NATHAN SHOCK CENTERS OF EXCELLENCE IN THE BASIC BIOLOGY OF AGING

PILOT AWARDEE SPOTLIGHT

Kevin Murach, PhD
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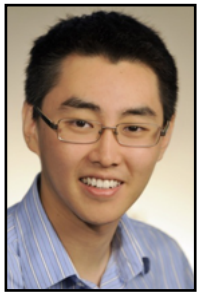

Yuan Wen, MD/PhD
Postdoctoral Fellow
University of Kentucky

2021 Oklahoma NSC Pilot Award

The Role of Satellite Cells in Epigenetic Adaptations to Lifelong Exercise

How did you become interested in aging?

Myself [Dr. Kevin Murach] and my Co-PI, Dr. Yuan Wen, have always wanted to work on something where our discoveries could impact a large number of people. Everyone is affected by aging, so it made sense to apply our knowledge and skills to the challenge of improving healthspan.

Briefly describe your project in non-scientific terms. What questions are you trying to answer?

Muscle size and function decline with aging, which is detrimental to healthspan and quality of life. Epigenetic decline and dysregulation (i.e. shifts in how genes are expressed without changing the genetic code) are characteristic of aging in all tissues, including skeletal muscle. We have shown that exercise can mitigate muscle aging at the epigenetic level. The purpose of our current investigation is to determine how muscle stem cells contribute to muscle epigenetic maintenance with exercise throughout the lifepan.

What previous research or experience informed the development of this proposal?

The current focus of my lab is studying the intersection between exercise, aging, and epigenetics. Mine and Dr. Wen's postdoctoral work centered around muscle stem cells. Our recent NIH-funded work provided evidence that late-life exercise mitigates muscle epigenetic aging, and that muscle stem cells contribute to muscle fiber epigenetics in distinct ways. Thus, we asked whether these stem cells could influence muscle epigenetic aging in response to exercise. We think it is conceivable that the presence of muscle stem cells with exercise throughout the lifespan could have a beneifical effect on skeletal muscle epigenetic aging.

What's exciting about your project's potential impact?

Understanding how stem cells contribute to muscle epigenetic profiles with exercise throughout the lifespan could help guide therapeutics aimed at targeting these cells to improve muscle mass and function. Our findings may therefore help improve quality of life during healthy aging, as well as in different conditions of muscle atrophy (which can increase in severity as aging progresses).

If your project is successful, what is the next step?

If the presence of muscle stem cells enhances epigenetic rejuvenation with exercise throughout the lifespan, we will design additional experiments with interventions to maximize the contributions of satellite cells. The hope is that we can dissect out the beneficial epigenetic alterations conferred by muscle stem cells, and obtain additional funding to expand our work in this area.

How has support from and collaboration with the NSCs helped further this project and/or your research overall?

The design of these experiments was heavily influenced by the personnel at the Genomics Sciences Core at the Oklahoma Nathan Shock Center on Aging. We had prolonged interactions and several meetings to discuss our project goals and plan our approach. With their guidance, we settled on an analysis plan that suited our needs, and the core has worked with us through troubleshooting. We expect the analyses to be complete by the end of the summer of 2022. Overall, the Nathan Shock Center has been pleasurable to work with, and we are excited to learn new things about exercise, muscle epigenetics, stem cells, and aging.