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FIRST PERSON

# First person – Kengo Takahashi

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. Kengo Takahashi is the first author on 'Glucose deprivation induces primary cilium formation through mTORC1 inactivation', published in Journal of Cell Science. Kengo is a PhD student in the laboratory of Kensaku Mizuno at Tohoku University, Sendai, Japan, where he investigates the link between nutrient conditions and ciliogenesis.

Kengo Takahashi

**How would you explain the main findings of your paper to non-scientific family and friends?**

In our human bodies, the function and homeostasis of cells are maintained through sensory organelles called primary cilia. Primary cilia are antenna-like structures that extend from the surface of cells, and defects in their formation are related to diseases called ciliopathies. These diseases include polycystic kidney disease, retinal degeneration, polydactyly, visceral inversion, obesity and mental retardation. However, the mechanisms of primary cilium formation are not fully understood and the relationship between extracellular nutrient conditions and ciliogenesis remains to be elucidated. In our paper, we tested various culturing conditions for their effects on cilium formation in human cells, and found that the extracellular glucose nutrient concentration can regulate ciliogenesis. Our data also demonstrated the importance of the mammalian target of rapamycin complex 1 (mTORC1) signaling pathway for regulation of cilium formation. mTORC1 is a major regulator of cell growth and proliferation, and is activated by the extracellular nutrient-rich environment. Although it was generally clear that nutrient conditions influence cell growth and maintenance, we have shown now that glucose deprivation increases cilium formation through mTORC1 inactivation.

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

My 'eureka' moment was the first time I saw cilium formation being initiated by rapamycin (a major inhibitor of mTORC1). This is the opposite to the previously established role of rapamycin, which was known to shorten cilium length. This observation surprised me and coincidently raised the possibility of other, yet unknown effects of rapamycin on primary cilia. I felt particularly happy when I got this result, because we were finally able to link nutrient-deprivation-induced cilium formation to its molecular basis.

**Have you had any significant mentors, and how have they helped you?**

Yes, I worked at Dr Kensaku Mizuno's lab. He advised me in key points and taught me a lot, for example how to do experiments and how to write papers. When I wrote the revision of my manuscript, he also helped me in planning my experimental schedules and in rewriting the paper. Writing in English with a clear logic was especially difficult, and his support helped a lot. Dr Tomoaki Nagai also supported me, especially in experimental procedures, as well as encouraged my training. My research has been supported a lot by these mentors and I thank them so much.

**"Great work is usually performed through good communication."**

**What's the most important piece of advice you would give first-year PhD students?**

For PhD students, there can be many concerns about experiments, meetings, papers and future jobs. It's better to work on everything with pleasure. In order to enjoy your studies, I think it's very important that communicate well with members of your lab. Great work is usually performed through good communication. Of course, it's very important to communicate with your mentors well, but the other members and students in your lab will also promote your thinking and you'll enjoy your projects much more thanks to them.

**What changes do you think could improve the professional lives of early-career scientists?**

I think it is important to study abroad. We should experience a wide range of scientific knowledge and establish relationships with many

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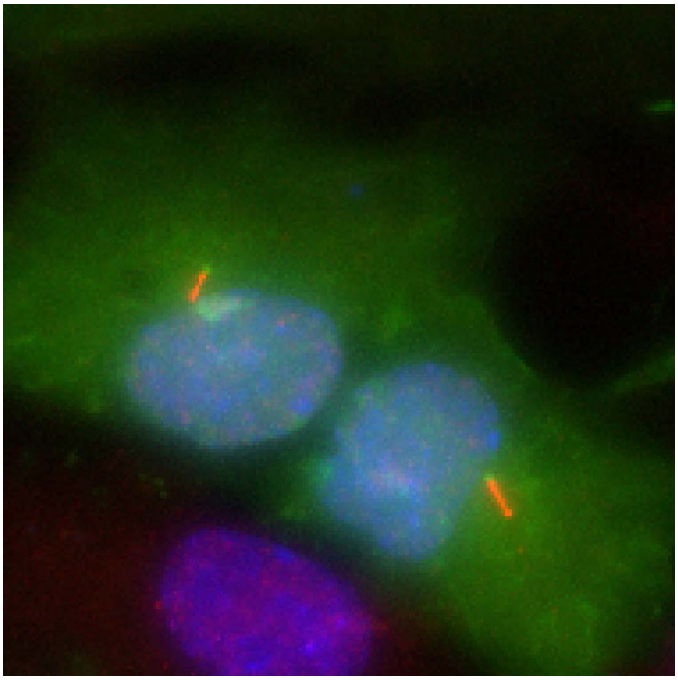

**RPE1 cells cultured in glucose-free medium and analyzed by staining for Arl13b (red), YFP (green) and DAPI (blue).**

scientists, so working in foreign institutes is very important. To improve the professional lives of young scientists, support structures are needed, so that many more early-career scientists can get scholarships and communicate with foreign researchers more easily.

### What's next for you?

I'll get my PhD degree this winter and I have decided to work at the Institute of a Japanese corporation from next April. I'd like to dedicate my studies to the creation of new products, which will support the health of our skin, blood vessels, and internal organs, including the brain.

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

My favorite hobbies are sport activities: soccer, baseball, tennis, running and snowboarding. Good ideas come from refreshing and moving the body. Watching sports also gives me energy to work on my projects.

#### Reference

**Takahashi, K., Nagai, T., Chiba, S., Nakayama, K. and Mizuno, K.** (2017). Glucose deprivation induces primary cilium formation through mTORC1 inactivation. *J. Cell Sci.* **131**, jcs208769.