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ECR SPOTLIGHT

ECR Spotlight – Kathryn van Boom

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. Kathryn van Boom is an author on 'Does sex matter in the cheetah? Insights into the skeletal muscle of the fastest land animal', published in JEB. Kathryn is a Postdoctoral research fellow in the lab of Professor Tertius Kohn at University of the Western Cape, South Africa, investigating the mechanisms and physiological response of humans and animals to physiological stressors (such as disease, diet and exercise), particularly in relation to skeletal muscle.

Kathryn van Boom

How did you become interested in biology?

I remember, my mom bought me a toy microscope when I was very young and I would put everything underneath it to see what it would look like. This interest continued as I got older – during high school my favourite subjects were biology, mathematics and physics. I have always been fascinated with how animals, the human body and all of nature functions so perfectly and beautifully. This fascination, along with my love of sports and the outdoors grew my passion for biology and physiology into adulthood. So my interest and passion started very young and I am fortunate to have been able to pursue this career field.

Describe your scientific journey and your current research focus

I completed a BSc in Human Physiology and Biochemistry at the University of Cape Town. I subsequently moved into more applied physiology, completing my BSc Honours and MSc in Exercise Science at the University of Cape Town. My MSc research focused on characterizing the skeletal muscle structure and metabolism of 16 different breeds of domestic dogs. During my MSc I was also involved in several other projects in our laboratory, which include the current publication. I then shifted direction slightly for my PhD, which was completed in the Faculty of Veterinary Science at the University of Pretoria in 2024. The study utilized metabolomics to investigate the effect of glycine supplementation on the metabolism of captive cheetahs as they are prone to an array of unusual diseases in captivity. My PhD study was an incredible experience and yielded important data (in the process of publication) that may aid in the conservation of these endangered animals. Currently, I am doing my postdoctoral fellowship at the University of the Western Cape and have, yet again, shifted gears slightly as our study is aiming to identify novel markers for insulin resistance and diabetes in a human population. Although my research and involvement has spanned different species and methodological approaches, the overall theme focuses on trying to understand mechanisms of animals and humans in response to different physiological conditions in the hopes of further understanding their physiology and metabolism to aid in disease prevention and treatment.

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

'Does sex matter in the cheetah? Insights into the skeletal muscle of the fastest land animal' is the first paper to offer comprehensive data on the skeletal muscle of this majestic and endangered animal. Cheetahs are built for speed and their skeletal muscle clearly shows this characteristic. Both males and females have predominantly fast twitch type IIX muscle fibres (over 60%) with males having larger fibres than their female counterparts. Male and female cheetahs were fairly similar overall. When compared with humans, cheetahs had a poor oxidative capacity (the ability to use oxygen to obtain energy) and, therefore, were less fatigue resistant. Cheetahs also appeared to have a reduced ability in the utilization or availability of creatine phosphate (for rapid energy) and glycogen (stored glucose) and had improved antioxidant defence as reflected by the enzyme activity and metabolite concentrations. This study provides valuable comparative information on the skeletal muscle of the fastest land animal.

What do you enjoy most about research, and why?

I love being able to ask questions and to develop methods and approaches to attempt to answer them. As a South African

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Journal of Experimental Biology (2024) 227, jeb249302. doi:10.1242/jeb.249302

Enjoying the sunshine. Photo credit: Adrian Tordiffe.

researcher, often this means ‘out of the box’ innovative thinking to utilize our limited resources fully and, even with all the challenges, produce reliable results. I enjoy working with different people across different departments, universities and countries in order to build collaborative relationships, grow skills and figure out ways of answering these questions together. I love the diversity of research, the freedom it gives you to explore, the hours spent in a lab, the character it builds when the experiment fails, the absolute joy when it succeeds and the friendships made. But most of all I love that once we have answered the question and completed the thesis or article, we will have asked 10 more questions.

What is the most important piece of equipment for your research, what does it do and what question did it help you address?

The fluorescence microscope in our laboratory has been my most used and appreciated piece of equipment throughout my academic journey. The microscope has filters that can detect fluorescent light at different wavelengths. This then emits light of different colours which allow you to identify different structures or proteins based on the antibodies you have used. In our laboratory, we primarily work with cross-sectional cuts of skeletal muscle – using the microscope allows you to determine fibre type, cross-sectional area, peripheral nuclei and any protein that you may be interested in investigating. There are many questions that it can help you answer, particularly linked to structure. And if there is a mounted camera, you can take beautiful pictures of the microscopic structures and cells that you see.

What is your favourite animal, and why?

It has to be a cheetah, it would be crazy if I said any other animal. It was such a privilege to work with these majestic animals during the course of my PhD and it is heartbreaking to see how they have been reduced to largely captive living due to all the threats that face them. The endangered cheetah is also symbolic of all the conservationists, biologists and researchers that work so hard to protect them and other animals like them.

Reference

Kohn, T. A., Knobel, S., Donaldson, B., van Boom, K. M., Blackhurst, D. M., Peart, J. M., Jensen, J. and Tordiffe, A. S. W. (2024). Does sex matter in the cheetah? Insights into the skeletal muscle of the fastest land animal. *J. Exp. Biol.* **227**, jeb247284. doi:10.1242/jeb.247284