NATHAN SHOCK CENTERS OF EXCELLENCE IN THE BASIC BIOLOGY OF AGING

PILOT AWARDEE SPOTLIGHT

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Single-nuclei transcriptional profiling of muscle in response to exercise in Drosophila

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How did you become interested in aging?
My interest in aging grew out of my interests in exercise biology and epigenetics. My lab studies how exercise variation arises, meaning why not everyone responds to exercise the same way. This work led us to ask how individuals of different ages respond to exercise, and if there is maybe an optimal exercise treatment that promotes healthy aging. For example, we would like to know if to gain the age-associated health benefit of exercise you have to exercise throughout your life, or if there are certain periods that are particular important. We would also like to know for how long the health benefits last once you stop exercising, and what determines how much of a health benefit an individual sees.

Briefly describe your project in non-scientific terms. What questions are you trying to answer?
Muscles are the primary tissue impacted by exercise. In this pilot project, we are trying to determine what cell types in muscles respond to or change after a 5-day exercise treatment. We are also trying to find out if there are specific metabolic or signaling pathways that get activated after the exercise treatment. Thus, the overall goal is to understand what happens within the muscle after a 5-day exercise treatment.

What previous research or experience informed the development of this proposal?
Our previous work identified several candidate genes controlling animal activity and exercise response linked to muscle and the communication between the muscle and the central nervous system. Thus, our first approach to follow up on this work is to start with the muscle and identify the molecular pathways that are induced after exercise.

What's exciting about your project's potential impact?
Understanding what happens in the muscle – and the body in general – with exercise is a first step towards designing optimal exercise treatments for individuals of all ages. It might also help us develop substitutes for exercise that mimic its health benefits.

If your project is successful, what is the next step?
Once we identify specific cell types or gene expression networks that respond to an exercise treatment, we will manipulate those cell types and/or networks experimentally, to determine if we can mimic the benefits seen with exercise. As this experiment was carried out with only one sex and genotype, we also need to make sure that the results can be confirmed with the other sex and multiple genotypes.

How has support from and collaboration with the NSCs helped further this project and/or your research overall?
As this project is currently unfunded, the support from the USC-Buck NSC provided important resources for us to carry out single-nuclei gene expression studies that would have not been otherwise possible. These data will provide important proof-of-principle data to support a planned grant application.