FIRST PERSON

First person – Danielle Bower

First person is a series of interviews with the first authors of a selection of papers published in Biology Open, helping early-career researchers promote themselves alongside their papers. Danielle Bower is first author on 'SERCA directs cell migration and branching across species and germ layers', published in BiO. Danielle is a radiology resident in the Department of Biomedical Research, University of Bern, Switzerland, investigating the biochemical mechanisms responsible for human disease and elucidating methods to intervene.

What is your scientific background and the general focus of your lab?

My academic background is in biochemistry, and my research background generally spans molecular and developmental biology. I have done research ranging from bacterial cell cycle regulation, to degradation of oncogenic proteins in their normal developmental environment, to the dynamic imaging of living organs and organisms in order to quantitatively assess at the cellular and sub-cellular level how fundamental developmental events occur. The focus of the lab where this work was performed is to develop and utilize advanced imaging methodologies to interrogate the behaviors and molecular activities of living biological systems.

How would you explain the main findings of your paper to non-scientific family and friends?

Think of a city subway map, or a tree, and all the individual branches that encompass the entire structure. If you were to build such a vast branched structure, how would you do it in an efficient manner without having to write specific, individual instructions for each branch? In this study, we describe a mechanism that nature has developed and employed from fruit flies through fish and all the way to mammals to direct when a new branch should form in a complex branched structure. This mechanism can be used over and over again to build a complex structure (such as the lung) by repetition. We believe this mechanism may have originated long ago in bacteria and has been conserved and adapted for use across bacteria, fungi, plants and animals.

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What are the potential implications of these results for your field of research?

Our results describe a calcium pump (SERCA) that regulates cell migration and branching in a conserved manner from invertebrates to vertebrates, and tissues from all germ layers. The very nature of being a highly conserved regulator means that these findings have implications for understanding the regulation of cell migration and budding across organogenesis. They may even link budding decisions from bacteria and fungi to the complex branching in vertebrates under one mechanism. Our results suggest that SERCA acts as a central organizer which can integrate inputs from the cellular environment, such as from growth factor morphogens, to tailor branching to the

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needs of the specific tissue. These findings may also have ramifications for targeting pathological budding, such as in tumor angiogenesis, diabetic neovascularization, and cancer metastasis.

What was a particularly surprising or exciting moment during your research?

When I decided to look for a specific calcium signature that distinguished migrating cells forming a new branch from cells that failed to migrate due to inhibition of the SERCA pump, I knew from my reading of the literature that I might be looking for anything ranging from changes in steady state levels of calcium to oscillations to calcium impulses, across a range of timescales. I set up the initial experiments to be able to detect any of these possibilities. Nevertheless, it was very exciting when I first saw the dramatic calcium impulses propagating between contiguous *Drosophila* tracheal cells. These impulses ended up not being important for directing cell migration or branching, but their striking behavior is nonetheless remarkable and merits further study as to their function.

What changes do you think could improve the professional lives of early career scientists?

I think a fundamental change to what the scientific community promotes as 'success' would help. We, as an international community of intellectuals broadly interested in furthering knowledge, should be most concerned with how our research and furtherance of knowledge will stimulate the curiosity of later generations and how it can be used to improve and protect our world. However, the overwhelming focus on publication number and journal impact to secure ongoing funding often obscures the bigger picture and brings a level of competition that can stifle creativity. Greater understanding and support from the scientific community in general for the broad range of important and rewarding career options open to young scientists beyond purely academic research, and more appreciation for balance, would help. This could help to mitigate the divisive competition and promote more collaboration. A better balance between the number of young scientists trained with the intention of pursuing an academic scientific career, and the number of permanent positions actually available in that realm, is also needed. To support young professionals who do pursue academic research, greater funding opportunities specifically for early career scientists to become independent investigators is necessary.

What's next for you?

I am currently undertaking my radiology residency training, and conducting research to assess the potential toxicity of contrast agents used in medical imaging. I look forward to continuing to integrate my clinical and research interests.

Reference

Bower, D. V, Lansdale, N., Navarro, S., Truong, T. V., Bower, D. J., Featherstone, N. C., Connell, M. G., Al Alam, D., Frey, M. R., Trinh, L. A., Fernandez, G. E., Warburton, D., Fraser, S. E., Bennett, D. and Jesudason, E. C. (2017). SERCA directs cell migration and branching across species and germ layers. *Biol. Open* **6**, doi:10.1242/bio.026039.