Summary Report of Activities

Faculty Research and Development Grant

*Understanding how Motherhood Makes Rats Smarter*

July 2013-July 2014

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**INTRODUCTION**

This report is on my research laboratory’s activities that were made possible by the Faculty Development Grant awarded in March, 2013 by the Committee for Faculty Development and Research and the PVPAA. The grant for $9000 was awarded with the understanding that I would conduct discipline-specific, meaningful research to help understand the neurologic benefits enjoyed by mother rats as a result of pregnancy and parenthood. Additionally, one of my primary goals was to work with Longwood undergraduate students with the intent to provide a potentially transformative experience for those students. It is my belief that these goals were achieved in the last year, as the efforts of the students working in my lab have led to the collection of large amounts of data, presentation at Longwood, regional, and international meetings, and the preparation of a manuscript for publication.

**ACTIVITIES**

In the past year, I have conducted research in the lab during the summer of 2013 (PRISM), through the 2013-2014 academic year, and into the summer of 2014 (PRISM). I had three students work with me 40 hours/week for 8 weeks during the 2013 PRISM program. Six students earned one credit hour for research during the Fall 2013 semester and four students earned one credit hour for research during the 2014 Spring semester. I then had two of those students work with me for 40 hours/week for 8 weeks during the 2014 PRISM program.

Funding through this grand has allowed me to buy rats on which to conduct behavioral experiments, housing materials for the rats, and reagents for conducting behavioral research and immunohistochemistry. This is of course the critical element in being able to maintain and stock a laboratory in which undergraduate students can work.

Additionally, funding through the Faculty Development Grant has allowed me to take students to conferences and travel to conferences myself. During the past year, my students have presented at: the PRISM Research Showcase, the Cook Cole College Research Showcase, the Society for Neuroscience (SFN), and the Symposium for Young Neuroscientists And Professors of the SouthEast (SYNAPSE).

I have also had the opportunity to collaborate with colleagues at James Madison University (Catherine Franssen, Ph.D.), the University of Richmond (Craig Kinsley, Ph.D.), and Randolph-Macon College (Kelly Lambert, Ph.D.) on these projects. My colleagues also have undergraduate students that have helped collect and analyze brain tissue (specifically, conducting immunohistochemistry and counting active neurons) collected at Longwood University. Indeed, one student from James Madison University traveled to Longwood to learn behavioral neuroscience techniques that he could not learn at JMU. He is still using some of those techniques as a neuroscience graduate student at American University. It is exciting to know that our work here at Longwood has such a large impact on undergraduate students in the region!

**MEASURABLE OUTCOMES**

Since July, 2013, I have been able to work with six of Longwood’s impressive undergraduate research students – **Ms. Alexandra Hauver** ’14, **Ms. Jessica LaFevre** ’15, **Mr. Brian Lotts** ’15, **Mr. Corey Russell** ‘14, **Mr. Bharanivyas Sankar** ’15, and **Mr. Keaton Unroe** ’17. Our work over the past year has led to positive outcomes in student learning, helping students reach career goals, outreach to the general public, and forwarding of my own research agenda.

Student Learning

* Students learn about the neuro-physiology and neuro-physiology, concepts that are not covered in depth in classes at Longwood.
* Students learn laboratory techniques that, while specific to behavioral neuroscience, are applicable to work positions after Longwood.
* We spend a great deal of time creating poster presentations, papers, and practicing presentation of our work. I feel that students in my lab enjoy a hands-on experience that will help them communicate science in future professional settings.

Students Reaching Career Goals

* Ms. Alexandra Hauver was accepted into a Masters of Nutrition Program at George Mason following graduation from Longwood. Further, Ms. Hauver earned one of only two Graduate Research Assistantships available to master’s students.
* Mr. Corey Russell has taken a position as an Animal Lab Technician at VCU following graduation from Longwood.
* Mr. Brian Lotts is awaiting to hear if he was granted early acceptance into VCU’s Physical Therapy Program.

Communicating Science and Outreach

* I presented our research in the form of a poster at the international neuroscience conference, **The Society for Neuroscience**, in October of 2013.
* Ms. Hauver and Ms. LaFevre presented our research in the form of a poster at the regional conference **SYNAPSE** in March, 2014.
* Our work was featured as part of a **redditt.com AMA** (Ask Me Anything) this past July. Redditt.com is one of the top 25 websites in the world and our work was one of the top 7 stories of the day globally and was the top science story for over a week. The ability to communicate the work that I’ve been able to do with Longwood students was an invaluable experience.
* Trained students from James Madison University in behavioral neuroscience techniques.

Forwarding Research Agenda

My students and I have collected data and gathered feedback from our two conference presentations. The feedback we’ve gotten has allowed us to:

* Begin writing a paper on how mother rats are able to discriminate their own pups from alien (from another mother) pups.
* Focus our future research to complete the maternal recognition project.
* Direct our future goals for the traumatic brain injury project that eventually became our 2014 PRISM project.

**FUTURE GOALS**

My students and I were able to collect an enormous amount of data regarding how mother rats identify and care for their own young (as opposed to pups from another mother) during our year working under this grant. We have neural tissue from over 45 rats that can continue to be analyzed as well as hours of behavioral video. This year, we will:

* Write a paper for peer-reviewed publication based on our findings thus far.
* Present our updated findings (including neurological data) at the 2014 Society for Neuroscience meeting in Washington, D.C.
* Continue to mine this data set to produce answers to the question of HOW mother rats benefit from parenthood.

Additionally, we began working on the traumatic brain injury project to investigate the neuroprotective benefits of motherhood. Though work on that project technically began during the PRISM program of 2014, funding through this grant allowed us to order animals and reagents in time for the summer. We collected a staggering amount of data during that summer. Our future goals are:

* Analyze data collected in the summer
* Present our preliminary findings at the 2015 SYNAPSE conference
* Conduct a targeted follow-up project based on feedback at the conference.

Finally, my goals as Principal Investigator of this lab remain the same: provide students with an immersive experience that allows them to develop lab techniques, learn about the field of behavioral neuroscience, and discover their passions – whether or not that includes continuing in research; conduct research that will contribute meaningfully to the field; and raise awareness about the fantastic research that is being conducted at Longwood University.

**CONCLUSION**

Thanks to the generous funding of my research projects by the PVPAA and the Committee for Faculty Development and Research, I feel that my lab has been able to conduct valuable research at Longwood University. The benefits have been wide-reaching. Students working in my lab have enjoyed transformational experiences that have shaped their thinking, broadened their research skillset, and helped them reach their career goals. Furthermore, we have been able to conduct meaningful research that has led to discipline-specific research presentations and will lead to peer-reviewed publication. Finally, the work done in my lab has proved interesting enough for it to be featured in magazine articles and on prestigious website forums that communicate our findings and draw valuable attention to the university. I thank you for the opportunity and will continue work with students on the data that we have collected during the period of this grant.