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First person – Susana Montenegro Gouveia

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. Susana Montenegro Gouveia is co-first author on 'PLK4 is a microtubule-associated protein that self-assembles promoting *de novo* MTOC formation', published in Journal of Cell Science. Susana is a postdoctoral fellow in the lab of Monica Bettencourt-Dias at Instituto Gulbenkian de Ciência, Oeiras, Portugal, investigating the *in vitro* reconstitution of complex biological processes and the fascinating world of microtubules.

Susana Montenegro Gouveia

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

Imagine that our body is a big Lego® construction; a castle, for instance. Inside that construction, you would have smaller structures, such as doors and windows, and each one of the tiny Lego® blocks responsible for putting those structures (and, ultimately, the castle) together are known as proteins. These can then be considered as the building blocks of our cells and bodies.

For our bodies to grow, cells must divide, i.e. one parent cell forms two identical daughter cells with the same number of chromosomes. The redistribution of chromosomes to the respective daughter cells is achieved through their movement along filaments called microtubules. Two so-called centrosomes, each built around a pair of centrioles, help to form the microtubule structures that distribute the chromosomes during cell division.

PLK4 is one of the protein building blocks and has been shown before to play a crucial role in the formation of centrioles. In addition, microtubules are composed of proteins called tubulin. In our paper, we discovered that PLK4 binds tubulin and has an important role in regulating microtubule dynamics. In addition, we showed, using purified proteins and by mixing them together, that PLK4 can self-organise into sphere-like structures that mimic the internal organisation of centrosomes in cells. This discovery provides new ways to understand centrosome formation and organisation, and, ultimately, allows researchers to better understand the molecular processes that control cell division.

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

"[…] the major challenge was convincing my laboratory and peers that these wild structures, looking like huge hollow spheres under the microscope, were not artefacts and were indeed meaningful."

There were many technical challenges associated with this work: from keeping our *Xenopus laevis* happy and getting good extract preparations, to achieving good PLK4 purification preps, as well as being able to visualise PLK4 MTOCs by correlative light-electron microscopy (CLEM) and being able to perform immunofluorescence on them. The list of technical issues can be quite extensive, as in every publication. However, for me, the major challenge was convincing my laboratory and peers that these wild structures, looking like huge hollow spheres under the microscope, were not artefacts and were indeed meaningful. This proved to be the most challenging task of the study, but, in the end, I am happy to say that we succeeded.

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

Every time I added PLK4 to a *Xenopus* extract and started seeing, under the microscope, these beautiful asters popping out like bright and colourful stars with a lively green PLK4 ring in the centre – those were always exciting times! However, a moment I will not forget was when Jadranka Loncarek and I, after many days of struggling, managed to trap these asters and see them via CLEM. It was fantastic, and we could finally prove that those were indeed PLK4 spheres.

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

Journal of Cell Science is a well-known journal in my research field and covers all aspects of cell biology, publishing front-line

Susana Montenegro Gouveia's contact details: Cell Cycle Regulation Laboratory, Instituto Gulbenkian de Ciência, Rua da Quinta Grande 6, Oeiras 2780–156, Portugal.
E-mail: susanamgouveia@gmail.com

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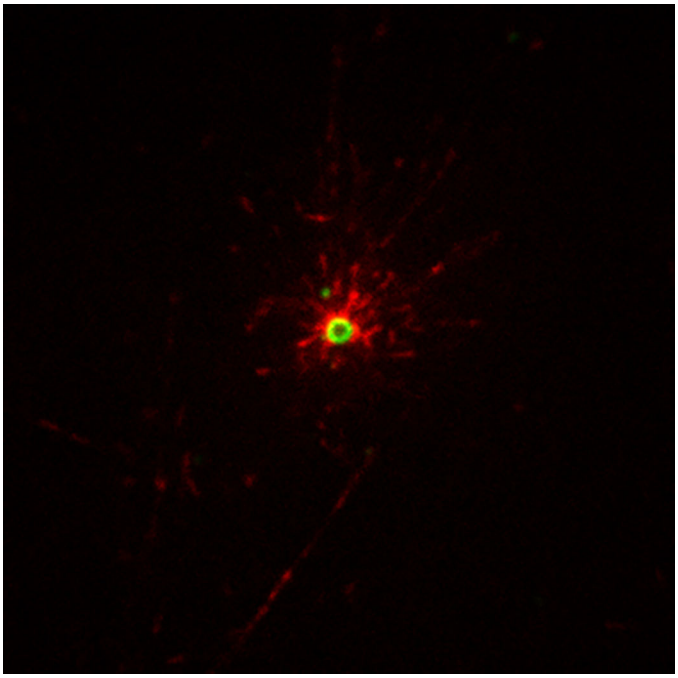

PLK4 MTOC in *Xenopus* extracts. PLK4 in green at the centre of the aster with microtubules visualised by EB3–mCherry in red.

research. However, when a colleague called my attention to the special issue focusing on 'reconstituting cell biology', I knew that this would be the perfect match to our work and the decision was made.

Have you had any significant mentors who have helped you beyond supervision in the lab?

I am deeply grateful to my PhD supervisor, Anna Akhmanova, who has been my mentor from the time I was a PhD student until today, and I am quite sure she will continue to be a mentor throughout my life. Anna is always available to provide enthusiastic and precious advice and always has a much-appreciated pragmatic and focused point of view. It is fantastic to still have her help.

In addition, there were many people and countless discussions around the laboratory corridors that helped to shape my idea of how to do good science. Here, I should highlight Raquel Oliveira, Miguel Soares, Maria João Amorim and Jadranka Loncarek, among others, for the scientific and moral support, many times underestimated.

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?

Curiosity has been the driver of my career in science. Moments like the ones looking through the microscope, seeing something amazing that you are observing for the first time and that push you to find an explanation, have always amazed me and made me continue to believe in science as a strong societal catalyser and knowledge generator.

Who are your role models in science? Why?

"[…] I am always fascinated by scientists who, after so many years in the field, still get shiny eyes when discussing their science […]"

It is not an easy job to be a scientist and especially a role model. PIs must fight for their place inside the community by writing competitive research grants, attending meetings, communicating their science and making it visible to the world. Often, these demands drive PIs away from the laboratory, from their mentorship role and from science. Therefore, I am always fascinated by scientists who, after so many years in the field, still get shiny eyes when discussing their science and manage to keep a good balance between the much-needed administrative and funding work and the science behind it, and even find the time and will to do bench work.

What's next for you?

I finished my postdoctoral studies 2 years ago and moved into industry for a new challenge. I am excited with my new career and all the things that I am currently learning. Science will always be part of my life, and the future will be exciting for sure!

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

When I finished my PhD and before starting my postdoctoral studies, I decided to take a well-deserved break and embarked on a solo trip around the world for 4 months. It was a fantastic experience and one of the best decisions in my life. I highly recommend it!

Reference

Montenegro Gouveia, S., Zitouni, S., Kong, D., Duarte, P., Ferreira Gomes, B., Sousa, A. L., Tranfield, E. M., Hyman, A., Loncarek, J. and Bettencourt-Dias, M. (2019). PLK4 is a microtubule-associated protein that self assembles promoting *de novo* MTOC formation. *J. Cell Sci.* **132**, jcs219501.