

FIRST PERSON

First person – Osiris Martinez-Guzman

First Person is a series of interviews with the first authors of a selection of papers published in Journal of Cell Science, helping early-career researchers promote themselves alongside their papers. Osiris Martinez-Guzman is first author on 'Mitochondrial–nuclear heme trafficking in budding yeast is regulated by GTPases that control mitochondrial dynamics and ER contact sites', published in JCS. Osiris conducted the research described in this article while a PhD student in Dr Amit Reddi's lab at the Georgia Institute of Technology, Atlanta, GA. She is now a postdoc in the lab of Dr Adam Hughes at the University of Utah, Salt Lake City, UT, where she is investigating organelle communication and mitochondrial metabolism.

How would you explain the main findings of your paper in lay terms?

Heme, the pigment that gives blood its red color, is an essential but potentially cytotoxic metabolite. As a consequence, cells have had to develop elaborate mechanisms to safely handle this molecule, but these mechanisms are poorly understood. Using fluorescent biosensors for heme, I developed an approach to monitor the subcellular distribution of heme as it is being synthesized in living cells. My results revealed two completely unexpected findings. Firstly, heme, which is made in the mitochondria, is mobilized to the nucleus faster than to other cellular locales and, secondly, the routing of heme to the nucleus is regulated by proteins that control mitochondrial dynamics and heme synthesis. Altogether, my work has revealed heretofore unknown mechanisms underlying the trafficking of heme, which could be exploited to treat a number of heme-related diseases including certain anemias, cancers and neurodegenerative disorders.

Were there any specific challenges associated with this project? If so, how did you overcome them?

There were two primary challenges. The first was trying to convince myself (and others) that the heme sensors we were using to probe heme trafficking did not themselves alter heme homeostasis. I spent considerable time and effort to show that the expression level of the sensors did not change the observed heme trafficking results or various aspects of heme homeostasis. The second challenge was making sense of our results. My data, on aggregate, suggest that certain proteins critical for regulating mitochondrial dynamics and inter-organelle contact sites also regulate the movement of heme to the nucleus. However, redundancy and overlap between various pathways for inter-organelle contact sites made it challenging to establish this model for heme transport. Our lab is still trying to develop approaches and tools that will allow us to further demonstrate that mitochondrial contact sites act as a highway for heme distribution.

When doing the research, did you have a particular result or 'eureka' moment that has stuck with you?

Mitochondria are dynamic organelles that are constantly dividing and fusing. My 'eureka' moment came when I found that GTPases that regulate mitochondrial fission and fusion work in opposing directions to regulate mitochondrial–nuclear heme trafficking. I still



Osiris Martinez-Guzman

remember sending a low-key email to my advisor Dr Reddi because I didn't want to be too excited about the results yet.

Why did you choose Journal of Cell Science for your paper?

Journal of Cell Science is one of the oldest, most reputable journals publishing in the general area of cell biology. Many key papers elucidating the mechanisms underlying mitochondrial dynamics and lipid trafficking were published in this journal. JCS was the most fitting forum for our work linking mitochondrial dynamics and heme trafficking.

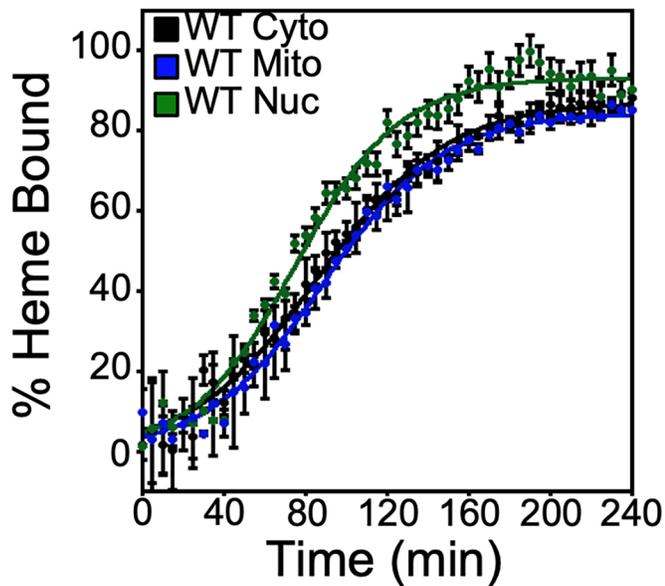
Have you had any significant mentors who have helped you beyond supervision in the lab? How was their guidance special?

Definitely, my mentor Dr Reddi and my lab mates were key to this work by not only advising me on my research and experiments, but also encouraging me to persevere.

What motivated you to pursue a career in science, and what have been the most interesting moments on the path that led you to where you are now?

I would say curiosity and early exposure to science motivated me and made me interested in pursuing a career in science. Being able

Osiris Martinez-Guzman's contact details: Department of Biochemistry, University of Utah, 15 N Medical Drive East, RM4100, Salt Lake City, UT 84112-5650, USA. E-mail: osiris.martinez-guzman@biochem.utah.edu



We observed that heme mobilization to the different compartments was similar, with nuclear mobilization being slightly faster, suggesting that there are parallel pathways for heme distribution and that, once heme is synthesized at the active site of ferrochelatase, distribution to the different locations is equally probable.

to answer questions that no one else has answered and advancing the frontiers of general biology and biochemistry was very attractive to me. The most interesting moments on the path that led me here involved mentoring people and communicating science. I've always been afraid of public speaking. Putting myself in situations where I had to communicate my science through mentorship and public

speaking made me realize how much I actually do like interacting with people in public forums. I've also had the opportunity to mentor some wonderful students, and that allowed me to realize I have a passion for teaching.

Who are your role models in science? Why?

One of my role models in science is my older sister, who exposed me to science early on. She would talk to me about her research and take me to her lab to show me the instrumentation. Once I got to college, she was my inspiration to apply for research fellowships. She also exposed me to what graduate school was like and made me realize it was an excellent next step for me. I would say Dr Reddi is another role model for me; his mentorship and his knowledge have been beyond what I expected and I am eternally grateful to him for shaping me into a great scientist. I would also say that Dr Rebecca Donegan in our lab has also been a big role model for me, for showing me you can be an excellent mom and an amazing scientist at the same time.

What's next for you?

I recently started working as a postdoctoral fellow under the supervision of Dr Adam Hughes at the Biochemistry department of the University of Utah. I would like to become a Professor one day and have my own research lab.

Tell us something interesting about yourself that wouldn't be on your CV

I enjoy baking and sharing my concoctions with my lab mates.

Reference

Martinez-Guzman, O., Willoughby, M. M., Saini, A., Dietz, J. V., Bohovych, I., Medlock, A. E., Khalimonchuk, O. and Reddi, A. R. (2020). Mitochondrial–nuclear heme trafficking in budding yeast is regulated by GTPases that control mitochondrial dynamics and ER contact sites. *J. Cell Sci.* **133**, jcs237917. doi:10.1242/jcs.237917