CMU Inquiry Report pertaining to DIO #7758

Background • Section I

On October 18, 2022, the Director of Research Compliance at Central Michigan University (CMU) received an email from DHHS Division of Investigation Oversight (DIO), Office of Research Integrity (ORI) on allegations of possible research misconduct against Panchanan Maiti, Ph.D., Adjunct Faculty, CMU, and Gary Dunbar, PhD, Faculty, Neuroscience Program, CMU. The ORI is inquiring about allegedly falsified data in the paper "*Ameliorative Properties of Boronic Acid Compounds in In Vitro and In Vivo Models of Alzheimer's Disease*" published in the *International Journal of Molecular Sciences* in 2020. The DOI-ORI letter indicates the article features allegedly falsified data concerning the reusing and relabeling of images of histological and immunofluorescent staining of mouse cortex and hippocampal sections four times. DOI-ORI asked CMU to conduct an inquiry into the allegedly falsified data since the published paper indicates it was supported in part by the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health (NIH) (Award Number K22 HL113045, project funding dates April 10, 2014 – January 31, 2019), awarded to Dr. Joseph D. Larkin at Eckerd College (St. Petersburg, Florida). The possible research misconduct allegations fit the definition of 42 C.F.R. § 93.103: Research misconduct means fabrication, *falsification*, or plagiarism in proposing, performing, or reviewing research, or in *reporting research results*. The paper is a basic science research article exploring reports where certain boronic compounds reduce amyloid accumulation and neuroinflammation. The researchers compared trans-2-phenyl-vinyl-boronic-acid-MIDA-ester (TPVA) and trans-beta-styryl-boronic-acid (TBSA) to see if these compounds could support their hypothesis that boronic compounds would reduce neuropathological deficits in cell-culture and animal models of Alzheimer's Disease. The experiments were undertaken to expand the knowledge base on using boronic compounds to understand the mechanisms of action of Alzheimer's Disease. A full assessment on the feasibility of using boronic compounds as a potential treatment still needs further investigation.

Allegations • Section II

From "*Ameliorative Properties of Boronic Acid Compounds in In Vitro and In Vivo Models of Alzheimer's Disease*" article published in the *International Journal of Molecular Sciences* in 2020:

1- ***Two images in Figure 4A appear to overlap.***
a subfield of an image representing the hippocampal tissue from 6-month-old 5xFAD mice without treatment (column 2, row 3) also was used to represent the hippocampal tissue from 12-month-old wildtype (WT) mice treated with trans-beta styryl-boronic acid (TBSA) (column 8, row 3) in Figure 4A

2- ***Figure 5A appears to have issues as well. Images differ in aspect ratio and coloring,* making it difficult to understand how this could simply be an error during figure assembly.**
a subfield of an image representing the cortex of 6-month-old WT mice (column 1, row 1) also was used to represent the cortex of 12-month-old WT mice (column 5, row 1) in Figure 5A

3- ***Figure 5A appears to have issues as well. Images differ in aspect ratio and coloring,* making it difficult to understand how this could simply be an error during figure assembly.**

an image representing hippocampal tissue from 6-month-old 5xFAD mice treated with TBSA (column 3, row 2) also was used to represent hippocampal tissue from 12-month-old 5xFAD mice treated with TBSA (column 7, row 2) in Figure 5A

4- **Similar serious concerns about Figure 6A. This suggests a systemic issue.**
a subfield of an image representing microglial activation in hippocampal tissue from 6-month-old 5xFAD mice treated with TBSA (column 2, row 3) also was used to represent hippocampal tissue from 12-month-old 5XFAD mice treated with TBSA (column 6, row 3) in Figure 6A

The above four allegations were listed in the October 18, 2022 letter from DIO-ORI with footnote #2 referencing https://pubpeer.com/publications/F3E5381765723A129BEB2093A4C7B2. The journal article does note that NIH funding was used for some parts of the study. The additional seven studies DIO-ORI indicate CMU should review due to data concerns are referenced in footnote #3 to a PubPeer link https://pubpeer.com/search?q=Panchanan+Maiti+Gary+Dunbar.

PHS Support • Section III

The four possible allegedly falsified data, listed in Section II (Allegations), are in the article published in *Int J Mol Sci. 2020* which states NIH Award Number K22 HL113045 was one of multiple funding sources. The John G. Kulhavi Professorship-CMU, a gift from Jeffrey Wigand and the Field Neurosciences Institute, and Ascension St. Mary's Hospital (Saginaw, MI) were the additional sources of funds for the study. As stated in an interview conducted on December 14, 2022, the NIH award was to co-author Dr. Joseph D. Larkin who is faculty at Eckerd College (St. Petersburg, Florida) (attachment: 1 page 17, lines 15-25 and page 18, lines 1-6). A letter (attachment 2) from Dr. Larkin to Dr. Dunbar, states approximately $2100 from K22 HL113045 was used to purchase two boron compounds for *Caenorhabditis elegans* (roundworms) experiments. The *C. elegans* experiments were conducted at Eckerd College, in Florida. The NIH award also assisted in having Zoe Burch (an undergraduate student doing *C. elegans* research in Dr. Denise Flaherty's Eckerd College laboratory) travel from Florida to observe the Dunbar group's work with their mice experiments. There was no sub-contract to CMU from Eckerd College to do any work for the research reported in the *Int J Mol Sci. 2020* article.

In reviewing the other seven papers where there could be data concern, no federal funding was associated with those studies. These papers were funded by the John G. Kulhavi Professorship-CMU, Field Neurosciences Institute, Ascension St. Mary's Hospital (Saginaw, MI), and department funds of CMU and Saginaw Valley State University.

Attachment 3 is a spreadsheet from CMU's Office of Sponsored Projects listing all proposal-awards for Dr. Dunbar over the past 10 years. He is associated with a Michigan State University-NIH award that has a start date of August 2021 which is after the publication date of the alleged falsified article. There are 3 NIH proposals under consideration that Dr. Dunbar is associated with, but no funds have been awarded yet.

Institutional Inquiry: Process and Recommendations • Section IV

In late October 2021, PubPeer sent emails to several CMU faculty members indicating possible irregularities in multiple peer reviewed research papers where Gary Dunbar, Ph.D. and Panchanan Maiti, Ph.D. are listed as contacts for the articles. PubPeer indicated concerns about duplicative images for

different experimental conditions where the irregularities would seem highly unlikely. Dr. Dunbar immediately contacted Vice President for Research and Innovation, David Weindorf, Ph.D., about receiving the PubPeer emails. Dr. Weindorf initiated an inquiry concerning the possible irregularities with the full cooperation of Dr. Dunbar. The claims concerning the five papers identified by PubPeer with image irregularities, were examined for duplication, alteration in orientation, magnification and color. On October 21, 2021, Dr. Weindorf enlisted Brad Swanson Ph.D. (faculty in the CMU Department of Biology), to review the articles/images referenced in the PubPeer emails. It was determined that the claims of the PubPeer emails were accurate concerning several of the images presented in the articles on October 25, 2021. (attachment 4) Gathering additional information, Dr. Weindorf had a discussion with Dr. Stephanie Duggan, M.D. (CEO of Ascension St. Mary) in early December 2022 on the nature of the claims in the PubPeer emails. The Field Neurosciences Institute (FNI) is an outreach service of Ascension St. Mary for the care to neurological patients and conducts neurological research. Dr. Maiti's primary affiliation was with the FNI Ascension St. Mary; he had an Adjunct Assistant Professor appointment ***without pay*** at CMU (attachment 5).

Dr. Dunbar spoke with Dr. Maiti concerning the duplicative images and responded to Dr. Weindorf on October 25, 2021. Dr. Dunbar stated: "our review of the data indicate that these did not affect any of the analyses or scientific conclusions in those articles, so we are contacting the journals to convey this and request that corrected figures be published as a Corrigendum." Dr. Weindorf referred the matter to Dennis Armistead (CMU Executive Director, Faculty Personnel Services) on December 6, 2021 (attachment 6) to determine whether the falsifications happened intentionally, knowingly, or recklessly to warrant a formal investigation (which was Dr. Weindorf's recommendation). On December 15, 2021, Dr. Dunbar was provided with a Research Misconduct Draft Inquiry Report (attachment 6) concerning the five publications that PubPeer identified in the emails sent to several CMU faculty members in October, 2021. The inquiry report indicates issues identified seem to fall under subcategory 2 of CMU policy 3-29, *falsification.* Dr. Dunbar provided a 47-page response to the inquiry report to Faculty Personnel Services concerning the PubPeer email irregularities on January 2, 2022. Dennis Armistead issued a letter on January 18, 2022 dismissing the research misconduct allegations against Dr. Dunbar. The letter states that the University did a thoughtful deliberation of the matter and the allegations that Dr. Dunbar engaged in misconduct as defined under policy 3-29 (attachment 7) were dismissed since they did not fit the definition of misconduct under the policy. The dismissal letter did caution Dr. Dunbar that the "intersection of misfortune, mistake, and purposeful misconduct does not lend itself to confidence and you and your colleagues should increase your efforts at vigilance and the high standards of accuracy and data integrity." The initial inquiry that was conducted by Dr. Weindorf, Vice President of Research and Innovation, did not formally sequester data as it was determined that corrective measures were being taken by Dr. Dunbar to right the mistakes identified in the scholarly publications.

Due to the research misconduct inquiry, the following articles had corrections published online on January 11, 2022, and March 10, 2022, respectively:

- Peruzzaro, S.T., Andrews, M.M.M., Al-Gharaibeh, A, Pupiec, O., Resk, M., Story, D., Maiti, P., Rossignol, J., Dunbar, G.L., 2019. Transplantation of mesenchymal stem cells genetically engineered to overexpress interleukin-10 promotes alternative inflammatory response in rat model of traumatic brain injury. *Journal of Neuroinflammation* 16, 2. Doi:10.1186/s12974-018-1383-2.
- Maiti, P., Bowers, Z., Bourcier-Schultz, A., Morse, J., Dunbar, G.L., 2021. Preservation of dendritic spine morphology and postsynaptic signaling markers after treatment with solid lipid curcumin particles in the 5xFAD mouse model of Alzheimer's amyloidosis. *Alzheimer's Research*

& Therapy 13, 37. Doi:10.1186/s13195-021-00769-9, had a correction published on March 10, 2022.

On August 11, 2022, Dr. Weindorf met with Dr. Dunbar as a follow-up to the research misconduct inquiry from 2021. On August 18, 2022, Dr. Dunbar provided to Dr. Weindorf a summary of their meeting. (Attachment 8) Dr. Maiti assisted Dr. Dunbar in re-evaluating images to provide corrections to the two publications indicated above. The lab is now utilizing a commercially available imaging duplication software to check all images. Dr. Dunbar indicated that Dr. Maiti is no longer with the Field Neuroscience Institute (FNI) and Dr. Dunbar, with assistance of Jayeeta Manna (researcher at FNI), extracted files from the FNI computers to re-evaluate the data for the other articles due to the concerns raised in the PubPeer emails. Dr. Weindorf's meeting notes (Attachment 9) indicate that Dr. Dunbar had been attempting to reconstitute data but some data are encrypted with issues in getting them unencrypted. Also noted was that Dr. Maiti has had an additional fifteen (15) papers flagged by PubPeer that were not associated with Dr. Dunbar. Dr. Weindorf replied to Dr. Dunbar on August 24, 2022 concerning the progress in correcting the published, peer reviewed research papers where irregularities were identified. While the process of re-evaluating the images is laborious, Dr. Weindorf asked Dr. Dunbar to proceed as quickly as possible. Dr. Weindorf noted that if the corrections cannot be fully defensible (e.g., where the data is errant or the conclusion cannot be substantiated by the data), a conservative pathway should be taken whereby the paper is formally withdrawn from the journal.

On October 18, 2022, the CMU Director of Research Compliance (Belinda Adamson) received an email from Karen Gorirossi with attachments and enclosures from Dr. Alexander Runko regarding DIO 7758. The next day (October 19, 2022) the email was forwarded to Dr. David Weindorf, Vice President of Research and Innovation, on how to proceed with this request. Dr. Weindorf contacted the CMU Provost, Dr. Nancy Mathews and CMU General Counsel, John Danner to determine the next steps. Ms. Adamson was requested to conduct the ORI inquiry concerning Dr. Gary Dunbar since the initial inquiry to the PubPeer emails was conducted by Dr. Weindorf. In doing so, Ms. Adamson could provide a fresh perspective, specifically from a research compliance standpoint. Ms. Adamson came to CMU in January of 2022. Her background is in clinical laboratory sciences which transitioned into basic research of chronic wound healing. She is a co-author of 33 peer-reviewed articles and Principal Investigator on an NIH SBIR grant. Her contributions to these articles were doing animal procedures, obtaining samples, doing histological and immunofluorescent staining, providing images and the data results to support the manuscripts. For the past fifteen (15) years she has been involved in research compliance. (attachment 1)

On October 31, 2022, Dennis Armistead was consulted to determine who Ms. Adamson should be contacting in the Office of Information Technology (OIT) to remotely image any CMU computers associated with Dr. Dunbar. Dennis Armistead indicated in an email that Ms. Adamson should work with Jim Bujaki (Vice President for IT and CIO) and John Danner (General Counsel) since the current CMU practice to preserve and then examine digital resources requires VP for IT/CIO **and** General Counsel approval. On November 3, 2022, Ms. Adamson received approval from both Jim Bujaki and John Danner for evidence sequestering of research records. The following represent CMU's capabilities:

- For an identified CMU administered desktop/laptop, CMU has the ability to remotely gather an image of the device while the device is connected to CMU's network. The device is required to be connected to the network for the entire remote imaging process. If CMU physically has the device in its possession, CMU can take the image and return the device.
- CMU can immediately place a Legal Hold on the Office 365 Account thus preserving any material from that point-in-time (MS Teams/Sharepoint, MS Exchange Email, MS Onedrive, etc.). This can be done immediately and will not notify the account holder.

- For "laboratory" computers, CMU needs to have the specific equipment identified but can remotely gather an image of the device assuming it is a workstation and not a specialized piece of dedicated laboratory equipment. (attachment10)

Dennis Armistead did not see any labor relations concerns in placing the legal hold on Dr. Dunbar's email. CMU's faculty is unionized and this had to be taken into consideration during the sequestration request. On November 4, 2022, Ms. Adamson had a phone conversation with Dr. Jerry Todd, Chief Information Security Office, providing him with Dr. Dunbar's email account and Global ID so IT could put a hold on Dunbar's email account and search for computers associated with Dr. Dunbar. On November 11, 2022 a request for putting a hold on any emails associated with Dr. Maiti was sent to Dr. Todd. On November 16, 2022, Ms. Adamson received an email from Todd Schafer, Associate Director of Information Security, updating her on the progress of securing the data for the inquiry. Imaging was done on two computers that Dr. Dunbar had logged into over the last month. A third computer which is used by multiple researchers in the Neuroscience Lab was also imaged after discussion with Dr. Todd. An email on November 17, 2022, from Mr. Schafer, indicated he had obtained access to the third computer and would have it imaged by the end of the day. He also provided Ms. Adamson with the shared folder link where the computers were mapped at. (attachment11)

On November 18, 2022, Dennis Armistead was contacted to indicate that IT had sequestered information from the computers associated with Dr. Dunbar. A request on the next steps needed in this inquiry was expressed to Mr. Armistead. A meeting was requested to review CMU policies prior to notifying Dr. Dunbar on the ORI request for an inquiry on the alleged misconduct. November 28, 2022, a meeting was held with Dennis Armistead, Dr. Weindorf, Ms. Adamson and Daniel Rinke, Director of Faculty Employee Relations to discuss the next step in informing Dr. Dunbar of the ORI inquiry. Dr. Weindorf sent an email containing a letter to Dr. Dunbar on November 29, 2022 informing him of the DHHS, DIO-ORI request to CMU for an inquiry into possible research misconduct on a paper authored by him. (attachment12) Dr. Dunbar had questions concerning union representation and the possibility of retaining his own lawyer; ultimately, he decided to proceed with union representation and no private attorney. On December 12, 2022, an interview date was established for December 13, 2022.

The interview was conducted by Belinda Adamson, Director of Research Compliance, on December 13, 2022 with the following persons in attendance: Gary Dunbar (respondent), Phil Squattrio (Grievance Chair for Faculty Association), Mark Shelton (UniServ Director for Region 12), Dan Rinke (Director/Faculty Employee Relations), and Dennis Armistead (Executive Director/Faculty Employee Relations). The interview was recorded and a transcript was made by Network Reporting- Statewide Court Reporters. The transcript is attachment 1.

Institutional Inquiry: Analysis • Section V

Background

The allegations of misconduct indicate there was reuse and relabeled images of histological and immunofluorescent staining of mice cortex and hippocampal sections to represent different tissues and conditions in figures 4A, 5A twice and 6A in the article "*Ameliorative Properties of Boronic Acid Compounds in In Vitro and In Vivo Models of Alzheimer's Disease*" published in the *Int J Mol Sci. 2020.*

- Figure 4A:
  Six and twelve-month-old 5xFAD mice and age-matched control mice were treated with TBSA (trans-beta-styryl-boronic-acid) or vehicle for 2 months at which time they were euthanized, and

their brains were perfused with 4% paraformaldehyde. The brains were sectioned which were then stained with 0.1% cresyl violet. Images were reviewed for pyknotic cells in the cortex, CA1 and CA3 areas of the hippocampus.

- Figure 5A:
  Six and twelve-month 5xFAD mice and age-matched wild-type mice were treated with TBSA (trans-beta-styryl-boronic-acid) for 2 months, euthanized, and their brains were sectioned and immunolabeled for GFAP (glial fibrillary acidic protein). Images are representative of GFAP-IR in the cortex, CA1 and CA3 area of the hippocampus.
- Figure 6A:
  Six and twelve-month 5xFAD mice and age-matched wild-type mice were treated with TBSA (trans-beta-styryl-boronic-acid) for 2 months, euthanized, and their brain sections were immunolabeled for IBa-1 (ionized calcium binding adaptor molecule 1). Images are representative of Iba-1-IR in the cortex, CA1 and CA3 and dentate gyrus of the hippocampus.

In Figure 4A, column 2, row 3 image is said to represent hippocampal tissue from a 6-month-old 5xFAD mouse without treatment whereas the column 8, row 3 image represents hippocampal tissue from 12-month-old wildtype (WT) mice treated with TBSA. These two images seem to be the same tissue section just overlapping images that were scaled up and shifted.

For Figure 5A, there are two issues identified. 1) Column 1, row 1 image is said to represent the cortex of 6-month-old WT mice whereas column 5, row 1 is said to represent the cortex of 12-month-old WT mice. These two images seem to be the same tissue section, just a difference in aspect ratio and coloring. 2) This second issue seems to be the same as #1, the same tissue section just a difference in aspect ratio and coloring. Column 3, row 2 is said to represent hippocampal tissue from 6-month-old 5xFAD mice treated with TBSA whereas column 7, row 2 represents hippocampal tissue from 12-month-old 5xFAD mice treated with TBSA.

Figure 6A irregularity looks to be the same tissue section just a different magnification. Column 2, row 3 is said to represent microglial activation in hippocampal tissue from 6-month-old 5xFAD mice treated with TBSA whereas column 6, row 3 is said to represent hippocampal tissue from 12-month-old 5XFAD mice treated with TBSA.

The letter from ORI indicating allegedly falsified data and ORI specific analysis of the images is footnoted to be associated with a PubPeer publication stream beginning in October, 2021. The PubPeer discussion identifies, in each of the above figures, the issues with boxes around the irregular images. The article indicates that NIH funding of one of the co-authors was used for the study. Drs. Dunbar and Maiti are the corresponding authors listed in the *Int J Mol Sci. 2020* publication, so CMU was contacted to initiate an inquiry into the allegedly falsified data due to NIH funds being used. When PubPeer emails were sent to several faculty members in October of 2021, CMU conducted an institutional misconduct inquiry as outlined in CMU Policy 3-29.

For this inquiry, the allegedly falsified data allegations for each of the four figures outlined above will be discussed as one allegation. Similar issues are being cited in all four figures concerning images of the same tissue section being used for different conditions.

Analysis

In reviewing the *Int J Mol Sci. 2020* article, Joseph Larkin, Ph.D. from Eckerd College in Florida, is the researcher awarded the NIH funds for the years of 2014 - 2019. The CMU Office of Sponsor Projects (OSP) was contacted on October 27, 2022 to see if CMU had a sub-award contract with Eckerd College for any research. The OSP provided a spreadsheet of all of Dr. Dunbar's proposal and award activity since 2005. (attachment3) The OSP records show that Dr. Dunbar was not associated with the K22 HL113045 award. Dr. Dunbar is associated with an NIH grant through Michigan State University having a start date of August 31, 2021, after the publication date of the journal article in this inquiry. The *NIH Reporter* was used to evaluate what work Dr. Larkin was conducting under the NIH grant referenced in the inquiry. The narrative indicates the research plans were to use computational modeling techniques to describe the function of boronic acids in proteasome inhibition and for saccharide identification in glycated protein. In the 2016 progress report, three journal articles were listed relating to computational chemistry and modeling. In the outcome section, the summary of the NIH report for Dr. Larkin said saccharide detection is key to determining disease states and what molecular features are important when designing new receptors. For year 2017-2019 there were no progress report outcomes reported.

The research associated with the NIH award does not look to fit the focus of the *International Journal of Molecular Sciences* article. Dr. Dunbar was asked in the interview, during the time of Dr. Larkin's award (2014-2019) was any research for this paper being done. Dr. Dunbar provided email correspondences beginning in August, 2017 with the Eckerd College co-authors for use in this inquiry. An email dated August 8, 2017 from co-author Denise Flaherty, Ph.D., indicates a desire to initiate conversations about using their compounds (boronic acid) in the mouse model. (attachment 13, page 1) Dr. Flaherty's research focus is the use of *C. elegans* to understand molecular neuropathology on the development, muscle function and neurological function in animals. Dr. Larkin collaborates with Dr. Flaherty on the use of boron compounds which shows *C. elegans* plaque burden changes. An email (8.10.17) from Dr. Larkin says his questions stem from being a computational physical chemist. He is curious about the mouse model and what can be determined about boron compounds as potential beta-secretase inhibitors. Dr. Flaherty's *C. elegans* work they have done together indicate the compounds are having an effect but they would love to know more. (attachment13, page 3) Drs. Larkin and Flaherty assemble a proposal with goals for the collaboration to assist Drs. Dunbar and Maiti in preparing an Institutional Animal Care and Use Committee (IACUC) application. (attachment13, page 6) An email from 8.28.17 indicates that Saginaw Valley State University (SVSU), Saginaw, Michigan and the Field Neurosciences Institute (FNI) laboratory, Saginaw, Michigan would be the sites where the animal experiments would be conducted. (attachment 13, page 8) On 10.10.17, Dr. Dunbar sent an email to Dr. Flaherty asking if he could provide him with a small amount of the compounds to begin cell culture work which would then be followed up with the *in vivo* work. The compounds were to be sent to the FNI laboratory. (attachment 13, page 10) In October 2017, *in vitro* work was started and results were available in November, 2017. By the end of 2017 into January, 2018, Dr. Flaherty's Eckerd Collage lab was doing *C. elegans* (flatworm) experiments. By the end of January, 2018, Zoe Burch from Dr. Flaherty's lab, came to Michigan to observe animal research being conducted at the Field Neuroscience Institute (FNI). (attachment 1 page 8, lines 10 – 25; page 9, lines 9-25; page 10, lines 1-15 and attachment13 page 16 and 19). Drs. Dunbar and Maiti verified that the mice work and *in vitro* work was done at the FNI and Saginaw Valley State University while Dr. Larkin and Dr. Flaherty did all the *C. elegans* work at Eckerd College. Dr. Larkin indicates, NIH funds (approximately $2,100) were used to purchase boronic compounds for the *C. elegans* experiments and travel for Zoe Burch to come to Michigan. (attachment 13 and attachment 1 page 15, lines 9-25; page 16, lines 1-17). In an email dated 7.23.20 from Dr. Flaherty, she indicates that initial expenses for her experiments were funded through Dr. Larkin's grant and Eckerd College Natural Science Summer Research Program. (attachment 13 page 116-

117) However, neither Dr. Dunbar nor CMU received any NIH funds to do their portion of the experiments. The boronic compound samples that were provided to Drs. Dunbar and Maiti most likely were from a stock supply of the boronic compounds that NIH funds purchased for Dr. Flaherty *C. elegans* experiments.

The possible misconduct allegations outlined by ORI relate to the mice brain images that were conducted at the FNI. No data from the *C. elegans* experiments is associated with alleged falsification of data present in the *Int J Mol Sci. 2020* article.

From the institutional inquiry in 2021, the images questioned by PubPeer do appear to be from the same tissue section. Dr. Dunbar acknowledges that there are image irregularities but without AI image review, he, Dr. Flaherty and Dr. Larkin did not realize this. Dr. Dunbar and Dr. Larkins research background is not in histoimmunochemistry imaging. Dr. Dunbar stated he is a behavioral neuroscientist who assisted in setting up the behavioral tasks and cues in the water maze experiments. (attachment1 page 44, lines 9-11). The NIH Reporter indicates Dr. Larkin's background is in computational chemistry and chemical information and modeling. Dr. Maiti was hired by FNI to be responsible for running the research laboratory and conducting the research associated with the mouse immunohistology portions of the project. At the time, Dr. Dunbar had a part-time position with FNI so daily laboratory and animal experiment management was facilitated by Dr. Maiti with limited oversight by Dr. Dunbar. (attachment 1, page 13, lines 10-25; page 14, lines 1-2)

Dr. Dunbar indicated in the interview that Dr. Maiti was hired by FNI as the research scientist for the laboratory. (Attachment 1 page 13, line 9-25; page 14, lines 1-25). Dr. Maiti also had a staff position at Saginaw Valley State University (SVSU) in a laboratory where the live animal experiments were conducted. He also taught some courses at SVSU. (attachment1, page 14, line 14-25; page 15, lines 1-13) When interviewing Dr. Maiti, on the January 13, 2023 phone call, he indicates his primary relationship was with FNI (attachment 14, time point 07:46; 17:55). All immunohistochemical work associated with the images under question were done at FNI. (attachment 14, time point 05:22, 06:27) Dr. Maiti indicates he did vivarium work at SVSU and was an Adjunct Assistant Professor at CMU to be able to assist CMU students when they were doing projects at FNI. (attachment14, time point 06:55) Dr. Maiti received an Adjunct Assistant Professor appointment at CMU, without pay, to participate in the educational programs of the University. (attachment 5)

Dr. Maiti indicates that he never had NIH funding for any of the work that he did at FNI. The imaging experiments were done by Dr. Maiti. Student volunteers assisted with some data collection but under the direction of Dr. Maiti. (attachment14 time point 05:22, 08:23, 11:03) At time point 09:18 in the interview, Dr. Maiti states he superimposed the wrong images being cited in the inquiry and Dr. Dunbar had little input into the images. Slides with images of interest were put aside and data was put on Excel spreadsheets for Dr. Dunbar's review. Dr. Maiti stated Dr. Dunbar has limited scientific knowledge of imaging therefore Dr. Dunbar had little input into the imaging data. (attachment14 time point 10:17)

Throughout this inquiry, Dr. Dunbar has stressed that his expertise is not immunohistochemical imaging and that he was relying on Dr. Maiti's expertise in this area for the selection, evaluation, and presentation of the images necessary for the project. Dr. Dunbar acknowledges the irregularities in the images provided for the manuscript, which makes an ORI inquiry valid.

Using the email correspondences with the Eckerd College co-authors and Dr. Dunbar's extensive work to re-evaluate and correct the data, due to the PubPeer emails, it is difficult to provide good evidence that the allegations of falsification of the images were done careless of the consequences by Dr. Dunbar.

What has come out of this inquiry is that putting faith into what your collaborator is doing without good oversight of the laboratory can cause errors in the final work product. From the additional evaluation of the data and considering the recommendations of the FNI Board of Directors, CMU Vice President of Research and Innovation, and comments from the *Int J Mol Sci. 2020* article editorial staff, Dr. Dunbar has requested the article of this inquiry and other articles with similar irregularities be retracted by each journal.

Dr. Maiti has taken responsibility for the imaging irregularities. In this matter, establishing *willful* carelessness remains difficult to prove. There is a pattern with Dr. Maiti of poor data documentation of research experiments making data and images not easily retrievable. As Dr. Maiti was not a paid employee of CMU and the work was done at SVSU and FNI, CMU faced certain limits in its ability to retrieve data associated with this inquiry. Compounding the difficulty is the fact that Dr. Maiti is no longer employed by FNI or SVSU. Dr. Maiti does not have access to the computers and instrumentation used for this project to be able to assist in providing the data for this access. He is currently residing outside of the United States attending medical school.

Conclusions • Section V

An inquiry for the allegations of possible research misconduct due to the use of PHS-supported research was appropriate. The information that has been gathered indicates some NIH grant award was utilized by the co-authors associated with Eckerd College to do *C. elegans* experiments for the cited article but there were no funds provided to CMU to conduct any experiments. This begs the question: does providing small samples of boronic compounds to CMU to do some *in vitro* and *in vivo* animal experiments warrant a full investigation of reckless fabrication in an area different than Dr. Larkin's NIH award? Dr. Larkin indicates his NIH funds were used for *C. elegans* experiments and travel for an Eckerd College student to come from Florida to Michigan for a week of observations of CMU work. The amount cited by Dr. Larkin ($2100) would seem to be an amount to cover travel to Michigan and a hotel stay for a week. Dr. Flaherty indicates Dr. Larkin's funds were used early on in her research of boronic compound and their effect on *C. elegans* in association with Alzheimer Disease. The allegations, by an anonymous complainant, concerned images from the CMU animal experiments, not the *C. elegans* experiment which the NIH grant had supported.

The main respondent, a CMU faculty member, of this inquiry does acknowledge that there were irregularities in the images once they had been identified by a PubPeer email. The irregularities were in the experiments of immunohistochemistry which is not his area of expertise. The main respondent and CMU Office of Research and Graduate Studies investigated the irregularities and has requested that the article be retracted. The secondary respondent in this inquiry who was not a CMU employee said the irregularities were his responsibility. As such, it does not seem that the work was undertaken careless of the consequences, but rather that poor laboratory work and documentation led to irregularities which are now being retracted with the full cooperation of the respondents.

The CMU Director of Research Compliance concludes the inquiry shows that an investigation is not warranted for Research Misconduct, since there was no preponderance of evidence that the NIH award was utilized in the fabrication of data or that it was done recklessly.

Attachments

Reference Number	Description	Attachment Label
1	12.14.22 Interview Transcription	1- InterviewTranscript12.14.22.pdf
2	Larkin Eckerd College Letter	2- LarkinEckerdCollegeletter.pdf
3	Office Sponsor Projects Spreadsheet	3- OSPspreadsheetDunbarawards.xls
4	Swanson Summary Image Review	4- SwansonSummaryImagesReview.docx
5	CMU Appointment Letter for Maiti	5- CMUappointmentMaiti.pdf
6	VP Research Inquiry Report 8.12.22	6- DunbarInquiryReport2021.pdf
7	Armistead Inquiry Letter to Dunbar	7- DunbarDismissalfromFPS - 1.19.22.docx
8	Dunbar Reply Letter 8.12.22	8- DunbarReplyLetter8.12.22.pdf
9	VP Research Handwritten Notes	9- DCWNotesAug2022.pdf
10	IT Letter from Bujaki	10- IT LetterBujaki.pdf
11	IT Letter on Imaging Computer	11- IT LetterSchafer.pdf
12	VP Research to Dunbar letter-ORI inquiry	12- Dunbar Notice-2022.pdf
13	Dunbar email trail with Eckerd College	13- Dunbar1.16.23Boron projectECcorrespondence.docx
14	Audio Recording Maiti Interview	14- MaitiInterviewRecording1.13.23.m4a
	CMU Research Integrity and Misconduct Policy	a- ResearchIntegrityandMisconduct Policy.pdf