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FIRST PERSON

First person – Juan Tao

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. Juan Tao is first author on '*Drosophila* Ptp4E regulates vesicular packaging for monoamine-neuropeptide co-transmission', published in JCS. Juan conducted the research described in this article while a postdoc in Edwin Levitan's lab at University of Pittsburgh. She is now a Research Staff in the lab of Michael Parsons at University of California, investigating how neuropeptide and other molecule transmitters are transported long distances in *Drosophila* synapses.

Juan Tao

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

Imagine you are trying to move cargos by trucks through a long and thin tunnel. The first decision you will need to make is how much to pack into one truck. The type II synapses in *Drosophila* are facing the same challenge in transporting neuropeptides and other small-molecule transmitters when sending signals to their target cells. We discovered that the protein Ptp4E plays an important role in determining the volume of neuropeptides and small-molecule transmitters that can be packaged in dense-core vesicles or vascular monoamine transporters. Ptp4E does not alter neuropeptide release efficiency, electrical activity or the size of dense-core vesicle (DCV) and vascular monoamine transporter (VMAT). Instead, Ptp4E regulates the volume of cargo by controlling the vesicular membrane transporter and luminal neuropeptidome content.

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

Yes, since most research on *Drosophila* neuronal muscular junction is conducted in the type Ib synapses, which are much bigger and shorter than the type II synapses, we first needed to develop tools to efficiently study type II synapses. Tdc2-GAL4 was used to specifically drive protein expressions in these type II synapses. Second, we were able to develop a method to image type II synapses in whole larvae without dissection. Third, to rule out the variability of protein expression driven by a UAS-GAL4 system, we used multiple GAL4 lines to drive the expression of different neuropeptide markers. In addition, we used a native *nSyb* promoter without GAL4 to drive neuropeptide marker expression.

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

Yes. The question of whether dense-core vesicles travel individually, in pairs or in clusters in Ptp4E knock-out type II synapses bothered us for a long time. The resolution of a regular confocal microscope was not able to clearly distinguish vesicle sizes. Fortunately, the imaging facility at the University of Pittsburgh purchased a STED super-resolution microscope. With the help of the specialists at the facility, we were able to image the vesicles and measure their diameters at 107±2 nm. This result was consistent with previous work, which also claimed the diameter of a single vesicle was around 100 nm. Additionally, the size of these vesicles was later confirmed by our collaborator using the thin section transmission electron microscopy. The advance in imaging technologies greatly helped my research.

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

The journal was established a century ago, has a prestigious international reputation and a wide range of readership. The journal has helped us share our research with a large scientific community. In addition, I have worked with JCS a few times before and each time had a very positive experience. The reviewers were very professional and provided constructive feedback that strengthened the research, and encouraged us to explore solutions for important questions.

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

Yes, I really appreciate Dr Floyd Mattie and Dr Dinara Bulgari, who both helped me a lot during graduate school and postdoctoral training. I came to graduate school with very limited lab experience and Floyd was a senior graduate student when I joined the graduate lab. He not only taught me lab techniques but also acted as a role model. Dinara was a mentor to me during my postdoctoral training. She shared her wisdom of life and gave me honest suggestions about pursuing a career in academia.

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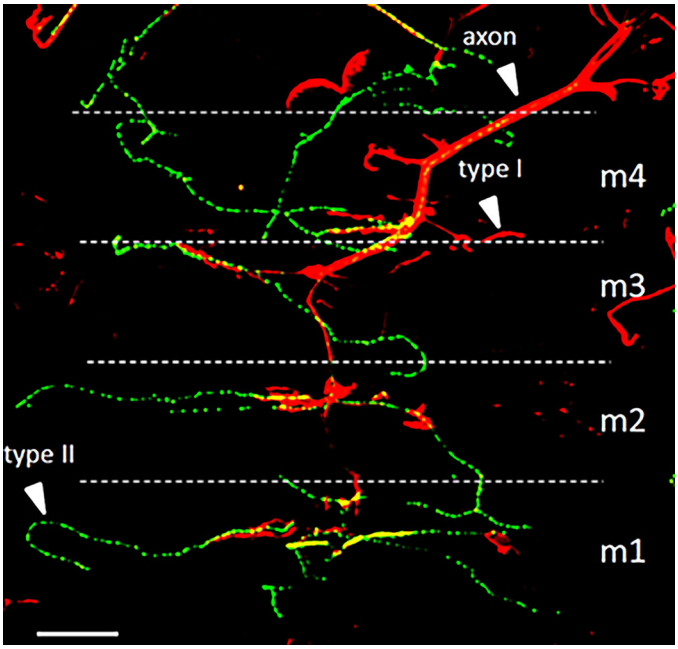

Overview image of *Drosophila* octopamine-containing type II synaptic boutons at muscle 1, 2 and 3.

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?

The excitement of new discoveries motivated me to pursue a career in science. I always have had a curious heart and wanted to figure out why things work in certain ways. Biomedical research gave me a lot of opportunities not only to ask questions, but also to find answers.

What's next for you?

I plan to apply for a permanent position in academia that combines teaching and research. I really enjoy teaching and would like to share my knowledge and passion for science with the next generation of scientists.

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

I have a big sweet tooth. California is a great fit for me as I can find great Boba tea and cake almost anywhere I go.

What would you like to share with first year Ph.D. students?

It's frustrating when experiments do not work and it's ok to repeat once or twice to confirm results. However, don't expect magic will happen if you just keep repeating the same protocol without changing anything. If an experiment has already failed twice, it's a good time to pause and think about why it failed. Talking to your PI, senior students or reading other related literature will help you figure out the reason and optimize the protocol.

Reference

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