© 2023. Published by The Company of Biologists Ltd | Biology Open (2023) 12, bio059820. doi:10.1242/bio.059820

FIRST PERSON

First person – Bailey Calder

First Person is a series of interviews with the first authors of a selection of papers published in Biology Open, helping researchers promote themselves alongside their papers. Bailey Calder is first author on 'Valproic acid affects neurogenesis during early optic tectum development in zebrafish', published in BiO. Bailey is a PhD student in the lab of Dr Arminda Suli at Brigham Young University (BYU), Provo, UT, USA, investigating the development of brain regions that integrate sensory inputs.

Describe your scientific journey and your current research focus

I obtained my bachelor's degree from Brigham Young University (BYU) in physiology and developmental biology. During my undergraduate experience I worked in the lab of Dr Jeffery Barrow, whose research focuses on the mechanisms which drive patterning of the vertebrate limb, and more specifically, creating a toolset for genetic manipulation of chicken embryos to investigate these questions. From this experience, I became interested in the concept of tissue patterning during development and the power of molecular techniques in developmental biology. Due to this interest, and a persistent fascination with how the brain interprets sensory input, I joined the lab of Dr Arminda Suli as a PhD student. Research in the Suli lab uses zebrafish to investigate the development of multisensory integrating centers within the brain, specifically the zebrafish optic tectum, which helps fish navigate their environment. My current research focuses on how treatment with a drug called valproic acid – which has been linked to Autism – changes development of the zebrafish optic tectum. Our long-term goal is to understand the connection between Autism and sites of multisensory integration within the brain, and our article published in this issue of Biology Open represents the first step towards this goal.

"Our long-term goal is to understand the connection between Autism and sites of multisensory integration within the brain …"

Who or what inspired you to become a scientist?

As an incoming college student, I felt unsure which career path would be right for me. During my second semester, I took an introductory biology course and became fascinated with the diversity of the natural world. As I continued in the course, I came to realize that I loved asking and answering scientific questions that didn't have an easy answer. This is when I realized that I wanted to become a scientist.

Bailey Calder's contact details: Department of Cell Biology and Physiology, 4005 Life Sciences Building (LSB), Provo, UT 84602, USA
E-mail: bcalder3@byu.edu

Bailey Calder

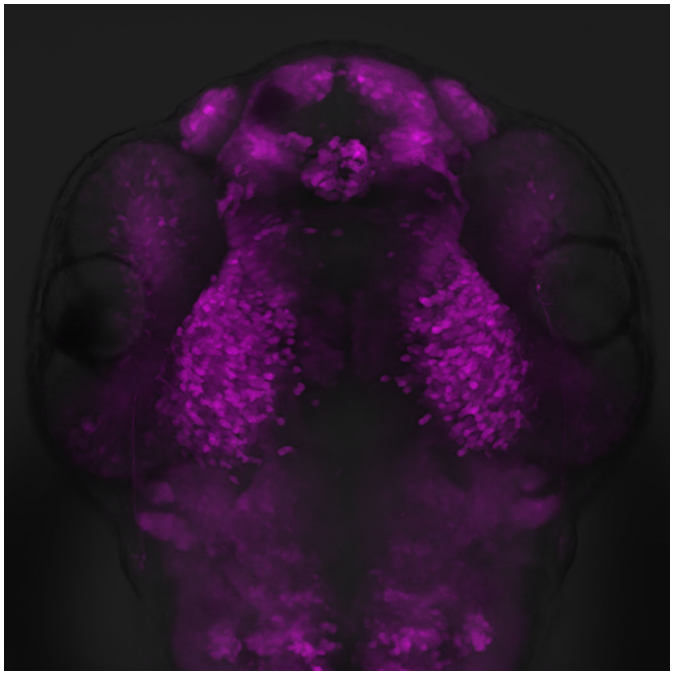
How would you explain the main finding of your paper?

The brain has an incredible way of taking input from all our senses and combining them into one cohesive framework of the world around us. Much of this work is shouldered by regions of the brain such as the superior colliculus in mammals and the optic tectum in zebrafish, which integrates sensory information and disperses it to the rest of the brain. Interestingly, recent research has identified these regions as possible areas that could be affected in Autism because of their critical role in how we perceive our environment and their effect on several other brain regions. In this paper, we used a drug called valproic acid, which mimics Autism-like behaviors in research animals, to determine whether early exposure changes the development of the optic tectum in zebrafish. Our efforts yielded three significant findings. First, early exposure to valproic acid caused changes in overall optic tectum shape and size. Second, it delayed cells from moving from an immature state (stem cell) into a mature state (neuron) where they could send and receive information. Third, these effects were most apparent when the exposure occurred during early stages of development and were greatly reduced when exposure occurred during later stages, thus suggesting a critical period where the optic tectum is especially sensitive. Overall, these findings suggest that valproic acid does impact the optic tectum and begs the question of how these changes might be causing the behaviors we see in Autism, which is the focus of our future work.

What are the potential implications of this finding for your field of research?

One problem that has plagued Autism research since the beginning is how diverse its diagnosis is. It encompasses a broad grouping of

Biology Open (2023) 12, bio059820. doi:10.1242/bio.059820



Representative confocal image of the optic tectum with cells undergoing the transition from an immature to mature neuronal state being labelled in magenta in *Tg(NeuroD:tRFP)*^{w68} transgenic zebrafish larvae.

symptoms and behaviors, which can be the result of anything from genetic mutations to environmental factors, all of which make it difficult to identify a singular cause. Our findings provide evidence that sites of multisensory integration within the brain such as the superior colliculus and the optic tectum are altered in an Autism model (valproic acid treatment), which, due to connections with many other brain regions, could provide a root cause for the diverse behavioral abnormalities seen in Autism. Furthermore, not only do we show that these regions are affected, but also that the severity is closely tied to developmental timing, which could explain the spectrum-like quality of individuals with Autism. Overall, our findings provide an initial characterization of the deviances in development of the optic tectum in an Autism model and serve as a springboard for future studies that will determine the mechanisms underlying these changes.

“One problem that has plagued Autism research since the beginning is how diverse its diagnosis is.”

Which part of this research project was the most rewarding?

As a first-year graduate student, this project has provided me with opportunities to expand my scientific repertoire. From the diverse imaging experiments and 3D analysis, I learned many techniques I was previously unfamiliar with and which I am now excited to apply to future research questions.

What do you enjoy most about being an early-career researcher?

I enjoy the opportunity to learn from and collaborate with more experienced researchers. I have been fortunate to have had great mentors throughout my scientific career and I look forward to many more in the future.

What piece of advice would you give to the next generation of researchers?

My biggest piece of advice would be to start research as soon as possible. Don’t wait to join a lab until you feel like you understand everything. A large part of research is on-the-job training so the sooner you start the more you will learn.

What’s next for you?

Since I am at the beginning of my PhD, I am looking forward to continuing this research project and am hopeful for more exciting discoveries to come.

Reference

Dixon, S. C., Calder, B. J., Lilya, S. M., Davies, B. M., Martin, A., Peterson, M., Hansen, J. M. and Suli, A. (2023). Valproic acid affects neurogenesis during early optic tectum development in zebrafish. *Biol Open* **12**, bio059567. doi:10.1242/bio.059567.