

INTERVIEW

Transitions in development – an interview with Daniel Ríos Barrera

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Daniel Ríos Barrera is a group leader at Instituto de Investigaciones Biomédicas, Universidad Nacional Autónoma de México. His research focusses on the coordination of cells to form functional tissues during development. We talked with Daniel over Teams to find out about his career path so far, his research and his work in promoting science in Mexico.

Let's start at the beginning: when did you first become interested in science?

I've been interested in science since I was 12 or 13. I enjoyed my biology classes because I had a great teacher. She was my only biology teacher from middle school to high school, and she was really good. I think that made me really like biology, but I was also interested in chemistry and physics. When it came to choosing a career, it was hard because I also liked informatics and even dancing and travelling, tourism and so on. I don't know how I narrowed it down! I looked at many different programs, and then I found this undergraduate programme on Biomedical Research where you could do lab rotations each year and choose the labs you wanted to work in. That was really motivating because it would allow me to explore different interests and cover different topics.

Why did you choose the lab of Juan Rafael Riesgo-Escovar for your PhD? Was that one of the labs you visited as an undergraduate?

No, I did my undergraduate here in Mexico City, but Juan's lab is in another city, Querétaro, which is about 200 km from here. It was one of the few *Drosophila* labs in Mexico – it's still one of the few *Drosophila* labs here. Before starting the last year of my undergraduate degree, I did a summer internship in Juan's lab. I already knew that I liked developmental biology, so I wanted to try working with flies. Afterwards, for my last year of undergrad, I did a rotation with Jesús Chimal-Monroy, who studies limb development in chick embryos. Then I had to choose between the two labs, and it was not an easy choice, because I also liked working on chick development. But what really got me into flies was all the tools that you can use, and all the approaches you can combine. That's why I decided to choose Juan's lab for my PhD. Also, from the personal side I found it exciting to move to another city, smaller than Mexico City, very vibrant, a place worth visiting. At the same time, I didn't want to go very far away from my family, so it was a perfect balance.

What did you work on during your PhD?

Juan has been working on dorsal closure for many years, trying to find new genes that are involved in the process. I was characterising a mutant that was isolated in the lab that has a defect in dorsal closure. We didn't know what it was; Juan told me, 'here are the mutant flies, and your project is to find out what's going on with them'. I found that the mutations affected a non-coding RNA that is



processed into different fragments. We don't really know what these fragments do, or whether they are the active forms, but we found that they regulate the gene expression required for dorsal closure.

You mentioned you wanted to stay close to family for your PhD, but you made a big move to Germany for your postdoc. What prompted this move and did you notice any differences in the approach to research between the two countries?

I knew I would eventually have to go abroad. I chose Maria's lab because her research was very appealing; I have always found branching morphogenesis a very interesting topic and I also admired how her lab covered many other different topics. It was really gratifying to see that, in terms of the science, things were very similar between Mexico and Germany. I could do exactly the same kind of genetics in Maria's lab that I was doing in Juan's lab. Actually, I wrote about the 'universality' of science in a post on the Node some years back. This was about an internship in Spain that I did during my PhD. In my post, I wrote that the everyday life is tough, because things are very different. This was true between Spain and Mexico, but even more so in Germany. But in the lab, I felt like I could just get on with my research. There was one important difference, which was the speed of things. In Mexico, things tend to be slow, for example if you need a reagent and you order it today, it will arrive in about a month, whereas over there, you could have it the next day. I was so surprised, and I had to get used to the delivery speed! Another thing that I enjoyed in Germany is that the density of researchers is higher, which makes it easier to have invited speakers and seminars, and to find close collaborations. Here, the density is lower and it's not so easy to reach the other cities outside of Mexico City.

What was your research focus in Maria Leptin's lab?

When I joined EMBL, I was part of two labs in the EMBL interdisciplinary postdoc programme (EIPOD). So, I was with

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Maria, and also with Christoph Merten, who was at EMBL at that time. Christoph's lab focuses on developing microfluidic solutions for different applications. Initially, my project was to develop a microfluidic system where we could culture tracheal cells from *Drosophila*. I was very much into signalling and so the idea was to expose the cells to FGF, which acts as a chemoattractant, and then see how the cells would grow towards the FGF. We could then follow different markers and see how they are recruited upon FGF exposure, but the project turned out to be a bit more complex than we initially expected. It took me a long time to set up the system. It is something we still have to finish, but I think there are some cool results coming out from that project. A few months into the project, when a couple of colleagues were about to leave, Maria suggested that I could work on their projects while I was setting up the microfluidics system. These projects were mostly about membrane trafficking, and how secretion and endocytosis contribute to the development of the very complex branches formed by tracheal cells. These became my main projects eventually. We published two papers co-authored with my former colleagues, and the collaboration with them was smooth and very fun. After that I completely shifted my interests towards membrane trafficking instead of signalling. Now, I'm really in love with membrane trafficking.

What were your most important considerations when you were looking for group leader positions?

I wanted to continue doing basic research, so I was looking for anywhere that I could find positions in cell and developmental biology. I always wanted to come back to Mexico, but at some point I thought it wouldn't be possible, because there are very few positions. Because of this, I really looked everywhere and wherever I saw an opening in developmental biology, I applied. Then I was very excited to see an opening in Mexico City. I knew I would have been devastated if I didn't get it, but I also knew that I had to at least try! I was considering staying in Europe, but I always thought that I could help more in Mexico. I felt that I could have a bigger impact there because the scientific community is so much smaller. I wanted to help train students and talk more about science here – that was my drive to come back. I still think there are many things that one can do to improve science and education in Mexico, and so I am really happy that I came back.

Are you involved in any specific programmes in Mexico or is it more about being part of the community there?

My position is mostly focused on research, but I try to teach one course every term. So far, I have lectured on gene regulation, cell biology, signalling and so on, but I always try to bring in policy issues, like fair peer-review evaluations, the use of preprints and open science. I also try to talk about gender equality, and I like to highlight some of the unknown figures of science, for example, everybody knows Morgan but most people don't know the work of Nettie Stevens, or many other female scientists that have also influenced the research that we do today. I'm also trying to volunteer for other positions. I'm getting training to be part of a programme that promotes gender equality and diversity within all the institutions in the university. I think this is another useful way that I can contribute to the community.

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How was your experience transitioning to a group leader? Do you have a best moment or a most challenging one?

Yes, I think that I have one of each and they are related to the pandemic. At the beginning, the lockdowns made my transition easier because I moved back from Germany and then just stayed home in Mexico. It helped because everything was slower, and this gave me more time to re-adapt. Eventually, I recruited students and for the first few months we only worked online, doing things like image analysis and writing a review. One of the best moments so far was when I could sit in in the lab and talk with my students. We already had some results, and we were discussing our working model, the results that we were getting and how we interpret them; I could see them getting excited about our work. This was a project that I designed, and I realised that now they also owned it. It was exciting to see that they were so enthusiastic about their work and the results coming in.

The most challenging moment came when the decision as to whether our students could come to the labs was in the hands of the PIs. I wanted to go to the lab and do experiments and the students also wanted to go to the lab to do experiments, but I knew that some of them had to commute for more than an hour in public transport. It was hard to know what the right call was, and that kind of decision has been difficult with every wave of the pandemic.

Can you summarise the research themes of your group?

We have two approaches. We are still studying trachea development because I realised there are many things from the membrane trafficking point of view that we could still answer. With Maria, we had a lot of insights into the role of secretion, endocytosis and transcytosis in the shaping of cells. I'm now trying to answer how membrane is sorted – we know the routes that it takes to be delivered to different parts of the cell, but we don't know how it is sorted to the basal side or what goes to the apical side. I think the developing trachea is the perfect system to answer these questions because it has very complex cell shapes that are easy to see and analyse. So, we're going to use that system to study the secretion or sorting questions. Then, the larger part of the lab is focused on the role of different tissues in shaping the trachea. We know a lot of things about how the tracheal system is formed. We know that it's regulated by secreted factors such as FGF, but this can't explain the different patterns of branching that we observe in different tissues. We'll be looking at how a tracheal cell might respond, or branch differently, when interacting with the nervous system compared to muscles for example. We want to ask, what are the specificities within a tissue?

What do you see as the most exciting questions in developmental biology over the next 10 years?

I think that looking at development as a whole, a single entity rather than its individual parts, will be important. So far, we have tried to study it in tiny bits, from genes to cells, but now we are trying to integrate this into the organismal level. I think that's really exciting, and we now have more tools to do these kinds of studies. For instance, in *Drosophila*, by using light sheet microscopy, we can see the development of the whole animal and label different tissues simultaneously. Another topic that I'm not involved in, but I think is really important, is looking into other organisms and not only the model organisms that we know so well. We can explore the development of other species, how similar, how different they are, from what we already know. I think that will enrich our understanding of development.

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What has been your approach for hiring new team members?

So far, I have accepted anyone who has come to me because I want to work with people that are interested in what we're doing. At the moment, I have time to take on students, and I think lab skills can be trained. Many of the students are very young, I have students that are from the first year of their degree and they're volunteering, because they want to be in a lab. I think that that level of dedication is really great. They do require a bit more training, but I think that's fine, because they always come with very good ideas. For example, I taught some undergraduates the way I mount embryos for live imaging, and they came up with different ways that I had never thought of! Of course, if students already have some lab skills, that's even better, but so far, if someone is interested, then why not have them in the lab?

How important do you think mentorship is in navigating an academic career?

I think it's very important to look for mentorship, and to find people that are willing to help. I've always had a lot of support from my supervisors, I was lucky with that. I think I was always used to looking for mentorship because of the training that I had as an undergraduate; having lab rotations, you become used to asking for advice. When it came to choosing my postdoc lab, for example, I talked with Juan and he helped me to make my decision. With Maria, I talked about different options that I wanted to look into and apply for. I did rehearsals with the lab for my interviews. I think it's important to have that kind of support. It's difficult enough being on the job market so do it without support would be even tougher.

And now that you have your own lab, with different challenges, has your pool of mentors changed?

Fortunately, my institute hired many other new PIs at the same time as me, and with all of them, we have formed a very solid network. We have a WhatsApp group, where we ask for advice. Often it can be bureaucratic questions, administrative things, but also it could be an issue with a student, asking each other for their opinions. We try and help each other and it's great to have that support network.

What advice would you give to people starting their own labs?

Coming back to mentorship, my advice would be to have a solid network to support you when you are making your application. Or if you're writing grants, it's good to ask people to read them and give you feedback. If you have this network that can help you, you can move faster. I asked for help not only from my mentors, but from colleagues who already had positions. They could give me advice on my applications, and even suggest which grants to apply for. I also tried to collaborate with former colleagues that were also setting up their labs or working in facilities, to join forces and create new projects.

On your website it says that you are a signatory of DORA, can you tell us a little about this initiative and why it is important to you?

DORA is a declaration of research assessment agreed at San Francisco about 10 years ago. It's an agreement between institutions like universities, publishers and scientists to have more

fair evaluations for science, not only for hiring positions, but also for evaluating people's profiles in general. It basically argues against the use of impact factors when evaluating one's performance. Of course, it is more difficult to look into papers and properly evaluate the quality of the research, but this makes much more sense than just looking at a number like the impact factor. It's pushing us to have evaluations that are not centred around journals and journal metrics. I remember as a student being very stressed about these things, worrying about publishing in a good journal with high impact factor, how it would affect my career if I didn't 'publish well'. It brings a lot of anxiety. I think that reading papers and making an informed decision is the fairest thing we can do. I also think this approach pushes people to be more open in science in general. In that sense, initiatives like DORA have opened up the door for other innovative projects like preprint servers, Review Commons and so on.

Can you tell us about your involvement in the new Marie Curie Alumni Association – Mexico chapter, and the importance of promoting/funding science in Mexico?

This is something that I've been very excited about recently, and something we have been working on for many months now. As I was saying earlier, for the first 3 years of my postdoc I was part of the EIPOD programme at EMBL. The EIPOD is funded by the Marie Curie Actions programme and that makes me a member of the Marie Curie Alumni Association (MCAA), which is a network of fellows and alumni spread all around the world. The MCAA organises different kinds of events, including workshops, forums and meetings, most of which are open to the public. EURAXESS is a branch of the EU that promotes science collaboration around the world and the Latin American Caribbean branch approached some of the alumni that are now based in Latin America to talk about the MCAA, and the opportunities they could have for us. Other countries in the region already had their chapters running, so we gathered a group of Mexican alumni to also create the Mexican chapter. EURAXESS LAC has been helping us from the beginning, not only to identify new Mexican alumni but connecting us with the other chapters and guiding us in the proposal that we submitted to the MCAA.

We already had a 'pre-launch' session, where we exchanged ideas for projects and collaborations with the Chapters of Argentina, Brazil, Chile, North America and Spain/Portugal. We also had a public forum, which was focused on inter-sectorial alliances for sustainable development. Thankfully the chapter is now officially created, and I was elected as Chair. In the future, we will do workshops on career development and focus on the so-called soft skills. We are also planning get-togethers between academia and industry to increase collaborations between the two sectors here in Mexico. I think that this is another, more practical, way that we can impact society. I'm really thankful for the support that we're getting from the MCAA.

Did you ever consider an alternative/non-academic career path?

I never really applied to anything that was not academic, but I really liked the editorial world. I thought that if I was to do something else, I would like to stay close to academia and try to be an editor. As a scientist, I still get to be involved in all the peer-review process, and I am serving as Early Career Editor for Molecular Biology of the Cell so I'm happy with my choice. But I do like the idea of seeing lots of different papers and helping to get them published; that sounds very appealing.

Finally, is there anything Development readers would be surprised to learn about you?

I've started becoming very interested in tattoos. I think this is relevant for the Development audience, because my first tattoo

was an axolotl which is, I feel, a Mexican contribution to developmental biology, as a species at least. And this week, I got a new tattoo. If you're a developmental biologist, you'll know it's a fly embryo!