA083695	2006, 10 26 - Sarkar Proposal 07010062.pdf Molecular Mechanism of Genistein (Isoflavone) in Prostate Cancer		8, 144	X					
Patent Application									
Patent WO 2011/ 126544 A2	10-967 PCT_US2011_000561 Thymoquinone Analogs for the Treatment of Pancreatic Cancer		108	X					
Dissertation									

Corrections to the Scientific Record

The Investigation Committee evaluated the prospects of correcting the scientific record for each instance of fabrication and/or falsification, whether the concern was determined to be research misconduct or not. The Committee determined how to correct the scientific record based upon confidence that correct data were identifiable. Recommended corrections by publishing errata were possible only in those few instances when mistakes could be verified based upon the laboratory record and a determination made that authentic, original data were found to be validly associated with the experiment and the publication.

The **10** publications recommended for **possible correction** are:

Paper 1 (Reference #179) Ahmad, A., Wang, Z., Kong, D., Ali, S., Li, Y., Banerjee, S., Ali, R., Sarkar, F.H. Breast Cancer Res Treat 122, 337-346, (2010);

- Replace duplicated panels in Figures 5A, 5B & 6C.

Paper 13 (Reference #152) Ahmad, A., Wang, Z., Kong, D., Ali, R., Ali, S., Banerjee, S., Sarkar, F.H. Breast Cancer Res Treat, 126, 15-25, (2011)

- Replace Figure 3C with a version demarcating the cutting and pasting.

Paper 20 (Reference #097) Li, Y., Kong, D., Wang, Z., Ahmad, A., Bao, B., Padhye, S., Sarkar, F.H. Cancer Prev Res, 4, 1495-1506, (2011). **(Allegations 39, 136)**

- Replace duplicated panels in Figures 3A & 3C; Replace PSA bands in Figure 6A.

Paper 21 (Reference #106) Bao, B., Wang, Z., Ali, S., Kong, D., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Miele, L., Sarkar, F.H. J Cell Biochem 112, 2296-2306 (2011) **(Allegations 40, 41, 42)**

- Replace the pasted vimentin bands in Figure 1C.

Paper 24 (Reference #182) Ahmad, A., Kong, D., Wang, Z., Sarkar, S.H., Banerjee, S., Sarkar, F.H. J Cell Biochem, 108, 916-925 (2009) **(Allegations 1, 2, 44)**

- Replace duplicated panels in Figure 5C.

Paper 26 (Reference #083) Singh-Gupta, V., Banerjee, S., Yunker, C., Rakowski, J.T., Jiner, M.C., Konskiu, A.A., Sarkar, F.H., Hillman, G.G. Cancer Letters, 318, 86-92 (2012). **(Allegation 46)**

- Replace the duplicated "B-DIM+Rad" image in Figure 1C.

Paper 37 (Reference #204) Solomon, L.A., Ali, S., Banerjee, S., Munkarah, A.R., Morris, R.T., Sarkar, F.H. J Ovarian Res 1(1):9 (2009). **(Allegation 127)**

- Replace Figure 3 so that the A2780 and C200 panels are switched and correctly labeled.

Paper 42 (Reference #026) Patzkó, Á., Bai, Y., Saporta, M.A., Katona, I., Wu, X., Vizzuso, D., Feltri, L.M., Wang, S., Dillon, L.M., Kamholz, J., Kirschner, D., Sarkar, F.H., Wrabetz,L., Shy, M.E. Brain 135:3551–3566 (2012)

- Duplicate panel in Figure 2A appears already to have been replaced by the corresponding author.

Paper 71 (**Reference #111**) Bao B, Ali S, Kong D, Sarkar SH, Wang Z, Banerjee S, Aboukameel A, Padhye S, Philip PA, Sarkar FH. PLoS One. 6(3):e17850. (2011). **(Allegation 139)**

- Replace duplicate panels in Figure 3C

Paper 57 (**Reference #244**) Banerjee, S., Hussain, M., Wang, Z., Saliganan, A., Che, M., Bonfil, D., Cher, M., Sarkar, F.H. Cancer Res 67(8):3818–3826 (2007). **(Allegation 67)**

- Replace PARP, Bcl-xL and Bax bands in Figure 4D with bands without masking and with lines showing cut marks

There are **22** publications listed in Table 3 above for which "**no action**" is recommended either because there was no determination of research misconduct because there was no preponderance of evidence, or because the publication was outside the period of investigation (e.g., Reference #301).

All the other publications in Table 3 with substantiated allegations are **recommended for retraction** because the Investigation Committee determined that there are no authentic data, no verifiable laboratory record of the experiment, no reasonable explanation of the fabrication and/or falsification or plagiarism, and that the Investigation Committee has no confidence that Dr. Sarkar or any of the lab members know what data might be authentic for any given allegation. On the basis of an exhaustive examination of the all material submitted, and all available laboratory records, the Investigation Committee considers it highly unlikely that any data that might be provided by Dr. Sarkar or other lab members to correct results determined in this report to be fabricated and/or falsified could be independently verified and validated. Among the publications where some of multiple allegations are found not to be instances of research misconduct, the remaining substantiated allegations justify recommending retraction.

Therefore, the Investigation Committee recommends that these **42 publications be retracted**:

Paper 2 (Reference #245) Kong, D., Li, Y., Wang, Z., Banerjee, S., Sarkar, F.H. Cancer Res 67, 3310-3319, (2007)

Paper 3 (Reference #262) Wang, Z., Sengupta, R., Banerjee, S., Li, Y., Zhang, Y., Rahman, K.M.W., Aboukameel, A., Mohammad, R., Majumdar, A.P.N., Abbruzzese, J.L., Sarkar, F.H. Cancer Res, 66, 7653-7660, (2006a)

Paper 4 (Reference #259) Bhuiyan, M.M.R., Li, Y., Banerjee, S., Ahmed, F., Wang, Z., Ali, S., Sarkar, F.H. Cancer Res, 66, 10064-10072, (2006)

Paper 5 (Reference #255) Banerjee, S., Zhang, Y., Wang, Z., Mingxin, C., Chiao, P.J., Abbruzzese, J.L., Sarkar, F.H. Int. J. Cancer, 120, 906-917, (2006)

Paper 6 (Reference #050) Wang, Z., Ali, S., Banerjee, S., Bao, B., Li, Y., Azmi, A.S., Korc, M., Sarkar, F.H. J Cell Physiol, 228(3), 556-562 Bao

Paper 7 (Reference #061) Soubani, O., Ali, A.S., Logna, F., Ali, S., Philip, P.A., Sarkar, F.H. Carcinogenesis, 33(8):1563-1771 (2012)

Paper 9 (Reference #077) Ali, S., Ahmad, A., Aboukameel, A., Bao, B., Padhye, S., Philip, P.A., Sarkar, F.H. Cancer Lett, 319, 173-181, (2012)

Paper 10 (Reference #079) Ali, S., Banerjee, S., Logna, F., Bao, B., Philip, P.A., Korc, M., Sarkar, F.H. J Cell Physiol, 227, 3373-3380, (2012)

Paper 12 (Reference #151) Ali, S., Ahmad, A., Banerjee, S., Padhye, S., Dominiak, K., Schaffert, J.M., Wang, Z., Philip, P.A., Sarkar, F.H. Cancer Res, 70, 3606-3617, (2010)

Paper 14 (Reference #122) Ali, S., Almhanna, K., Chen, W., Philip, P.A., Sarkar, F.H. Am J Trans Res, 3, 28-47, (2011)

Paper 15 (Reference #072) Kong, D., Heath, E., Chen, W., Cher, M., Powell, I., Heilbrun, L., Li, Y., Ali, S., Sethi, S., Hassan, O., Hwang, C., Gupta, N., Chitale, D., Sakr, W.A., Menon, M., Sarkar, F.H. Am J Trans Res, 4, 14-23, (2012)

Paper 16 (Reference #130) Banerjee, S., Kong, D., Azmi, A.S., Wang, Z., Ahmad, A., Sethi, S., Sarkar, F.H Int. J. Cancer, 128, 1240-1250, (2010)

Paper 17 (Reference #162) Ali, S., Banerjee, S., Schaffert, J.M., El-Rayes,B.F., Philip, P.A., Sarkar, F.H. J Cellul Biochem, 110, 171-181, (2010)

Paper 18 (Reference #188) Banerjee, S., Wang, Z., Kong, D., Sarkar, F.H. Cancer Res, 69, 5592-5600, (2009)

Paper 19 (Reference #236) Wang, Z., Banerjee, S., Kong, D., LI, Y., Sarkar, F.H. Cancer Res, 67, 8293-8300, (2007a)

Paper 25 (Reference #046) Xia, J., Li, Y. [Youlian], Yang, Q., Mei, C., Chen, Z., Bao, B., Ahmad, A., Miele, L., Sarkar, F.H., Wang, Z. Intern. J., Molecular Sci, 13, 9627-9641 (2012)

Paper 28 (Reference #270) Li Y., Kucuk, O., Hussain, M., Abrams, J., Cher, M.L., Sarkar, F.H. Cancer Res. 66(9): 4816-25 (2006)

Paper 32 (Reference #218) Wang, Z., Song, W., Aboukameel, A., Mohammad, M., Wang, G., Banerjee, S., Wang, S., Kang, D., Wang, S., Sarkar, F.H., Mohammad, R. Int J Cancer. 123(4):958-66 (2008)

Paper 39 (Reference #198) Ali, S., Varghese, L., Pereira, L., Tulunay-Ugur, O.E., Kucuk, O., Carey, T.E., Wolf, G.T., Sarkar, F.H. Cancer Letters 278: 201-209 (2009)

Paper 40 (Reference #291) Ma, J., Zhang, Q., Chen, S., Fang, B., Yang, Q., Chen, C., Miele, L., Sarkar, F.H., Xia, J., Wang, Z. PLoS One. 8(7):e69485 (2013)

Paper 41 (Reference #292) Li, Y., Ahmed, F., Ali, S., Philip, P.A., Kucuk, O., Sarkar, F.H. Cancer Res 65(15): 6934-6942 (2005)

Paper 69 (**Reference #099**) Wang, Z., Banerjee, S., Ahmad, A., Li, Y., Azmi, A.S., Gunn, J.R., Kong, D., Bao, B., Ali, S., Gao, J., Mohammad, R.M., Miele, L., Korc, M., Sarkar, F.H. PLoS ONE 6(6): e20537, (2011)

Paper 43 (**Reference #107**) Bao, B., Wang, S., Ali, S., Kong, D., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Miele, L., Sarkar, F.H. Cancer Letters 307(1): 26–36 (2011)

Paper 44 (**Reference #118**) Maitah, M.A., Ali, S., Ahmad, A., Gadgeel, S., Sarkar, F.H. PLoS ONE 6 (1): e16068 (2011)

Paper 46 (**Reference #139**) Wang, Z., Li, Y., Ahmad, A., Banerjee, S., Azmi, A.S., Kong, D., Wojewod, C., Miele, L., Sarkar, F.H. Journal of Cellular Biochemistry 112:78–88 (2011)

Paper 47 (**Reference #149**) Banerjee, S., Azmi, A.S., Padhye, S., Singh, M.W., Baruah, J.B., Philip, P.A., Sarkar, F.H., Mohammad, R.M. Pharm Res 27: 1146–1158 (2010)

Paper 72 (**Reference #167**) Wang Z, Li Y, Banerjee S, Kong D, Ahmad A, Nogueira V, Hay N, Sarkar FH. J Cell Biochem. 109(4):726-736. (2010)

Paper 49 (**Reference #186**) Banerjee, S., Kaseb, A.O., Wang, Z., Kong, D., Mohammad, M., Padhye, S., Sarkar, F.H., Mohammad, R.M. Cancer Res 69:5575-5583 (2009).

Paper 51 (**Reference #196**) Gadgeel, S.M., Ali, S., Philip, P.A., Wozniak, A., Sarkar, F.H. Cancer 115:2165–2176 (2009)

Paper 53 (**Reference #217**) Ali, S., Banerjee, S., Ahmad, A., El-Rayes,B.F., Philip, P.A., Sarkar, F.H. Mol Cancer Ther 7, 1708-1719 (2008)

Paper 55 (**Reference #231**) Wang, Z., Kong, D., Banerjee, S., Li, Y., Adsay, N.V., Abbruzzese, J., Sarkar, F.H. Cancer Res 67:11377-11385 (2007b)

Paper 56 (**Reference #234**) Gadgeel, S.M., Ali, S., Philip, P.A., Ahmed, F., Wozniak, A., Sarkar, F.H. Cancer 110: 2775–2784 (2007)

Paper 58 (**Reference #247**) Raffoul, J.J, Banerjee, S., Singh-Gupta, V., Knoll, Z.E., Fite, A., Zhang, H., Abrams, J., Sarkar, F.H., Hillman, G.G. Cancer Res 67(5): 2141-2149 (2007)

Paper 59 (**Reference #257**) Rahman, K.M.W., Sarkar, F.H., Banerjee, S., Wang, Z., Liao, D.J., Hong, X., Sarkar, N.H. Mol Cancer Ther 5: 2747-2756 (2006)

Paper 60 (**Reference #258**) El-Rayes, B.F., Ali, S., Ali, I.F., Philip, P.A., Abbruzzese, J., Sarkar, F.H. Cancer Res 66:10553-10559 (2006)

Paper 61 (**Reference #263**) Zhang, Y., Wang, Z., Ahmed, F., Banerjee, S., Li, Y., Sarkar, F.H. International J. Cancer 119: 2071-2077 (2006a)

Paper 63 (**Reference #272**) Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. Cancer 106:2503–2513 (2006b)

Paper 64 (**Reference #277**) Wang, Z., Zhang, Y., Li, Y., Banerjee, S., Liao, J., Sarkar, F.H. Molecular Cancer Ther 5(3):483–493 (2006c)

Paper 65 (**Reference #278**) Wang, Z., Banerjee, S., Li, Y., Rahman, K.M.W., Zhang, Y., Sarkar, F.H. Cancer Res 66(5): 2778-274 (2006d)

Paper 66 (**Reference #280**) Mohammad, R.M, Banerjee, S., Li, Y., Aboukameel, A., Kucuk, O., Sarkar, F.H. Cancer 106:1260–1268 (2006)

Paper 67 (**Reference #282**) Zhang, Y., Banerjee, S., Wang, Z., Xu, H., Zhang, L., Mohammad, R., Aboukameel, A., Adsay, N.Z., Che, M., Abbruzzese, J.L., Majumdar, A.P.N., Sarkar, F.H. Cancer Res 66(2): 1025-1032 (2006b)

Paper 68 (**Reference #284**) Wang, Z., Zhang, Y., Banerjee, S., Li, Y., Sarkar, F.H. Inter. J. Cancer 118, 1930–1936 (2006e)

Errata

The Investigation Committee is aware of 5 instances when Dr. Sarkar either submitted or has already published errata for publications under investigation in an attempt to correct the scientific record.

- Paper 6 (Reference #079) Allegation 14. See DIO4915 Image File A, slides 111 & 114.
  Wang, Z., et al., J Cell Physiol, 229(8), p.1118, (2014) DOI: 10.1002/jcp.24551

  Given that concerns about the authenticity of the "original data" led to the finding of fabrication and/or falsification, the Committee does not find that this erratum corrects the scientific record.

- Paper 8 (Reference #241) Allegation 17. See DIO4915 Image File A, slide 128.
  Li, Y., et al, J Biological Chem. (2013) 288(48), p.34755

  The Committee agrees that this is an acceptable correction to the scientific record.

- Paper 15 (Reference #079) Allegation 27. See DIO4915 Image File B, slide 211.
  Kong, D., et al., Am J Transl Res. (2013) 6(1):102-103. PMID: 24349627

  The Committee finds that this erratum does not correct the scientific record and should also be retracted.

- Paper 42 (Reference #026) Allegation 133. See DIO4915 Image File C, slide 479.
  Patzkó, Á., et al., Brain (2014) - http://dx.doi.org/10.1093/brain/awu269

  The Committee agrees that this is an acceptable correction to the scientific record.

- Paper 71 (Reference #111) Allegation 139. See DIO4915 Image File E, slide 727.
  A correction proposed in the response but no evidence it was submitted to PLoS One.

  The Committee agrees that this would be an acceptable correction to the scientific record.

GENERAL CONCLUSIONS

The Investigation Committee's evaluation of the allegations included inquiring about the management and work environment or "culture" in Dr. Sarkar's laboratory. The Investigation Committee considered Dr. Sarkar's leadership, his laboratory members' understanding of their responsibilities and of Dr. Sarkar's expectations, laboratory operations and research practices, how Dr. Sarkar and his associates, assistants and collaborators interacted, and how research results were communicated within the laboratory. The Committee concludes that this "culture," the consistent patterns of behavior by Dr. Sarkar and his laboratory members, the highly frequent claims of mistakes, the numerous instances when no laboratory record or identifiable original data were found, and the scale of the confirmed instances of research misconduct demonstrate that Dr. Sarkar was reckless in his research activities, as understood under University policy and 42 CFR Part 93. However, for each individual allegation, the determination of whether research misconduct occurred or not, and by whom,

was based in every instance solely upon careful evaluation of the evidence discovered within the publications or grant applications, in the laboratory record and computer drives, and in consideration of submitted documentation and testimony.

The Investigation Committee concludes, based on interviews with Dr. Sarkar and the witnesses, that Dr. Sarkar focused on getting more grants funded and on publishing more papers to demonstrate productivity that would support grant applications. Dr. Sarkar claimed there was no motivation for him to fabricate or falsify data (Sarkar Transcript, V.2, p.291, ll.17-22; p.300, ll.10-23; p.301, pp.7-9; p.301, ll.23 to p.302, ll.1). Dr. Sarkar also claimed there was no motivation for his lab members to fabricate or falsify data since "... they had nothing to gain, because they didn't want to pursue their independent scientific career" (Sarkar Transcript, V.2, p.299, ll.9-16). Yet the Committee notes that the consequences of the research misconduct cited in this report include inflating Dr. Sarkar's research productivity and enhancing the likelihood of his receiving more NIH funding. Despite Dr. Sarkar's claim that there was no incentive for getting grants (Sarkar Transcript, V.2, p.300, ll.20-23), the Committee notes that Dr. Sarkar would have benefitted in his annual merit reviews by having been awarded NIH grants, as well as by his inflated publication record. The Investigation Committee finds it likely that Dr. Sarkar's funding history and publication record would have contributed to his being named a Distinguished Professor and to his professional standing in his field.

Leadership. Dr. Sarkar is the director of his laboratory, is the PI on the several NIH grants that funded the research in his laboratory during the period under investigation, and by all accounts, including his own, he is the leader of his laboratory and a distinguished scholar in the field of cancer research. The members of his laboratory acknowledge him as their leader and hold him in high regard. They consistently report that Dr. Sarkar is very hard working and smart. They express loyalty and indebtedness to Dr. Sarkar. He is also respected by his collaborators, even when they emphasize their independence from him. His titles, positions and activities – within and beyond the University – indicate that Dr. Sarkar has an excellent reputation in the cancer research field.

The Investigation Committee finds that Dr. Sarkar sets the direction of his laboratory in semi-annual "brainstorming" sessions and weekly lab meetings but there is little evidence that Dr. Sarkar exercised direct supervision or oversight of laboratory staff or of the quality of their work. The Committee finds that Dr. Sarkar's expectations seemed to have influenced how some lab members selected and presented results. The Committee finds no evidence that Dr. Sarkar was involved directly in training any student or staff member. Despite this, Dr. Sarkar appears to have had a significant influence on his graduate student, Dr. Wang. In his dissertation, Dr. Wang gratefully acknowledged Dr. Sarkar as his respected mentor and guide who "...has taught me innumerable lessons and insights on the academic research" (p.iii). Dr. Wang also thanked Dr. Banerjee, Dr. Kong and Ms. Ali, as well as Drs. Li and Rahman, for "... sharing their knowledge and experience" (p.iii).

Based on interviews with Dr. Sarkar and others, the Investigation Committee is convinced that Dr. Sarkar is and was aware of what constitutes good laboratory practice, and knew how and by whom those practices were not followed in his laboratory. In particular, the laboratory records kept by Dr. Banerjee and Dr. Wang were confusing, incomplete, disorganized, and uncorrected by Dr. Sarkar. The inadequacies of record-keeping both contributed to the fabrication and falsification found in many of Dr. Sarkar's publications and rendered it very difficult for the Investigation Committee to authenticate or validate many experiments described in the publications. The Committee concludes that Dr. Sarkar took only cursory steps to correct problems with record-keeping. For example, Dr. Banerjee who kept no workable record of his experiments, testified he was admonished about this by Dr. Sarkar at least once (Banerjee Transcript, V.1, pp.133-137). Yet the problem persisted and Dr. Sarkar admits that he should have done more to correct this.

The Investigation Committee concludes that Dr. Sarkar has no basis to claim that he did not know what was happening in his laboratory because he was too busy or not paying attention. The evidence shows that Dr. Sarkar failed to establish or maintain standards of quality control in record keeping, or to exercise due diligence to correct unacceptable practices. The Committee concludes, based on an examination of the evidence, that Dr. Sarkar's failures of mentorship and laboratory management rise to levels of recklessness that enable irresponsibility, uncritical collegiality, acceptance of poor laboratory practices, indiscriminant awarding of authorships, and ultimately resulted in widespread research misconduct by him and others.

Collegiality. The members of Dr. Sarkar's laboratory appear to get along nicely. They share in Dr. Sarkar's drive to achieve and are also self-motivated to succeed. Multiple members of the laboratory might contribute to a particular publication and be co-authors. However, the Investigation Committee found that staff scientists at all levels were mostly "silo-ed" in that they worked essentially alone on one to three projects (papers) at a time, with infrequent contributions from others. There is no evidence that anyone in Dr. Sarkar's laboratory exercises critical evaluation of others' methods, analyses, data, figures or manuscripts. Manuscripts and the research behind them are viewed at every stage as the primary responsibility of one person, almost exclusively the first author of the publication. Dr. Sarkar claimed responsibility for the final products. The work of others on their own projects, and even in a few instances data collected by one person for another's project, appear to have been accepted at face value by Dr. Sarkar and others. Dr. Sarkar's apparent failure to critically evaluate the work by his subordinates extends also to his responses to these allegations when Dr. Sarkar had every reason to suspect the integrity of the work done in his lab.

Accepted Practices. Several poor and/or irresponsible research practices appear entrenched in Dr. Sarkar's laboratory. In addition to the often poor or non-existent research records noted above, these include tailoring results toward specific conclusions, image manipulation, viewing figures and images as merely representative or irrelevant to experimental outcomes, and a reckless disregard of a meaningful use of control groups or control conditions. Practices falling short of accepted laboratory standards are not in themselves evidence of misconduct, but their acceptance by Dr. Sarkar contributed to instances of research misconduct. The Investigation Committee concludes that copying and re-using and manipulating images were accepted and practiced by many if not all lab members. The Committee also notes that, contrary to accepted standards of authorship, responsibility for publications was diluted by either cavalierly granting co-authorships for trivial contributions or, as Dr. Sarkar said, "... many times a co-author may not have a significant contribution, but I put the name of the co-author so that we can build our portfolio towards the objectives of the program project grant" (Sarkar Transcript, V.1, p.92, ll.10-14).

Recklessness. The Investigation Committee concludes that Dr. Sarkar is responsible, directly and indirectly, for all of the research misconduct in his laboratory because he neglected supervision, permitted and/or encouraged practices such as re-using, re-arranging, copying, manipulating and re-labeling data images, and promoted a disregard for the value and integrity of data, especially by dismissing the importance of control conditions to such an extent that members of his lab appear to have acted purposefully to use and re-use Western blot bands in published figures to indicate expected results in experiments even when the bands were taken from other experiments.

Dr. Sarkar cannot excuse himself from his responsibility by claiming ignorance for several reasons. First, while outside the period under investigation, there are earlier publications by Dr. Sarkar – without other Respondents as co-authors – showing cutting and pasting and re-using images, including publication of the 8-lane Rb bands image from file "Rb(vivo).jpg" that was re-used repeatedly in subsequent papers (e.g., References #294 & #301).

Second, the Investigation Committee finds that Dr. Sarkar was reckless in his research because he had every occasion to review raw data and inspect figures at any step prior to submission of a manuscript or grant application and there is little evidence that he did so. Several people testified that Dr. Sarkar worked on manuscripts every weekend at home. The files on Dr. Sarkar's sequestered lab computers included few interim drafts or copies of experimental data. His lab computers mostly contained final drafts of manuscripts. The lack of additional drafts or data on his lab computers is consistent with Dr. Sarkar writing manuscripts on a computer at home, a computer that was not available to the Committee. Given his direct involvement in writing, reviewing and editing all these manuscripts and the dozens of instances of fabrication and falsification contained in these publications and grant applications for years, the Investigation Committee concludes that Dr. Sarkar was aware of, tolerated, and likely promoted these practices.

Third, Dr. Sarkar demonstrated his reckless research practices by so pervasive a pattern of falsification and fabrication and plagiarism among so many people over an extended period of time that the Investigation Committee determined that it is highly unlikely that Dr. Sarkar could not have known about the repeated copying, re-use, manipulation and re-labeling of images and figures. The Committee concludes that Dr. Sarkar was reckless in failing to check his data and drafts of his figures, and by failing to establish a basic system of checks and balances for critical review of work, data, figures, or writing.

Fourth, Dr. Sarkar demonstrated his continuing recklessness by submitting fabricated, falsified, and inaccurate responses to the allegations. The Investigation Committee finds it very difficult to believe that any researcher, upon learning of so many allegations against his work, could fail to examine every piece of data, to question every method, and to challenge even trusted lab members. Yet, as documented above, a number of responses contained fabricated or falsified data. It strains credulity that the Respondents would have been unable to locate so many of the original images used in the figures addressed in these allegations, when they were often able to locate alternative, duplicate or repeated images they purported to be from the same experiments, often with lanes in the correct order for a "replacement" figure. Further, the Investigation Committee notes, per Federal guidelines regarding a respondent's responsibilities, that the "... failure to provide research records adequately documenting the questioned research is evidence of research misconduct..." where a respondent "... had the opportunity to maintain the records but did not do so, or maintained the records and failed to produce them in a timely manner ..." (cf, 42 C.F.R. § 93.106).

Fifth, Dr. Sarkar demonstrates his recklessness in research practice by failing to maintain even basic laboratory records and data management protocols as required by NIH regulations. The repeated failure by him and his team to find original data demonstrates this clearly. The Investigation Committee was able to find some original data – albeit by brute-force searching – that Dr. Sarkar and his team claimed they could not find. There was even one occasion where Dr. Sarkar submitted as replicated data, data that were actually original. This suggests that he and his team apparently do not know at this point what data are real and what are fabricated, and have no means to find out given that their lab notebooks are often functionally useless. The Investigation Committee finds Dr. Wang's tangle of re-used and manipulated and re-labeled Western blots, control bands and cell culture photomicrographs is utterly chaotic.

Sixth, Dr. Sarkar demonstrates recklessness by the extent of the carelessness he permitted. Even if there were no intent to deceive on Dr. Sarkar's part – which, based on the evidence, the Investigation Committee finds difficult to believe – the level of carelessness needed to account for all the copying, manipulation and re-labeling of images is so great as to define reckless on its own.

Finally, Dr. Sarkar admitted to "mistakes" that are frankly consistent with recklessness when he testified that he "did not maintain the highest rigor that a scientist must do..." (Sarkar Transcript, V.1, p.293, ll.11-13) and, regarding examining notebooks, raw data and figures, that he "...should have been

much more vigilant. I should have been much more rigorously looking through it. I should have demanded all the raw data, and when they are compiling the data to make a composite figure, I should have cross-checked and checks and balances should have been done thoroughly with me, but because of my time commitment I guess I failed in that category, and I'm recognizing it" (Sarkar Transcript, V.2, p.496, ll.1-16). Similarly, Dr. Sarkar also testified regarding his responses to the Investigation Committee that "...it was part of my own deficiency that I did not spend a significant amount of time looking into these figures and drawing that up and then trying to see where it came from" (Sarkar Transcript V.1, p.175, ll.24 to p.176, ll.2). The Investigation Committee agrees and considers his deficiency to be true not only of how he approached specific responses to allegations during this investigation, but also of how he produced the research, publications and grant applications in the first place. Dr. Sarkar testified that after the investigation began, he changed practices in his lab so that he reviews raw data and checks composite figures (Sarkar Transcript, V.1, pp.111-112; pp.125-126). This indicates that he had not done so before the investigation.

Summary. Dr. Sarkar established in his laboratory an environment and practices which focused on high productivity in publications and grant applications but which disregarded basic checks on the integrity of data, records, and reporting. The Investigation Committee finds that the evidence shows that Dr. Sarkar engaged in and permitted (and tacitly encouraged) intentional and knowing fabrication, falsification, and/or plagiarism of data, and its publication in journals, and its use to support his federal grant applications. The Committee concludes that in establishing and maintaining this laboratory "culture," Dr. Sarkar was persistently reckless and that this recklessness enabled repeated instances of research misconduct over years and across numerous publications and NIH grant applications and progress reports. The Investigation Committee concludes that due to his recklessness, Dr. Sarkar bears overall responsibility for each confirmed instance of research misconduct.