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PEOPLE & IDEAS

Susana Godinho: Placing cell biology at the center of cancer research

Marie Anne O'Donnell

Godinho investigates the role centrosomes play in cancer cell biology.

All the wild creatures near the coastal town of Setubal, Portugal, fascinated Susana Godinho when she was young, and her love and curiosity for the natural world has persisted. She remembers persuading her grandfather to make leashes suitable for taking captured lizards for walks and catching bugs and tiny fish for a closer look. By the time she was 10 years old, Godinho had acquired her first microscope and was examining an eclectic range of small particles, such as dust! Godinho found preparing these samples to look at under the microscope to be extremely rewarding and says this solidified her interest in science and experimentation from an early age. She has, however, now retired the lizard leashes and started her own research group in 2013 at Barts Cancer Institute, Queen Mary University of London, where her team use microscopes to follow the behavior of centrosomes and how the amplification and clustering of these occur in cancer cells and contribute to tumorigenesis.

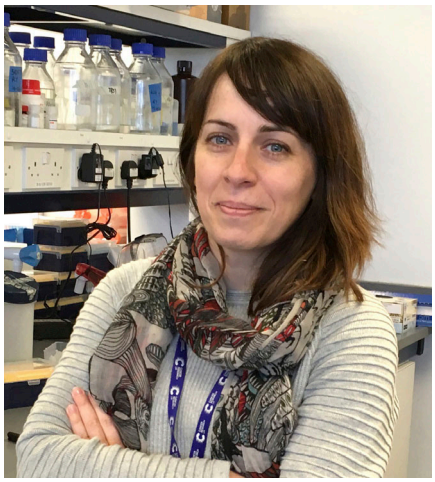
We contacted Godinho to learn more about her scientific journey so far.

Where and with whom have you studied?

In high school I fell in love with laboratory work in our chemistry classes, but while mixing chemicals was fun, biology was always what made me tick, so choosing a college degree was easy. I studied biology at the Faculty of Sciences, University of Lisbon, that had a specialized area dedicated to molecular biology and genetics and combined biology with laboratory work, which was perfect for me. It was during college that my passion for cell biology and molecular machineries really developed. I met my former PhD advisor, Alvaro Tavares, while I was doing a laboratory rotation and he invited me to join his newly established laboratory at Institute Gulbenkian of Science as his first PhD student. It was during my PhD that I learned how cells divide using *Drosophila* as a model system, and in particular the role of Polo kinase in this process (1). I also spent some time in David Glover's laboratory at Cambridge University, which was an invaluable experience, both personally and professionally. At the end of my PhD I joined David Pellman's laboratory at Dana-Farber Cancer Institute/Harvard Medical School in Boston to study mitosis in cells with abnormally amplified centrosomes (2, 3). It was very clear that a laboratory with diverse research interests was the best fit for me. David's laboratory, working on polarity, cytoskeleton, ploidy, cell division, and genomic instability, offered the perfect opportunity to broaden my research interests.

What drew you to focus on cancer cell biology?

After my PhD I become very interested in the microtubule cytoskeleton. This was the reason I initially contacted David for a possible postdoc position in his laboratory. However, I ended up not focusing that much on microtubules. In David's office during my interview, he described the fascinating process of centrosome clustering that allows cells with amplified centrosomes to divide in a bipolar manner (as opposed to undergoing multipolar mitosis). This is particularly crucial for cancer cells, which often harbor extra centrosomes. From that moment, I was hooked. I never thought that cancer cell biology was for me but I was wrong. Understanding how cancer cells adapt to unusual conditions/abnormalities is truly fascinating. In a way, it brought me back to my favorite subject in college, how bacteria adapt to extreme conditions to avoid death.



Susana Godinho. Image courtesy of Susana Godinho.

What are you currently working on and what is up next for you?

From understanding how abnormal centrosomes impact mitosis (2, 4), I started to

modonnell@rockefeller.edu.

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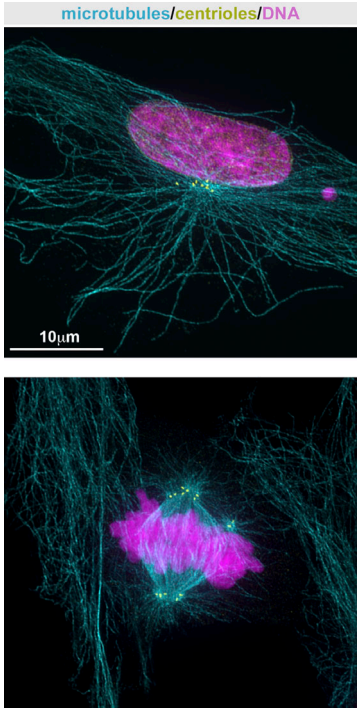

RPE-1 cells exposed to transient Polo-like kinase 4 overexpression to induce extra centrosomes in interphase (top) and mitosis (bottom). Cells were stained for microtubules (α-tubulin; cyan), centrioles (centrin2; yellow), and DNA (magenta). Image courtesy of Susana Godinho.

question whether these abnormalities could have a broader impact to cells. Indeed, centrosome abnormalities can affect cells independently of mitosis, by changing the microtubule cytoskeleton and promoting cell invasion, for example (5). More recently, we surprisingly found that the presence of extra centrosomes can lead to altered secretion, thus cells carrying extra centrosomes can influence surrounding cells, a concept that changed the way we look at how these cells contribute to cancer (6). This finding was the foundation of some of the laboratory's new directions, aiming at understanding how extra centrosomes lead to this secretory phenotype and how this impacts other cells/tissues that are in the vicinity of these cells.

We now think about centrosome abnormalities as a stress response that can have a pleiotropic effect on cells, akin to other oncogenic events. How cells sense/deal with this stress is crucial to understand the impact of these abnormalities in cancer. This is part of the broader vision for the laboratory that we plan to implement in the next few years.

What did you learn during your training that prepared you for being a group leader?

Throughout our careers we are always learning how to become/be group leaders. As a PhD student, I learned how to be independent, how to formulate and test hypotheses, how to keep up with literature (it was easier back in the day!), and that persistency is key. As a postdoc, I learned how to network, write grants and manuscripts, and broaden my research interests. All of these have been instrumental to me as group leader. However, there are many things we are not prepared for. We often complain about our lack of skills managing people. While I supervised several people during my PhD/postdoc, having the responsibility for someone else's career is something you can only experience as group leader, and it is challenging. Most of us starting laboratories also face problems with time management, as suddenly we not only are responsible for our projects but also have an incredible amount of administrative work to do, like teaching and managing, to name a few. There are courses available to help you acquire some of these skills, but the reality is that most of us learn from trying/failure (isn't it how we got here?) so we need to be prepared to be unprepared! We will make mistakes but, more importantly, if we keep an open mind we will learn from them.

"We now think about centrosome abnormalities as a stress response that can have a pleiotropic effect on cells, akin to other oncogenic events."

What has been the biggest challenge in your career so far?

A career in science is filled with challenges, it is hard to pick one! But perhaps the one I was not expecting was the challenge of keeping the laboratory productive in a research environment where PhD students and postdocs have 3-year contracts (in the UK) and maintaining continuity is difficult. In the first years of the laboratory, I spent time mentoring/teaching and establishing a laboratory culture just to realize that after 4–5 years I was back to year 1 as the senior people left. This was a shock to me and took some time to adjust. It also made me more proactive about how to implement the laboratory culture I envisioned. As a result, I started to write a laboratory book with tips (how to prepare documents and figures, for example) and laboratory-approved protocols for everyone in the laboratory. This allows some of the information to be maintained and can be edited as we go along.

What is the best advice you have been given?

I think the best advice I got before I started my laboratory was from my postdoc mentor, David Pellman. He told me not to hurry to fill the laboratory with people, to do it slowly and make sure you have time to set up the laboratory and supervise people. I would give the same advice to anyone staring their laboratories, just keep in mind continuity as well!

Any tips for a successful research career?

Find out what you love to do and makes you smile. Look for laboratories/projects that you are really excited about. A career in research can be challenging and requires a lot of hard work but if you are motivated you will put in the effort you need to succeed.

1. Godinho, S., and A.A. Tavares. 2008. *Cell Cycle.* https://doi.org/10.4161/cc.7.16.6439
2. Kwon, M., et al. 2008. *Genes Dev.* https://doi.org/10.1101/gad.1700908
3. Ganem, N.J., et al. 2009. *Nature.* https://doi.org/10.1038/nature08136
4. Rhys, A.D., et al. 2018. *J. Cell Biol.* https://doi.org/10.1083/jcb.201704102
5. Godinho, S.A., et al. 2014. *Nature.* https://doi.org/10.1038/nature13277
6. Arnandis, T., et al. 2018. *Dev. Cell.* https://doi.org/10.1016/j.devcel.2018.10.026

The laboratory at the Centre for Cancer Cell and Molecular Biology Christmas party, December 2019. Left to right: Judit, Dina, Judith, Bongwhan, Susana, Emily, Sophie, and Sarah. Image courtesy of Susana Godinho.