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ECR SPOTLIGHT

ECR Spotlight – Sulayman Lyons

ECR Spotlight is a series of interviews with early-career authors from a selection of papers published in Journal of Experimental Biology and aims to promote not only the diversity of early-career researchers (ECRs) working in experimental biology but also the huge variety of animals and physiological systems that are essential for the 'comparative' approach. Sulayman Lyons is an author on 'Highland deer mice support increased thermogenesis in response to chronic cold hypoxia by shifting uptake of circulating fatty acids from muscles to brown adipose tissue', published in JEB. Sulayman conducted the research described in this article while a PhD student in Dr Grant McClelland's lab at McMaster University, Hamilton, Canada. He is now a Postdoctoral Fellow in the lab of Dr Jacqueline Beaudry at University of Toronto, Canada, investigating how animals can partition metabolic substrates to fuel metabolism.

Sulayman Lyons

How did you become interested in biology?

I think we can all agree that animals can do some pretty amazing things. From a young age, I've always been interested in figuring out how the body works. I was amazed by elite athletes performing at the top of their game and animals thriving in the harshest of conditions. This led me to ask questions like how can cheetahs achieve such high running velocities? Why are bears able to hibernate for so many months of the year? How can whales hold their breath underwater for so long? How do salmon migrate such great distances? As I learned more about the natural world, I developed a deep appreciation for the feats of the animal world, which has kept me asking questions and seeking answers.

Describe your scientific journey and your current research focus

My scientific journey began at McMaster University, where I majored in Biology, with a physiology specialization. In the third year of my studies, I took a seminar course which invited a new researcher each week to discuss their research. This course sparked my interested in research, particularly studies involving animals living in extreme environments. This led me to conduct a fourth year thesis project with Dr Graham Scott, where my work focused on diaphragm form and function in deer mice living at high altitude. I enjoyed my work so much that I knew I wanted to continue my research career.

Once I completed my undergraduate degree (2016), I joined Grant McClelland's lab to start my Masters and transitioned to complete my PhD. My work focused on understanding how high-altitude deer mice have evolved to sustain heat production using fats for fuel. Through this training, I came to appreciate the importance of diverse experimental techniques and approaches, ranging from the molecular to the whole-animal level, to solve complex research questions. I was fortunate to complete my training in an incredible lab environment, with an extremely supportive supervisor, colleagues and mentors.

Sulayman Lyons's contact details: University of Toronto, 1 King's College Circle, Toronto, Ontario, Canada.
E-mail: sulayman.lyons@utoronto.ca

Once I completed my PhD, I wanted to gain research experience in another field, specifically within the realm of nutritional and biomedical sciences. Since my PhD research focused on understanding how animals have optimized their metabolic pathways to ensure survival in extreme environments, I wanted to apply my knowledge in contexts where these pathways work sub-optimally, such as in diabetes and obesity.

I joined Jacqueline Beaudry's lab in October 2022 as a postdoctoral fellow in the Department of Nutritional Sciences at the University of Toronto. I am currently studying how nutrition and hormones impact fat tissue metabolism in the context of obesity and diabetes.

How would you explain the main findings/message of your paper to a member of the public?

In the wild, deer mice living in high-altitude environments constantly face cold temperatures and low oxygen levels. Because these mice do not hibernate, and are instead active throughout the winter, they have evolved special strategies to maintain their body temperatures and ensure their survival. As expected, if we compare a high-altitude deer mouse with a low-altitude deer mouse, we see that high-altitude deer mice are more effective at maintaining their body temperature and generating body heat in cold, low oxygen conditions. Interestingly, this process of increased heat production has been linked to increases in burning fat. Fats are better than sugars for fueling heat production because they are an abundant source of energy; however, burning fats requires more oxygen, making it more 'expensive' than burning carbohydrates.

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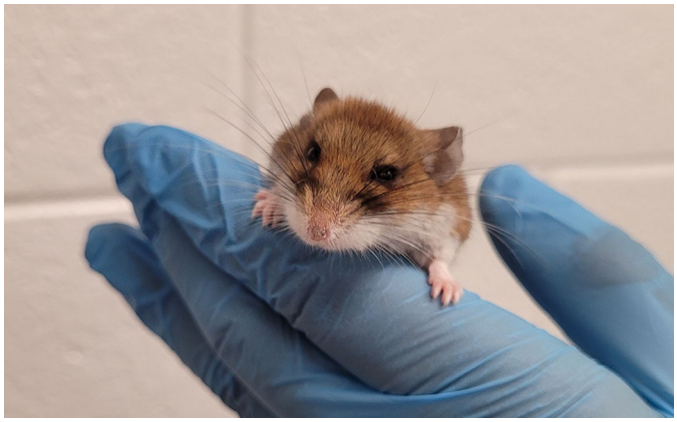

A high-altitude deer mouse (*Peromyscus maniculatus*), native to Mount Blue Sky (4300 m above sea level, Colorado, USA), that just finished a maximal cold-challenge trial, like a champion!

In the current study, we were interested in understanding which tissues were responsible for the uptake of fat to sustain this heat production. We discovered that when high-altitude mice go from warm, normal-oxygen conditions to cold, low-oxygen conditions, they begin to shift fat uptake from muscle to a specialized heat-producing organ called brown adipose tissue. Surprisingly, this shift was not observed in low-altitude deer mice, suggesting that high-altitude deer mice have evolved to improve fat delivery and uptake into brown adipose tissue in cold, low-oxygen conditions. Our findings provide some insight as to how these special mountain mice can survive the daunting environment of high altitude.

What do you enjoy most about research, and why?

I enjoy research because it's an exciting journey of exploration, where I delve into the unknown, unravel mysteries, and shed light on uncharted territories. The process of research drives my curiosity and pushes me to search for answers to complex questions. I have a lot of fun using a diverse array of tools and innovative strategies to gather evidence and piece together a comprehensive picture of the mechanisms I am studying.

Research has also granted me the opportunity to teach and share my passion for research with other learners at all stages of education. I find it very rewarding when inquisitive minds ask questions and I get to watch them problem solve and find solutions.

Lastly, I am grateful for the fact that research has enabled me to meet some brilliant people from around the world. The connections made through research have opened doors to new collaborations and networking experiences, which have greatly contributed to my personal and professional growth. I have learned that a variety of unique backgrounds and diverse perspectives is crucial for scientific discovery.

What is your favourite animal, and why?

Despite my last name being 'Lyons', my favourite big cat is in fact the cheetah. Everything about them screams SPEED, from their aerodynamic lightweight bodies, powerful legs, and semi-retractable claws which act like spikes on a track shoe. I always enjoy watching documentaries on these speedy cats.

What do you like to do in your free time?

When I am not thinking about or doing research, I enjoy physical activity like playing football (soccer) or squash. I've most recently taken up the challenge of completing a marathon, which I am excited to tackle. Other activities I enjoy include watching anime, playing board games with friends, and cooking. I also think it's very important to take time to spend time with friends and family, as they are often my biggest support systems and patiently listen to me talk about my research all day.

Reference

Lyons, S. A. and McClelland, G. B. (2024). Highland deer mice support increased thermogenesis in response to chronic cold hypoxia by shifting uptake of circulating fatty acids from muscles to brown adipose tissue. *J. Exp. Biol.* **227**, jeb247340. doi:10.1242/jeb.247340