NATHAN SHOCK CENTERS OF EXCELLENCE IN THE BASIC BIOLOGY OF AGING

PILOT AWARDEE SPOTLIGHT

Victoria K. Gibbs, PhD

Associate Professor
University of Alabama at Birmingham

2023 UAB NSC Pilot Awardee

Evaluating the freshwater crustacean, Daphnia pulex, as an alternative, short-lived animal model of healthspan and aging

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How did you become interested in aging?
I first began researching aging during my postdoctoral work at UAB with that allowed me to study individual variation in aging for in-bred mice experiencing different energetic demands from temperature exposure while being provided the same ration of food. The conditions of the study replicated caloric restriction by increasing the energetic demand of one group of mice but limiting their food intake to match that of mice held at thermal neutrality. The connection between energetics and aging is very interesting to me. My graduate training prepared me to ask questions related to nutritional composition of diets and flow of energy into growth and reproduction in aquatic animals, and I can now apply those skills in this area of aging biology.

Briefly describe your project in non-scientific terms. What questions are you trying to answer?
Comparative animal models of aging biology can provide valuable insight into the mechanisms driving the hallmarks of aging and how aging interventions may affect health and lifespan. Water fleas, freshwater crustaceans of the genus *Daphnia*, are short-lived, easy to maintain in the laboratory, and reproduce primarily by females generating clones. Whereas, *Daphnia* have been used for decades to study eco-toxicology, only recently have investigators begun to use the water flea for lifespan studies; however, the culture conditions vary among these studies. My main objective for the pilot project is to evaluate culture conditions published by different laboratories to determine what culture medium, temperature, photoperiod, and food supports better health and longevity for better standardization of the model. My lab will also develop a suite of healthspan metrics that can be used to assess the health of water fleas exposed to interventions shown to extend lifespan in other animal models, such as dietary restriction, rapamycin, and metformin.

What previous research or experience informed the development of this proposal?
During my first faculty appointment as an Assistant Professor of Biology at a liberal arts college, I sought questions and a model that would be amenable to training undergraduate students in the research. Lifespan studies with *Daphnia pulex* was a perfect fit for my lab at the time. My students conducted experiments using dietary restriction as an intervention to evaluate the effects on the energetics of reproduction and lifespan. The early experiences with the model encouraged me to consider how it could be improved for repeatability across laboratories with more measures of healthspan beyond reproduction.

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

I believe the most exciting potential impact comes from all the students who have and will receive training in research through working with the model. Research experiences for undergraduates can open new doors to career possibilities they may not have considered. My career trajectory changed for the best when I had my first research experience, and I hope I can help other students find their path.

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

I would like to explore the effects of other drug interventions or even environmental exposures that may impact health and lifespan in *Daphnia pulex*. I believe we can also explore transgenerational effects of exposures on offspring success by following cohorts of clones from parthenogenic mothers.

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

The financial support has helped me establish my laboratory on campus and afforded me the opportunity to use Core services to collect and analyze valuable data on oxygen uptake rates with the Comparative Organismal Energetics Core at UAB and the Data Analytics Core. Additionally, I have grown my network of potential collaborators with whom I plan to continue discussing future projects. The data I have collected will form the foundation of future grant applications.