

Regenerative Medicine Minnesota - Progress Report

July 5, 2018

Grant Title: Medical Student Summer Research Program in Regenerative Medicine – Pre-T35

Grant Number: RMM-2017-EP-02

Principal Investigator: Troy Lund, M.D., Ph.D.

Project Timeline: 5/30/17–5/29/18

Brief description of project: The Medical Student Summer Research Program in Regenerative Medicine was at the University of Minnesota. The program aligns with the Medical School’s mission and strategic directions including the Dean’s commitment to research. The combination of faculty expertise in regenerative medicine and institutional resources at the University of Minnesota presents a unique training opportunity for medical students. The primary objectives of the program are to create an infrastructure for medical student research, implement an effective training model, and develop a successful mentoring model. The goal is to provide an overall exceptional research experience for medical students that will promote entry into a physician-scientist pathway, increase the number of regenerative medicine researchers, and advance the field of regenerative medicine.

Where did this project take place? The Medical Student Summer Research Program in Regenerative Medicine took place at the University of Minnesota on the Twin Cities campus. Students were assigned to laboratories in the Dwan Variety Club Research Building, Nils Hasselmo Hall, Lions Research Building, and Phillips-Wangensteen Building.

People impacted by project and where they are from: Faculty and students from the University of Minnesota Medical School were involved in the education program.

- Jackson Baril’s faculty mentor was Dr. Robert Tranquillo, a Distinguished McKnight University Professor and Head of the Department of Biomedical Engineering in the College of Science and Engineering. Jackson’s project title was, “Analyzing Cell Surface Markers and Plasmin Activity of Adipose Stem Cells for Tissue Engineered Vascular Grafts”.
- Lisa Marshall’s faculty mentor was Dr. Angela Panoskaltis-Mortari, a Professor in the Medical School, Departments of Pediatrics and Medicine. Lisa’s project title was, “Endothelial Progenitor Cell Differentiation in Mouse Lung Scaffold with Tenascin C Coating”.
- Zachary Miller’s faculty mentor was Dr. Walter Low, a Professor in the Medical School, Department of Neurosurgery. Zachary’s project title was, “Characterization of oligodendrocyte precursor cell development in the porcine brain and spinal cord”.
- Mary Soderlund’s faculty mentor was Dr. Gregory Vercellotti, a Professor in the Medical School in the Department of Medicine. Mary’s project title was, “Discovering TLR-4/MD-2 Heme-binding”.

What was the outcome of the project? (Did the project work the way you expected it to? What were the successes? What were the failures? How did it impact regenerative medicine in Minnesota?)

Four first year medical students were selected to participate in the program. The duration of formal research training for the students was eight weeks, beginning on June 26 and ending on August 25. Each student wrote a project proposal with specific aims and conducted an independent research project focused on a scientific question relevant to regenerative medicine. In doing so, students gained experience in literature review, experimental design, hypothesis testing, data collection, and interpretation. They also learned a variety of laboratory techniques including confocal microscopy, cell culture, infectivity assays culturing and differentiating cells, decellularizing tissue, sectioning, staining with H&E and fluorescent antibodies, taking images on a microscope, Western blot, PCR, flow cytometry, fluometric enzyme assays, cell culture, and coating cylindrical fibrin casts.

Over the course of the summer, the students attended two Responsible Conduct of Research workshops and a discussion led by the Program Director. During the last week, students presented their projects and demonstrated that the program had improved their knowledge in the foundations of regenerative medicine, specifically stem cell biology, laboratory medicine, and bioengineering. At the conclusion of the program, the students were asked to provide feedback via a Qualtrics survey. All four students said that they would recommend the program to their peers. We anticipate that additional evidence of accomplishments will be revealed through publications, oral or poster presentations at meetings or conferences, and future research involvement.

The program was administered according to the proposed plan. Feedback from the cohort of students was highly positive, so we feel it was and will continue to be a successful education program (see attached results). We have not identified any failures. We anticipate that the program will ultimately increase in the number of regenerative medicine researchers in Minnesota and advance regenerative medicine therapies in the state and beyond.

Please list any of the following that have resulted from your Regenerative Medicine Minnesota grant funding:

Publications and/or manuscripts submitted for publication: We were pleased to learn Zachary Miller’s abstract "Expression Patterns of Transcription Factors Influencing Oligodendroglioneogenesis in Porcine Spinal Cord" was presented at the American Association of Neurological Surgeons (AANS) meeting in New Orleans, LA. A manuscript is being prepared for submission.

Disclosures/patents

Other grant applications and/or awards: In addition, Regenerative Medicine Minnesota funding was awarded for summer 2018. The third cohort started the program this month. An NHLBI T35 application is being prepared for submission in early 2019.

Responsible Spending:

Please let us know how you spent the money. Any unspent funds must be returned.

Dr. Troy Lund (Principal Investigator)	\$14,769
Kelly Miettunen (Administrator)	\$6,248
Medical Student Stipends	\$14,993
Supplies	\$11,197
Medical Student Travel	\$925
Total Direct Costs	\$48,133
Indirect Costs	\$15,883
Total	\$64,017

Summer Research Program in Regenerative Medicine: Student Survey

Please respond to the following statements about your faculty mentor. 1 indicates that you Strongly Disagree, 9 indicates that you Strongly Agree.

My faculty mentor made himself/herself available to me.

Zach Miller	9
Lisa Marshall	9
Mary Soderlund	7
Jackson Baril	8
Average	8.25

My faculty mentor responded to my questions in a timely fashion.

Zach Miller	9
Lisa Marshall	9
Mary Soderlund	8
Jackson Baril	9
Average	8.75

My faculty mentor was flexible.

Zach Miller	9
Lisa Marshall	9
Mary Soderlund	7
Jackson Baril	8
Average	8.25

My faculty mentor treated me like a colleague.

Zach Miller	9
Lisa Marshall	9
Mary Soderlund	7
Jackson Baril	8
Average	8.25

My faculty mentor directed me to appropriate reading material.

Zach Miller	8
Lisa Marshall	9
Mary Soderlund	9
Jackson Baril	7
Average	8.25

My faculty mentor provided a positive learning experience.

Zach Miller	9
Lisa Marshall	9
Mary Soderlund	8
Jackson Baril	9
Average	8.75

Please provide any additional feedback or comments regarding your faculty mentor.

Zach Miller	Walt is a great mentor. He gave me just the right amount of guidance - he made me think about what I was doing and ways to approach it, instead of just telling me what he would do.
Lisa Marshall	Angela was an awesome mentor. She was great to work with and had very reasonable expectations for me during this relatively short program.
Mary Soderlund	n/a
Jackson Baril	I have worked with Dr. Tranquillo before so it was a good continuation. I would have liked to meet with him a couple more times, but that's also on me to schedule those meetings.

Please respond to the following statements about your faculty mentor. 1 indicates that you Strongly Disagree, 9 indicates that you Strongly Agree.

My research skill set improved over the course of the program.

Zach Miller	9
Lisa Marshall	8
Mary Soderlund	7
Jackson Baril	8
Average	8

This research experience was worthwhile.

Zach Miller	9
Lisa Marshall	7
Mary Soderlund	4
Jackson Baril	7
Average	6.75

I have interest in continuing the project I started as part of the program.

Zach Miller	7
Lisa Marshall	7
Mary Soderlund	6
Jackson Baril	8
Average	7

What laboratory techniques did you learn? If none, list N/A.

Zach Miller	Confocal microscopy, cell culture, infectivity assays
Lisa Marshall	Basically everything I did- my previous research was in a very different area. Culturing and differentiating cells, decellularizing tissue, sectioning, staining with H&E and fluorescent antibodies, taking images on a microscope
Mary Soderlund	Western blot, PCR many others
Jackson Baril	Flow Cytometry, flurometric enzyme assays, cell culture, and coating cylindrical fibrin casts.

Will you be an author on a poster related to the research you conducted as part of the program?

Zach Miller	yes
Lisa Marshall	no
Mary Soderlund	no
Jackson Baril	maybe

Will you be an author on a manuscript related to the research you conducted as part of the program?

Zach Miller	yes
Lisa Marshall	no
Mary Soderlund	no
Jackson Baril	no

Will you give a presentation at a national meeting related to the research you conducted as part of the program?

Zach Miller	maybe
Lisa Marshall	no
Mary Soderlund	no
Jackson Baril	maybe

What can we do to improve the program for the next cohort?

Zach Miller	I think it was great overall. I was already working in the lab, so it was very easy for me to transition into my summer project. There's really nothing I would change because it went so smoothly.
Lisa Marshall	I received an offer for the program really late, but I think it was due to someone else not being able to do the program anymore, so I'm not sure there would have been a way to prevent the late notice.
Mary Soderlund	Nothing to add
Jackson Baril	Although my PI was very clear with forwarding information regarding funding to me, I'm not sure the others had the same experience and that information (chart string, etc) should be sent directly to us as well.

Please provide any additional feedback or comments regarding your experience with the Summer Research Program in Regenerative Medicine.

Zach Miller	We are submitting an abstract to American Association of Neurological Surgeons national meeting, and I will be the presenter if it is accepted. I am also continuing to work on my project this school year and should be authoring a manuscript once we have a more complete story.
Lisa Marshall	Overall, I think this is a really good program. It's a great opportunity for medical students like me who haven't had a lot of super medically-relevant research experience. I really liked how hands-off the program was as far as letting us be completely involved in our lab. The only thing I didn't really like was the seminars- I didn't think they were super relevant for students that were just doing research for the summer. However, they would be super helpful for students doing more long-term research.
Mary Soderlund	
Jackson Baril	Overall it was a great experience!

Would you recommend the Summer Research Program in Regenerative Medicine to your peers?

Zach Miller	yes
Lisa Marshall	yes
Mary Soderlund	yes
Jackson Baril	yes