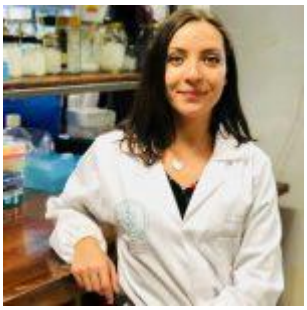
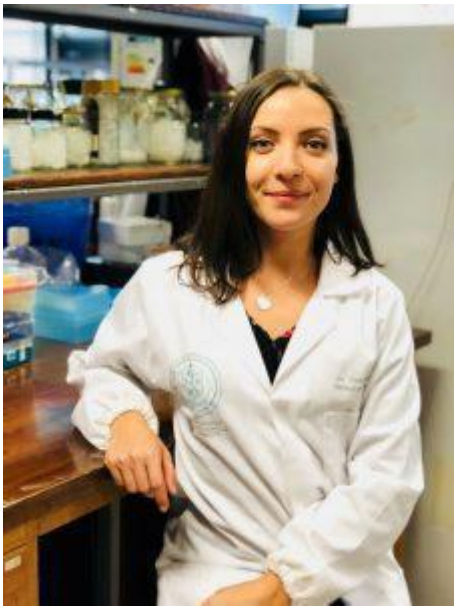
Caroline Beltran





Our immunologist of the month is Dr. Caroline Beltran from the Immunology Research Group, Division of Molecular Biology and Human Genetics at Stellenbosch University, South Africa. She is a postdoctoral research fellow who was awarded the prestigious Crick African Network Fellowship from the Francis Crick Institute in the UK. We were excited to get in touch with her and learn about her interesting work.

What are your research Interests?

Currently, I am working in the field of Tuberculosis, specifically interested in monitoring treatment response, and identifying key pathways to modulate the immune response to improve patient outcome and prevent tissue damage. TB presents as a highly complex and varied disease with a high level of biological heterogeneity, even within the same host. An important aspect of TB research is to translate basic research into effective clinical practice to move TB therapy into a higher rate of success. How can we manipulate the host immune response to counter the intricate mechanisms Mtb has developed to evade and exploit its host? My current research focusses on combining high-end technologies to enable a more contextually relevant way of assessing new drugs and host directed therapies in murine models of TB. I am using tissue

clarification in combination with a comprehensive set of imaging tools to provide new insights into the macro, 3D aspect of lesion formation right down into individual cell-specific interactions.

Who or what influenced your research focus?

I am a nerd at heart, so I have to say, technology development! We are living in the golden age of molecular biology in terms of new tools, methods, and instruments available to us. This has really driven the kind of research I am doing where I want to leverage these incredibly powerful tools to enable a more comprehensive and holistic view of both the host and pathogen response. My love of microscopy and imaging has taken me down an exciting path of novel ways to characterize the varied clinical manifestations observed during symptomatic disease, treatment, and long-term outcome (relapse/recurrence). By combining high content imaging with tools like single cell sequencing, we gain a highly nuanced view of disease pathogenesis.

How do you use your skillset to contribute to advances in immunology?

I would say I am a bit of a jack of all trades (but hopefully a master of some). The longer I am in research, the more focussed my skillset is becoming but I like to think I bring a varied toolset to address some of the key questions that remain in TB immunology. TB is shaped both by the pathogen and host, and we need contextually relevant biological models of TB that can enable faster assessment of new drugs and therapies. My skillset including basic science, animal models, biohazard level 3 work, microscopy, and molecular biology, combined with clinical human research, provides a comprehensive arsenal for a disease like TB.

What trans-disciplinary collaborative research projects have you been involved in?

I was lucky to land a post-doc in a highly collaborative lab under Prof Gerhard Walzl which has afforded me the opportunity to work with a varied team of engineers, clinicians, bioinformaticists and of course, molecular biologists. With this team, we have focussed on comprehensively assessing the varied responses seen in TB patients during treatment and attempt to provide different biomarkers that can be used to quickly identify patients at risk of relapse both from a global view of the host response with PET CT imaging, characterizing the immune response at the site of the disease (BALF proteomics), all the way to metabolite markers present in the urine which was done with our collaborators in the US.

Do you have any advice for early-career researchers?

The impostor syndrome in early career researchers is very real and something I am constantly working against. It’s hard not to compare oneself to other researchers who are publishing high impact papers regularly and not feeling like you are not up to the same level. You need a lot of perseverance and thick skin to make it in science and you have to be able to deal with a lot of failures. My biggest piece of advice is to find what you are really passionate about, the ideas that keep you up at night and go for it. Once you have an idea or project that really blows your hair back, the work (and struggle) becomes worth it because you know you are working on something worthwhile that feeds your love of science.

How has your research (work/life balance) been affected by the COVID-19 pandemic?

Like everyone, the pandemic had a major effect on my research. In 2019, I was awarded a fantastic fellowship which was a dream come true, only to have very hard lockdown in South Africa where I couldn’t do any lab work for a whole year. I am now trying to catch up this lost time, so my work life balance has taken a huge knock.

What hobbies of yours keep your mind fresh and reinvigorate you when away from your work?

Rock climbing and pottery keep me sane! I think it’s so important to have interests outside of science and I often find that these can be really complimentary to my research. Doing pottery allows my creativity to come out where I am not so constrained by the limits of doing replicate experiments where accuracy and preciseness is key. Being able to let go on a piece of clay is extremely cathartic and allowing myself to relax often allows me to come up with my best ideas for my work. Rock climbing is another favourite pastime and allows me to spend time outdoors, whilst still keeping some problem-solving aspect which we all love as scientists.

Interview by Stefan Botha