THE OFFICE OF RESEARCH INTEGRITY®

NEWSLETTER

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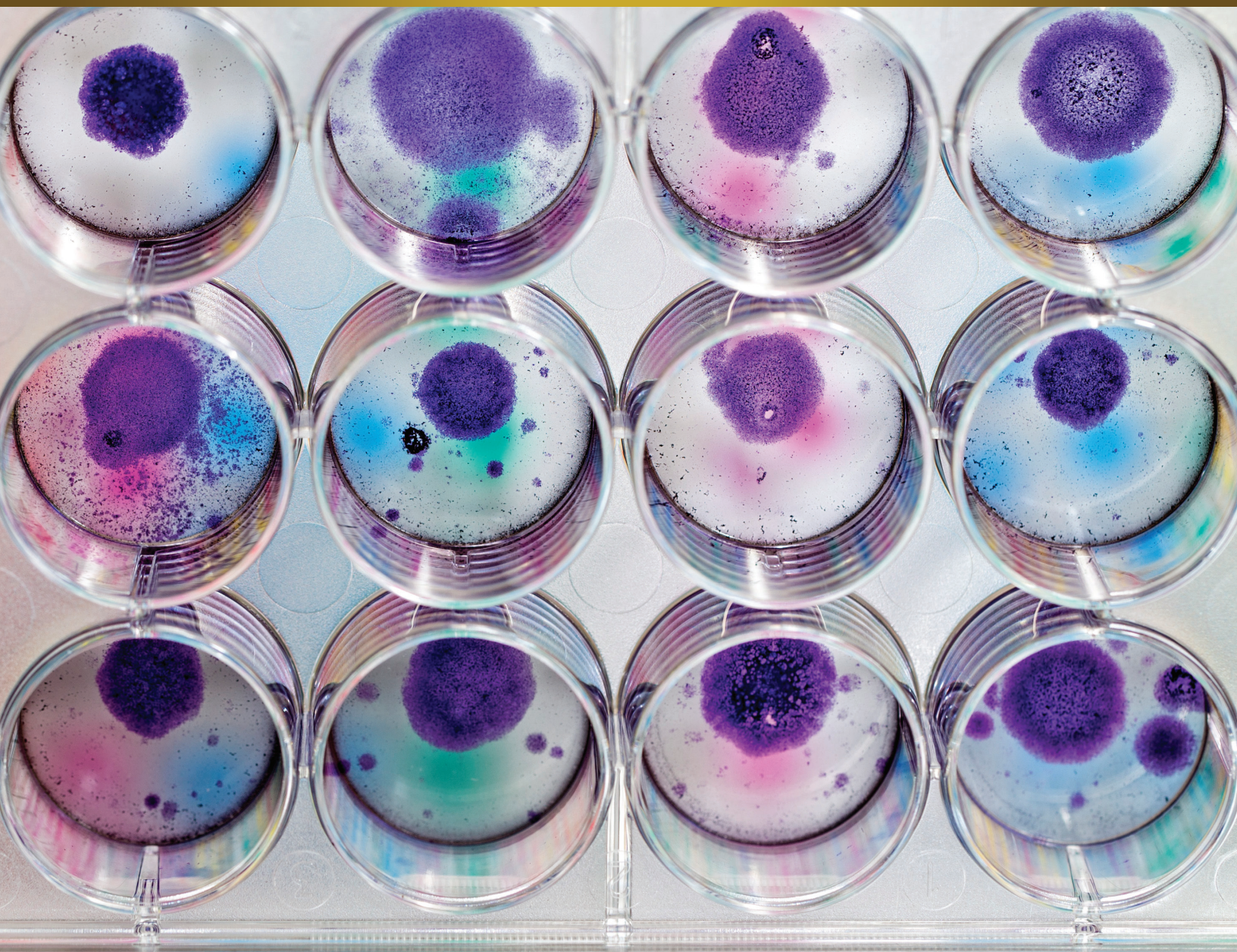

Cancer Test
Source: iStock

IN THIS ISSUE:

Message from the Director's Office

This issue reports on the Administrative Law Judge's granting of summary judgment in the Office of Research Integrity (ORI) case: U.S. Department of Health and Human Services v. Dr. H.M. Krishna Murthy (Murthy case). It discusses an investigation that has taken years – and countless hours of work — to resolve. Additionally, the institution dedicated a massive amount of time and effort to the inquiry and investigation. I'm taking advantage of this opportunity to acknowledge the range of contributions by ORI staff on this case and all other work we do to protect U.S. Public Health Service (PHS) funding.

ORI investigators are most visible to the institutions and Research Integrity Officers (RIOs) who interact with us on cases. Their diligence, pursuit of scientific rigor, and extraordinary technical skill are essential to fair assessment of institutional investigation reports. They make themselves available to provide technical assistance to institutions in developing those reports. ORI investigators also work closely with the U.S. Department of Health and Human Services (HHS) Office of General Counsel (OGC) to weigh the evidence on the likelihood of research misconduct (RM), align findings, and execute administrative actions.

Almost 5,000 institutions in the United States and worldwide who receive PHS funding sign assurances of compliance with 42 C.F.R. Part 93. If an institution's process and/or report for a case involving possible RM is insufficient for ORI to determine if misconduct occurred, ORI conducts a compliance review. ORI then provides written notice to the institution on the differences between its declared and actual processes as reflected in the institutional report, with an aim to remedy inadequacies.

ORI staff handle thousands of queries each year. Extensive recordkeeping and the experience of ORI's staff enable responsive and consistent

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application of 42 C.F.R. Part 93. We also consult with other federal departments and agencies as appropriate, given the sources of funding that may be involved in an allegation of RM.

Experience with cases may be adapted as case studies for a range of ORI training and educational efforts, including website and social media updates, professional presentations, and lectures. ORI hosts a range of domestic and international visitors from institutions seeking to improve their research integrity programs, and we provide grants for workshops and research in RM and the responsible conduct of research.

Everyone at ORI works to meet the intent of 42 C.F.R. Part 93. Case findings attract the public's attention, but the day-to-day actions of ORI staff are essential to success. A judge's ruling in ORI's favor is cause for recognition. In this issue, we're particularly pleased to announce a major decision in the Murthy case, which was released on April 2, 2018. I thank the many ORI staff, particularly the investigators and OGC colleagues, whose perseverance on this case made all the difference.

Wanda K. Jones

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Images in Scientific Publications Under Growing Scrutiny

Kathi E. Hanna

Adding or removing content from a digital image, as opposed to merely processing or sometimes cropping it, is considered manipulation, and it violates the code of ethics of photojournalists. Widespread and easy access to digital image processing software, such as Photoshop, has increased the odds of manipulated images appearing in all types of publications, including scientific journals. Under the regulations that implement ORI's statutory authority at 42 C.F.R. Part 93, research misconduct is defined as "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results." As such, intentional manipulation of images to mislead readers or misrepresent research results is research misconduct.

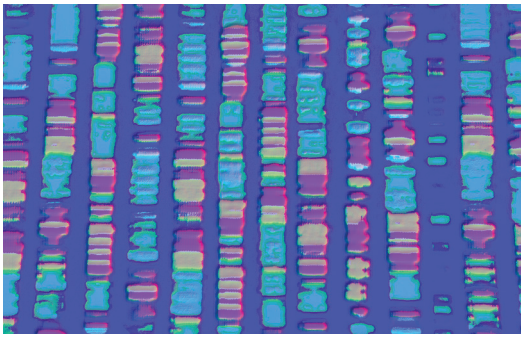

Image is an example of the type of images that may be questioned in a research misconduct allegation. Source: iStock.

Although websites such as PubPeer and Retraction Watch have served to uncover manipulated images of, for example, electrophoresis gels or Western blots, scientific publishers are under pressure to more aggressively ensure the images they publish are true representations of research findings. In the past few years, several studies have documented image manipulation or inappropriate duplication of images in life science journals.

Advanced software has made it easier to analyze images to determine whether they have been manipulated or erroneously duplicated, although such analyses can be time consuming and less than optimal regarding sensitivity and reliability. An editorial and an article published in June 2017 focus on the implications of both prospective and retrospective analysis of digital images submitted to or published in the scientific literature.

An article by Kerry Gens in *The Scientist*[1] reports on efforts by *Molecular and Cellular Biology* to review its archives in search of troubling figures (or images). Based on its review, the journal has begun publishing retractions and corrections. Gens writes that the journal is following the lead of *The EMBO Journal* and the *Journal of Cell Biology* in its efforts to prospectively review submissions for inappropriate manipulation and has gone one step further to review papers dating back to 2010. The journal's editor-in-chief told Gens that the volume of errors is "significant," but many involve simple mistakes that the authors are eager to correct. *The EMBO Journal* editor told *The Scientist* that despite this heightened scrutiny, the error rate remains stable at roughly 20 percent, citing the need for better education.

An editorial published in *Nature*[2] calls for more robust efforts to counter image manipulation, referencing studies that suggest that as many as one in five papers published in the life sciences includes one or more manipulated figures. As an example, the editors call out an independent investigation of the Leibniz Institute on Aging in Germany, which found that one research group of cell biologists had published eight high-impact papers with manipulated images. The group faced a reprimand and sanctions and had to retract or correct findings.

The editors commend journals such as the *Journal of Cell Biology* and the *EMBO Journal* for checking images in all papers accepted for publication and note that other journals do random spot checks. Acknowledging that current processes for assessing image manipulation are labor-intensive, the

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editors encourage development of technological fixes, such as algorithms for improving detection, reliability, and affordable automation of image analysis. However, they emphasize that more is needed. The Leibniz Association, which conducted the independent review in Germany, now requires its scientists to agree in writing to adhere to "good scientific practice" and organizes scientific integrity seminars. In calling for both human and technological approaches to this challenge, the editors note that, "Primary responsibility for image integrity lies with principal investigators, who need to be aware of its importance and ensure that the young scientists in their teams, who came of age in the digital era, wield Photoshop tools appropriately."[2]

References

1. Grens, K. "Journal cleans up image archives." *The Scientist*, June 12, 2017. https://www.the-scientist.com/?articles.view/articleNo/49642/title/Journal-Cleans-Up-Image-Archives/

2. Editorial. "Image doctoring must be halted." *Nature* 546, 575, June 29, 2017. doi:10.1038/546575a

A Pilot Study Identifies Ethical Violations in Biostatistical Consulting

A pilot study by Wang et al. (2017) provides a preliminary view of the types and extent of bioethical violations that can arise between investigators and the biostatisticians with whom they consult. The survey was administered to a randomly drawn sample of 112 professional biostatisticians who routinely consult with biomedical scientists and asked participants (who were anonymous) to respond to 18 scenarios of violations in two ways. Participants were asked if they had been asked by an investigator to commit any of the 18 violations, and if so, how many times in the past five years. Participants also were asked to rank the severity of the violation. The survey did not ask whether the biostatistician actually committed the violation, which the investigators hoped would improve the response rate.

The two most severe violations were: "falsify the statistical significance to support a desired result," which 4% of participants had been asked to do at least once over the past 5 years; and "change data in order to achieve the desired outcome," which also had been asked of 4% of participants at least once in the past 5 years. Less severe violations, as ranked by respondents, also were requested more frequently. For example, 40% of participants said they had been asked to "remove categories of a variable in order to report more favourable results." Nearly half had been asked to "fail to show plot since it did not show as strong as effect as you would have hoped for."

The authors write that this survey "quantified, for the first time, the frequency of requests for 'inappropriate data manipulation or practice' by investigators via consultations with biostatisticians on a national level" (p. 1). The research team has received funding from ORI for a Phase II study to more comprehensively describe the frequency and severity of such requests, with the goal of developing training modules to improve the research ethics culture and reduce the frequency of requests from investigators to violate biostatistical standards.

***Note**: This work was supported by a grant from the Office of Research Integrity (ORI) of the U.S. Department of Health and Human Services (DHHS). Grant No. 1 ORIIR150017-01-00.*

Reference

Wang MQ, Yan AF, Katz RV. Identifying bioethical issues in biostatistical consulting: findings from a US national pilot survey of biostatisticians. *BMJ Open* 2017;7:e018491. doi:10.1136/bmjopen-2017-018491

Events and Community Engagement

ORI's Division of Education and Integrity (DEI) continues to maintain active engagement with the research integrity community.

The Responsible Conduct of Research Instructor Workshop (RCRIW) has quickly become a valued part of ORI's annual programming. This "train-the-trainers" workshop is designed for experienced Responsible Conduct of Research (RCR) instructors to share and model the techniques used in their RCR programs. Attendees gain ideas for improving their own RCR courses and programming. We thank DePaul University and PRIM&R, our cosponsors, for making our third offering of this intensive two-day workshop a success on March 21–22, 2018. Experienced instructors presented on topics such as authorship, data management, program evaluation, and research misconduct. Participants and instructors shared their experiences in optimizing RCR education at their institutions, allowing for lively discussion. ORI is in the planning stage with Emory University and PRIM&R to hold the 4th RCRIW in Atlanta. The dates will be announced soon through our website and eBlasts. Stay tuned!

On April 3–5, 2018, Indiana University and Purdue University hosted "Plagiarism: A Conference on the Identification, Processing, Prevention and Cultural Context of Plagiarism," funded by ORI grant ORIIR170031-01-00. The conference brought together RIOs, RCR instructors, faculty, and federal partners to explore the breadth of plagiarism issues and their subtleties in the modern, multicultural research environment.

Upcoming Events

On June 15, 2018, the University of Utah is presenting "Build Research Integrity through Reproducibility," funded in part by ORI grant ORIIR170034. The one-day conference will feature internationally-known guest speakers, panelists, a poster session, and networking opportunities. For more information, see: http://campusguides.lib.utah.edu/UtahRR18/Conference.

George Mason University is in the final planning stages for its workshop, "Promoting Research Integrity in Multidisciplinary and Multi-team Based Science Initiatives," funded by ORI grant ORIIR170033, to be held in late June or early July. The workshop will focus on National Institutes of Health (NIH) principal investigators and will be aimed at clarifying the nature of lapses in the operation of complex multi-team systems when it comes to research integrity, using the insights of participants from both their direct and indirect multi-teams experience. Watch the ORI website for updates and registration information.

DEI is already in the planning phase for its FY19 events. We are always looking for new cosponsors and new ideas for events. We welcome your suggestions (AskORI@hhs.gov).

Research Misconduct Case Summaries

H.M. Krishna Murthy, Ph.D.

Based on evidence and findings of an investigation conducted by the University of Alabama at Birmingham (UAB), the Office of Research Integrity's (ORI's) review of UAB's investigation, and additional evidence obtained and analysis conducted by ORI in its oversight review of UAB's investigation, ORI found that Dr. H.M. Krishna Murthy (Respondent), former research associate professor in UAB's Department of Vision Sciences, committed research misconduct in research supported by U.S. Public Health Service (PHS) grants, specifically National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH), grants R01 AI051615, R01 AI032078, and R01 AI045623; National Heart, Lung, and Blood Institute (NHLBI), NIH, grants P01 HL034343 and R01 HL064272; and National Institute of Diabetes and Digestive and Kidney Diseases, NIH, grant R01 DK046900.

Falsified and/or fabricated research was reported in:

- *Nature* 444:221-225, 2006 (hereafter referred to as "*Nature* 2006"); retracted in: *Nature* 532:268, 2016 April 14
- *J. Biol. Chem*. 274:5573-5580, 1999 (hereafter referred to as "*J. Biol. Chem*. 1999"); retracted in: *J. Biol. Chem*. 284:34468, 2009
- *Proc. Natl. Acad. Sci*. USA 101:8924-8929, 2004 (hereafter referred to as "*PNAS* 2004"); Editorial Expression of Concern in: *PNAS* 107:6551, 2010 April 6
- *Biochem*. 44:10757-10765, 2005 (hereafter referred to as "*Biochem*. 2005")
- *Proc. Natl. Acad. Sci*. USA 103:2126-2131, 2006 (hereafter referred to as "*PNAS* 2006"); Editorial Expression of Concern in: *PNAS* 107:6551, 2010 April 6
- *Acta Cryst*. D55:1971-1977, 1999 (hereafter referred to as "*Acta Cryst*. 1999"); retracted in: *Acta Cryst*. D66:222, 2010
- *J. Mol. Biol*. 301:759-767, 2000 (hereafter referred to as "*J. Mol. Biol*. 2000"); retracted in: *J. Mol. Biol*. 397:1119, 2010
- *Cell* 104:301-311, 2001 (hereafter referred to as "*Cell* 2001")
- *Biochem*. 41:11681-11691, 2002 (hereafter referred to as "*Biochem*. 2002")
- Protein Data Bank (PDB) identification codes 2HR0, 1BEF, 1RID, 1Y8E, 2A01, 1CMW, 2QID, 1DF9, 1G40, 1G44, 2OU1, and 1L6L (the PDB is funded in part by NIH)

Falsified and/or fabricated research results also were referenced in the following PHS grant applications:

- 1 R21 AI056224-01 submitted to NIAID, NIH
- 1 R01 AI064509-01 submitted to NIAID, NIH
- 1 R01 AI64509-01A1 submitted to NIAID, NIH
- 1 R01 AI051615-01A1 submitted to NIAID, NIH
- 1 R03 TW006840-01 submitted to Fogarty International Center (FIC), NIH

ORI found by a preponderance of the evidence that Respondent intentionally, knowingly, or recklessly engaged in research misconduct by falsifying and/or fabricating X-ray crystallographic data for eleven (11) protein structures and falsely reporting them as experimentally derived from X-ray diffraction experiments in nine (9) publications and in twelve (12) deposits in the PDB. ORI found that Respondent intentionally, knowingly, or recklessly falsified and/or fabricated the PDB coordinate files deposited for all of the eleven (11) structures (PDB entries 2HR0, 1BEF, 1RID, 1Y8E, 2A01, 1CMW, 1G40, 1G44, 2OU1, 1L6L, 2QID, and 1DF9) and the X-ray diffraction data (structure factors) corresponding to six (6) of the eleven (11) structures (PDB entries 2HR0, 1BEF, 1RID, 1Y8E, 2A01, and 1CMW).

Specifically, Respondent falsified and/or fabricated:

- the protein crystal structure of complement component C3b reported in *Nature* 2006 and the

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corresponding structure factors and coordinate file deposited in the PDB for entry 2HR0

- the protein crystal structure of dengue virus NS3 serine protease reported in *J. Biol. Chem*. 1999 and the corresponding structure factors and coordinate file deposited in the PDB for entry 1BEF
- the protein crystal structure of vaccinia virus complement control protein (VCP) in complex with heparin reported in *PNAS* 2004 and the corresponding structure factors and coordinate file deposited in the PDB for entry 1RID
- the protein crystal structure of VCP in complex with suramin (VCP-suramin) reported in *Biochem*. 2005 and the corresponding structure factors and coordinate file deposited in the PDB for entry 1Y8E
- the protein crystal structure of apolipoprotein A-I reported in *PNAS* 2006 and the corresponding structure factors and coordinate file deposited in the PDB for entry 2A01
- the protein crystal structure of Taq DNA polymerase reported in *Acta Cryst*. 1999 and the corresponding structure factors and coordinate file deposited in the PDB for entry 1CMW
- the protein crystal structure of VCP crystal form I reported in *Cell* 2001 and the corresponding coordinate files deposited in the PDB for entry 1G40

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Motions for Summary Judgment Explained

On January 19, 2018, the Administrative Law Judge (ALJ) of the Departmental Appeals Board issued a recommended decision to the then-acting Assistant Secretary for Health (ASH) granting summary judgment in favor of ORI and sustaining ORI's proposal to impose a ten-year debarment and a ten-year ban on PHS advisory services against H.M. Krishna Murthy, Ph.D., formerly at the University of Alabama at Birmingham, as well as correction of his research record. The case, which is summarized in this newsletter, is the second case in the last year decided by the ALJ on a motion for summary judgment.[1]

Although motions are familiar to attorneys, they might not be familiar to everyone else involved in the investigation and adjudication process. When a party to a litigation asks the ALJ to rule on a specific issue, that request is known as a motion. Following a Respondent's request for a hearing, and depending on the ALJ's scheduling order, a party may file a motion for summary judgment in addition to, or sometimes instead of, the parties' pre-hearing briefs laying out their respective cases and evidence. There are many reasons that either party might file a motion. The anticipated result is efficiency in the proceedings that follow. Motions might involve procedural matters or evidentiary issues that could be decided before a full presentation of the case at an in-person hearing. This is common practice in all forms of litigation—criminal, civil, and administrative.

One type of motion is a request for summary judgment. When asking for summary judgment, a party is asserting that there is no material fact in genuine dispute between the two sides. This means that the requester, or moving party, is saying that there is no need for an in-person hearing to determine the facts because none of the facts that are material to a final determination is genuinely in dispute. One way in which the non-moving party can oppose the motion is by showing that any fact is in genuine dispute and would have a material effect on the ALJ's final determination (e.g., whether the Respondent created an image in question).

In deciding on the summary judgment motion, the ALJ focuses on whether the fact in question is genuinely in dispute and material to the outcome. If so, the ALJ would proceed with an in-person hearing; otherwise, the ALJ could grant summary judgment for the requester, deciding the case and ending the hearing process. When ORI succeeds on a motion for summary judgment, the ALJ proceeds with a recommendation to the ASH as the ALJ would if the case had been decided after an in-person hearing.

References

1. *ORI Newsletter* 24(2):4, 2017 September.

- the protein crystal structure of VCP crystal form II reported in *Cell* 2001 and the corresponding coordinate file deposited in the PDB for entry 1G44
- the protein crystal structure of apolipoprotein A-II reported in *Biochem*. 2002 and the corresponding coordinate file deposited in the PDB for entry 2OU1
- the protein crystal structure of apolipoprotein A-II in complex with βoctyl glucoside reported in *Biochem*. 2002 and the corresponding coordinate file deposited in the PDB for entry IL6L
- the protein crystal structure of dengue virus NS3 protease in complex with a Bowman-Birk inhibitor reported in *J. Mol. Biol*. 2000 and the corresponding coordinate files deposited in the PDB for entries 2QID and 1DF9

ORI issued a charge letter enumerating the above findings of research misconduct and proposing HHS administrative actions. Respondent subsequently requested a hearing before an ALJ of the Departmental Appeals Board to dispute these findings. ORI filed a motion for summary judgment, which Respondent opposed. On January 19, 2018, the ALJ issued a recommended decision to the acting Assistant Secretary for Health (ASH) granting summary judgment in favor of ORI and sustaining ORI's proposal to impose a ten-year debarment and a ten-year ban on PHS advisory services against Respondent as well as correction of Respondent's research record. The Acting ASH served a copy of the ALJ's recommended decision on the HHS Debarring Official pursuant to 42 C.F.R. § 93.523(c), and the decision constituted the findings of fact to the HHS Debarring Official in accordance with 2 C.F.R. § 180.845(c). On April 2, 2018, the HHS Debarring Official issued a final notice of debarment to begin on April 2, 2018, and end on April 1, 2028. Thus, the research misconduct findings set forth above became effective, and the following administrative actions have been implemented, beginning on April 2, 2018:

(1) Dr. Murthy is debarred for a period of ten (10) years from eligibility for any contracting or subcontracting with any agency of the United States Government and from eligibility for or involvement in nonprocurement programs of the United States Government, referred to as "covered transactions," pursuant to HHS' implementation (2 C.F.R. Part 376) of Office of Management and Budget (OMB) Guidelines to Agencies on Governmentwide Debarment and Suspension (2 C.F.R. Part 180);

(2) Dr. Murthy is prohibited from serving in any advisory capacity to PHS including, but not limited to, service on any PHS advisory committee, board, and/or peer review committee, or as a consultant for a period of ten (10) years; and

(3) ORI will send a notice to the pertinent journals of the following publications that require retraction or correction and to the PDB for the following entries that require obsolescence, in accordance with 42 C.F.R. § 93.407(a)(1) and § 93.411(b):

- *Cell* 104:301-311, 2001
- *Biochem*. 41:11681-11691, 2002
- *Proc. Natl. Acad. Sci*. USA 101:8924-8929, 2004
- *Biochem*. 44:10757-10765, 2005
- *Proc. Natl. Acad. Sci*. USA 103:2126-2131, 2006
- PDB entries 1RID, 1Y8E, 2A01, 1G40, 1G44, 2OU1, and 1L6L

Colleen T. Skau, Ph.D.

Based on Respondent's admission, an assessment conducted by the National Institutes of Health (NIH), and analysis conducted by the Office of Research Integrity (ORI) in its oversight review, ORI found that Dr. Colleen T. Skau, former postdoctoral fellow in the Cell Biology and Physiology Center of the National Heart, Lung, and Blood Institute (NHLBI), NIH, engaged in research misconduct in research supported by NHLBI, NIH.

ORI found that Respondent engaged in research misconduct by intentionally, knowingly, or recklessly

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reporting falsified and/or fabricated data and/or falsifying and/or fabricating data in the following two (2) papers:

- *Cell* 167(6):1571-1585, 2016 (hereafter referred to as "Paper 1")
- *Proceedings of the National Academy of Sciences* 112(19):E2447-E2456, 2015 (hereafter referred to as "Paper 2")

ORI found that Respondent engaged in research misconduct by intentional, knowing, or reckless falsification and/or fabrication of the research record by selectively reporting by inappropriate inclusion/omission or alteration of data points in ten (10) figures and falsely reporting the statistical significance based on falsified data in ten (10) figures across the two (2) papers and supplementary material. Specifically, ORI found that:

- in Paper 1, Respondent falsified and/or fabricated the research record in:
  - Figure 3B, by selectively omitting/including data points in the Rescue condition
  - Figure 5B, by reporting a significant difference between conditions by performing statistical calculations based on fabricated primary data
  - Figure 5C (bottom), by selectively omitting images and conditions from the analysis
  - Figure 6I (bottom left), by reporting data from the same data set as Figure 6B (top)
  - Figure S5B, by reporting statistical significance despite performing a T test calculation that returned an insignificant p-value
  - Figure 7F, by reporting that error bars represented standard deviation, when they actually represented standard error of the mean (S.E.M.)
  - Figure S4D, by performing different normalizing calculations in the Rescue condition than performed in other conditions and by omitting three data points from the Rescue conditions calculated average
- in Paper 2, Respondent falsified and/or fabricated the research record in:
  - Figure 1E, by selectively omitting data points from the analysis
  - Figure 2A, by selectively omitting data points from the analysis
  - Figure 2C (left and right), by changing selected raw measurements by multiplying with a fixed value to make the data consistent with data collected in other experiments
  - Figure 5B, by selectively including and omitting data points from the analysis
  - Figure 5C, by selectively including and omitting data points from the analysis
  - Figure 7A (right), by reporting that error bars represented standard deviation, when they actually represented standard error of the mean (S.E.M.)

ORI found that Respondent engaged in research misconduct by intentionally, knowingly, or recklessly falsely claiming in the methods and results to have performed validation of deletion/re-expression of FMNR2 levels in genetically modified B16 cell lines when that genetic modification was not validated for data reported in Figures 7 and 7S of Paper 1.

ORI found that Respondent engaged in research misconduct by intentionally, knowingly, or recklessly falsely reporting a larger number of data points than actually were collected in fourteen (14) figures across the two (2) papers and supplementary materials. Specifically:

- in Paper 1, Respondent falsified and/or fabricated the reported data in:
  - Figure 2B (top), by reporting ten (10) cells per condition when nine (9) Knock Down (KD) and eight (8) Rescue were included in the analysis
  - Figure 2B (middle), by reporting ten (10) cells per condition when eight (8) Rescue were included in the analysis
  - Figure 3B (top), by reporting twenty-five (25) cells per condition when nineteen (19) Control, nineteen (19) KD, and fourteen (14) Rescue were included in the analysis

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- Figure 3B (bottom), by reporting twenty-five (25) cells per condition when twenty-four (24) Control and twenty-three (23) Rescue were included in the analysis
- Figure 5A, by reporting to have examined fifty (50) cells per condition, when only twenty-three (23), twenty-three (23), and twelve (12) for the 2mg/mL conditions (Control, KD, and Rescue, respectively) and twenty-five (25), twenty (20), and nine (9) for the 3mg/mL conditions (Control, KD, and Rescue, respectively) were recorded
- Figure 6D, by reporting ten (10) cells per condition when only eight (8) Control were recorded
- Figure 7D, by reporting four (4) mice for each of two (2) independent clones (8 total) for each condition when only four (4) Vector+GFP, four (4) WT, and two (2) B16 conditions were examined
- Figure S2E (top), by reporting to have measured two hundred fifty (250) Focal Adhesions per condition, when only fifty-six (56) measurements were recorded for the Leading Edge Adhesions (LEA) analysis
- Figure S2E (3rd row left and 4th row left), by reporting twenty-five (25) cells per condition when only ten (10) cells were recorded
- Figure S4C, by reporting ten (10) cells per condition when only five (5) cells were recorded
- Figure S5B, by reporting ten (10) cells per condition when only seven (7) and six (6) cells were recorded for Control and KD respectively
- Figure S6E, by reporting twenty-five (25) cells per condition when only twenty-four (24), eighteen (18), and sixteen (16) cells were recorded for Control (48hr), KD (24hr), and KD (48hr) respectively

▸ in Paper 2, Respondent falsified and/or fabricated the reported data in:

- Figure 1E (top), by reporting six (6) cells per condition when only three (3) were recorded in Tropomyosin (Tpm) analysis
- Figure 2C (middle and right), by reporting twenty (20) cells per condition when only sixteen (16), sixteen (16), and five (5) cells were recorded for Control, KD, and Rescue respectively
- Figure 3A (right), by reporting the data from one of four analyses in the KD condition as the average of five
- Figure 3C (right), by reporting examination of ten (10) stress fibers per condition when only three (3), four (4), and seven (7) cells were recorded for Control, KD, and Rescue respectively
- Figure 5B, overstating the number of adhesions examined
- Figure 5C, overstating the number of cells examined in all conditions
- Figure 7D (right), by reporting examination of ten (10) cells per condition when only five (5), four (4), and five (5) cells were recorded for Control, KD, and Rescue respectively

ORI found that Respondent engaged in research misconduct by intentionally, knowingly, or recklessly fabricating results and/or falsely labelling experimental results that arose from alternate experimental conditions/experiments in seven (7) figures across the two (2) papers and supplementary materials. Specifically:

▸ in Paper 1, Respondent falsified and/or fabricated the record in:

- Figure 5B (top right), by reporting results of 8 and 12 um pore migration, which did not originate from experimental observations
- Figure 5B (bottom left), by reporting results for the Rescue condition, which did not originate from experimental observations
- Figure 5B (left), by using selected regions from the same original image to represent both the control (top) and rescue conditions (bottom)
- Figure 5C (bottom), by reporting data derived from 2.5um channels as originating from 3.5um channels

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- Figure 6B (top), by reporting results for the "Glass" condition (all treatments) and rescue treatment (both conditions) that did not originate from experimental observations
- Figure 6B (bottom), by reporting results for the 8um pore condition that did not originate from experimental observations
- Figure 6E, by reporting results for the ATRi and ATMi treatments (Control and KD conditions) and DMSO control (Rescue condition) that did not originate from experimental observations and reporting results as originating from DMSO (Control and KD conditions) controls that had originated from a different treatment Figure 6G, by reporting results for the "No Drug" conditions that did not originate from experimental observations Figure 6I, by reporting results in all conditions that originated in part from the same experimental dataset reported in Figure 6B (top)
- Figure S4D, by reporting results that did not originate from experimental observations for the KD condition
- Figure S6C (right), by shifting selected data points in the KD condition from their original time points to different time points
- Figure S7A, by using bands to represent FMN2 expression in six separate conditions, which originated from different molecular weight regions in three lanes on the original Western blot, and by representing absence of FMN2 expression in two conditions (CRISPR1 and CRISPR2) by reporting absence of bands in lanes in which no protein had been loaded
- Figure S7F (rightmost), by selecting single data points from different treatments and reporting them as means and standard deviations for all of the treatments

▸ in Paper 2, Respondent falsified and/or fabricated the record in:

- Figure 2A (top), by reporting results for the Rescue condition that did not originate from experimental observations
- Figure 3C (right), by reporting results for the Rescue condition that did not originate from experimental observations

Dr. Skau entered into a Voluntary Settlement Agreement and voluntarily agreed, beginning on January 25, 2018:

(1) to have her research supervised for a period of three (3) years; Respondent agreed to ensure that prior to the submission of an application for PHS support for a research project on which Respondent's participation is proposed and prior to Respondent's participation in any capacity on PHS-supported research, the institution employing her must submit a plan for supervision of Respondent's duties to ORI for approval; the plan for supervision must be designed to ensure the scientific integrity of Respondent's research contribution; Respondent agreed that she will not participate in any PHS-supported research until a plan for supervision is submitted and approved by ORI; Respondent agreed to maintain responsibility for compliance with the agreed upon plan for supervision.

(2) that for a period of three (3) years, any institution employing her must submit in conjunction with each application for PHS funds, or report, manuscript, or abstract involving PHS supported research in which Respondent is involved, a certification to ORI that the data provided by Respondent are based on actual experiments or are otherwise legitimately derived and that the data, procedures, and methodology are accurately reported in the application, report, manuscript, or abstract;

(3) if no supervisory plan is provided to ORI, to provide certification to ORI on annual basis that she has not engaged in, applied for, or had her name included on any application, proposal, or other request for PHS funds without prior notification to ORI;

(4) to exclude herself voluntarily from serving in any advisory capacity to PHS including, but

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not limited to, service on any PHS advisory committee, board, and/or peer review committee, or as a consultant for a period of three (3) years; and

(5) to the correction or retraction of:

- *Cell* 167(6):1571-1585, 2016
- *Proceedings of the National Academy of Sciences* 112(19):E2447-E2456, 2015

Bhagavathi Narayanan, Ph.D.

Based on the report of an investigation conducted by New York University (NYU) and analysis conducted by the Office of Research Integrity (ORI) in its oversight review, ORI found that Dr. Bhagavathi Narayanan, former research associate professor in NYU's Department of Environmental Medicine, engaged in research misconduct in research supported by National Cancer Institute (NCI), National Institutes of Health (NIH), grants R03 CA107813, R01 CA106296, R01 CA106296-05S1, R03 CA133929, and P30 CA017613.

ORI found that Respondent engaged in research misconduct by knowingly and intentionally falsifying and/or fabricating data reported in the following three (3) published papers and seven (7) grant applications submitted to NIH:

- *Clin. Cancer Res*. 9:3503-3513, 2003 (hereafter referred to as "*Clin. Cancer Res*. 2003")
- *Anticancer Res*. 31(12):4347-4358, 2011 (hereafter referred to as "*Anticancer Res*. 2011")
- *Int. J. Oncol*. 40:13-20, 2012 (hereafter referred to as "*Int. J. Oncol*. 2012")
- R01 CA163381-01
- R01 CA138741-01A1
- R01 CA106296-06A1
- R01 CA106296-06A2
- R03 CA158253-01A1
- R21 CA170314-01
- R01 ES024139-01

ORI found that Respondent fabricated and/or falsified Western blot data for protein expression levels in cancer tissues and/or cells in fifty-eight (58) blot panels included in twenty-two (22) figures reported in three (3) papers and seven (7) grant applications submitted to NIH. In the absence of valid Western blot images, the quantitative data presented in associated bar graphs and statistical analyses also are false.

Specifically, Respondent trimmed and/or copied Western blot images from unrelated sources, manipulated them to obscure their origin, and reused and relabeled them to represent different experimental results in:

- Figures 5C, 6C, and 7C in *Clin. Cancer Res*. 2003
- Figures 2c, 4b, 6a, and 6b in *Int. J. Oncol*. 2012
- Figure 2B in Anticancer Res. 2011, also as Figure 1C in R01 CA163381-01
- Figure 2A in Anticancer Res. 2011, also as Figure 1B in R01 CA163381-01
- Figure 5D in Anticancer Res. 2011, also as Figure 8 in R01 CA163381-01
- Figure 1A in R01 CA163381-01
- Figure 6 in R01 CA138741-01A1
- Figure 4 in R01 CA106296-06A1
- Figure 4 in R01 CA106296-06A2
- Figures 3 and 6 in R03 CA158253-01A1
- Figures 3 and 4 in R21 CA170314-01
- Figures 8A and 8B in R01 ES024139-01

Dr. Narayanan entered into a Voluntary Exclusion Agreement and voluntarily agreed, beginning on February 26, 2018:

(1) to exclude herself for a period of three (3) years from any contracting or subcontracting with any agency of the United States Government and from eligibility or involvement in nonprocurement programs of the United States Government referred to as "covered transactions" pursuant to HHS' Implementation (2 C.F.R. Part 376) of OMB Guidelines to

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CASE SUMMARIES OF RESEARCH MISCONDUCT FINDINGS

Agencies on Governmentwide Debarment and Suspension, 2 C.F.R. Part 180 (collectively the "Debarment Regulations");

(2) to exclude herself voluntarily from serving in any advisory capacity to the U.S. Public Health Service (PHS) including, but not limited to, service on any PHS advisory committee, board, and/or peer review committee, or as a consultant for a period of three (3) years; and

(3) as a condition of the Agreement, to the retraction of *Anticancer Res*. 31(12):4347-4358, 2011 (PMID: 22199300), and will request that this paper be retracted.

Brandi M. Baughman, Ph.D.

Based on an assessment conducted by the University of North Carolina, Chapel Hill (UNC), Respondent's admission, and analysis conducted by the Office of Research Integrity (ORI) in its oversight review, ORI found that Dr. Baughman, postdoctoral fellow in UNC's Center for Integrative Chemical Biology and Drug Discovery, Division of Chemical Biology and Medicinal Chemistry, engaged in research misconduct in research supported by the National Institute of General Medical Sciences (NIGMS), National Institutes of Health (NIH), grant R01 GM100919.

A previous notice of research misconduct findings based on Respondent's prior admission (Fed. Reg. 82(117):28078-28079, 2017 July 20) included eleven (11) figures in *PLoS One* 11 10):e0164378, 2016 in research supported by the National Institute of Environmental and Health Sciences (NIEHS), NIH, and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), NIH. The Respondent has signed a statement confirming that she committed no additional instances of data manipulation.

ORI found that Respondent engaged in research misconduct by falsifying data that were included in the first submission of a manuscript to *ACS Chem. Biol*. (hereafter referred to as the "Manuscript") and in the final published version: Baughman, B.M., Pattenden, S.G., Norris, J.L., James, L.I., & Frye, S.V. "The L3MBTL3 methyl-lysine reader domain functions as a dimer." *ACS Chem. Biol*. 11:722-728, 2016 (hereafter referred to as "*ACS* 2016"). The paper was retracted in: *ACS Chem. Biol*. 13(1):281, 2018 Jan 19.

Respondent falsely reused and relabeled 14 individual Western blot images from an unrelated experiment conducted in September 2013 showing pulldown with biotin-UNC1215 using 0401 and HeLa overexpressed FL L3MBTL3 lysates (hereafter referred to as the "9/13 experiment") to falsely represent Western blot analysis of GFP:Flag co-IP experiments in GFP-WT lysates in Figure 3 of the Manuscript and a supplementary analysis of co-IPs with FullL-D274A in Figure 6 of *ASC* 2016. Specifically, Respondent used Western blot band images from:

- lanes 3 and 4 (GFP input and GFP Bn-1215 IP; 9/13 experiment) to represent:
  - lanes 1 and 2 (GFP:FLAG co-IP experiments in 3MBT-GFP lysates in the presence or absence of D381A; Figure 3, Manuscript)
  - N=3 in Figure S6, ACS 2016
- lanes 5 and 6 (GFP/Flag Input and GFP/FlagIP; 9/13 experiment) to represent:
  - lanes 3 and 4 (GFP:Flag co-IP experiments in FL-GFP-WT lysates; Figure 3, Manuscript
  - N=1 in Figure S6, ACS 2016
- lanes 9 and 10 (mCherry input and mCherry Bn-1215 IP; 9/13 experiment) to represent:
  - lanes 5 and 6 (GFP:FLAG co-IP experiments in FL-GFP lysates in the presence or absence of D381A; Figure 3, Manuscript)
- lanes 11 and 12 (mCherry/Flag input and mCherry/Flag IP; 9/13 experiment) to represent:
  - lanes 7 and 8 (GFP:FLAG co-IP experiments in FL-GFP WT lysates; Figure 3, Manuscript)
- lanes 13 and 14 (mCherry/Flag IP unbound and mCherry/Flag BN-1215; 9/13 experiment) to represent:

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CASE SUMMARIES OF RESEARCH MISCONDUCT FINDINGS

- lanes 9 and 10 (GFP:FLAG co-IP experiments in FL-GFP lysates in the presence or absence of D274A; Figure 3, manuscript
- N=2 in Figure S6, ACS 2016

Dr. Baughman entered into a Voluntary Exclusion Agreement. The following administrative actions have been implemented for a period of two (2) years, beginning on March 19, 2018:

(1) Because Dr. Baughman knew when she signed the 2017 Agreement with ORI that there was an additional paper with falsified figures, she agreed to exclude herself voluntarily from any contracting or subcontracting with any agency of the United States Government and from eligibility or involvement in nonprocurement programs of the United States Government referred to as "covered transactions" pursuant to HHS' Implementation (2 C.F.R. Part 376) of OMB Guidelines to Agencies on Governmentwide Debarment and Suspension, 2 C.F.R. Part 180 (collectively the "Debarment Regulations"); this Agreement supersedes the terms of the previous supervision Agreement that included three (3) years of research supervision, which began on May 17, 2017; and

(2) Dr. Baughman agreed to exclude herself voluntarily from serving in any advisory capacity to the U.S. Public Health Service (PHS) including, but not limited to, service on any PHS advisory committee, board, and/or peer review committee, or as a consultant.