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FIRST PERSON

First person – Shin Ohsawa

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. Shin Ohsawa is co-first author on 'The methanol sensor Wsc1 and MAPK Mpk1 suppress degradation of methanol-induced peroxisomes in methylotrophic yeast', published in JCS. Shin conducted the research described in this article while a PhD student in Yasuyoshi Sakai's lab at Kyoto University, Japan. He is now a postdoc in the lab of Marc Bühler at the Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland, investigating sensing and signaling mechanisms involved in gene expression and cellular dynamics in yeast.

Shin Ohsawa

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

The synthesis and degradation of organelles are strictly regulated by the level of extracellular nutrients. For instance, methylotrophic yeasts that utilize methanol as a carbon source regulate peroxisomes in response to methanol concentration. On plant leaves, where methanol concentration shows diurnal fluctuations, some factors involved in peroxisome synthesis and degradation are indispensable for methylotrophic yeasts to proliferate. In our paper, we reveal that the plasma membrane protein KpWsc1 senses extracellular methanol concentrations and transmits the information to the nucleus, inducing gene expression that regulates not only synthesis of peroxisomes, but also their degradation. Regulation of peroxisome homeostasis by KpWsc1 gives further insight into organelle homeostasis and survival strategies of microbes in nature.

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

The consumption of methanol in the *Kpwsc1*-deleted strain is slower than in the wild-type strain, because KpWsc1 is a key factor in regulating the expression levels of the gene encoding the methanol metabolic enzyme. Initially, to assess pexophagy activity during methanol cultivation, we had to adjust the methanol concentration individually for each strain. When I faced this problem, I remembered the Beppu flask, which was developed by Professor Emeritus Teruhiko Beppu (University of Tokyo). The flask has two compartments separated by a membrane that allows medium components, including methanol, to pass through and be maintained at the same level but does not allow yeast cells to mix. Fortunately, Professor Kenji Ueda at Nihon University, who was a colleague of Professor Beppu, generously gifted us a large number of these flasks. Using the flask, we could ensure equal methanol concentrations between wild-type and *Kpwsc1*-deleted strains, and show that KpWsc1 represses pexophagy in the presence of methanol.

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

We showed that KpWsc1 is a key sensor for suppression of pexophagy during methanol cultivation. However, at the beginning of this project, we hypothesized that KpWsc1 could be involved in the regulation of pexophagy when cells are moved from methanol-containing medium to ethanol-containing medium, as that is the typical condition to induce pexophagy. To test this, I usually incubated cells in methanol-containing medium for 16 h and then shifted them to ethanol-containing medium. One day, I overslept and was late arriving at the laboratory, accidentally incubating the cells for 20 h in methanol-containing medium. This longer incubation fortunately revealed that Atg30 is highly phosphorylated in the *Kpwsc1*-deleted strain at a late exponential phase in methanol cultivation. At that time, I appreciated oversleeping.

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

Journal of Cell Science has built a solid reputation and published a lot of high-quality studies related to autophagy. The focus of my research on signaling involved in pexophagy is a great fit for JCS, and I hope that the wider readership will be interested in my paper.

Have you had any significant mentors who have helped you beyond supervision in the lab? How was their guidance special?

Professor Yasuyoshi Sakai and Associate Professor Hiroya Yurimoto of the Graduate School of Agriculture, Kyoto University, have taught me about the fun of science and basic logical thinking. In particular, Professor Sakai has always

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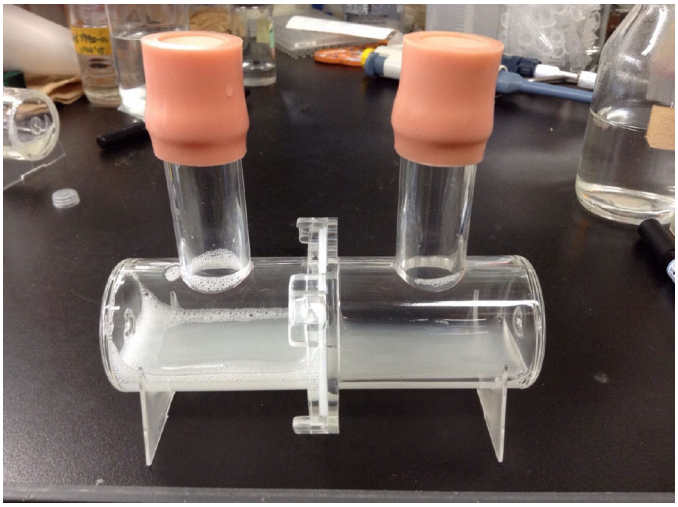

A Beppu flask.

inspired and excited me. Associate Professor Yurimoto has also led me in the direction of research. Thanks to them, I still enjoy science without getting lost on my way.

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?

My elementary school teacher said to me "Water consists of oxygen and hydrogen", and I thought that I could breathe in the bath by drinking water. Of course, I could not breathe, and I choked on a lot of water instead. This is just a funny story, but back then I did not understand why it happened. Afterwards, I studied the covalent bond of water molecules in junior high school, which explained the reason why I could not breathe in the bath. This incident taught me that there were a lot of natural things I could not explain. It excited me to uncover an unexplainable phenomenon. In my paper, I was able to uncover the mechanism of pexophagy to some extent, and at the same time I realized that many things I cannot explain still lie ahead. These things stimulate me again and again.

Who are your role models in science? Why?

Fortunately, I have spent time with one of my science role models since I was born. This is my father, Ro Osawa, who is a professor at the Graduate School of Agriculture, Kobe University. He said to me "Science research is like climbing a mountain. No matter how small the mountain, the view from the top is completely different from that from the ground, and it shows the top and pathway of the next mountain." I would like to see a lot of new scenery from the top of a mountain, like him.

What's next for you?

Since I was a university student, I have had an interest in epigenetic regulation, such as histone modifications maintained across generations. Currently, my research topic is the mechanism underlying the epigenetic state regulated by nutrients in fission yeast. Eventually, I would like to apply my research in yeast to human health and disease.

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

I am a twin. My father gave a history textbook and a science textbook to me and my twin brother, respectively, when we were children. Twenty years later, I became a science researcher and my twin brother became a history teacher in a junior high school, contrary to my father's expectation. However, I still like studying history too, and it motivates me to do science research, because human history is also the process of scientific development.

Reference

Ohsawa, S., Inoue, K., Isoda, T., Oku, M., Yurimoto, H. and Sakai, Y. (2021). The methanol sensor Wsc1 and MAPK Mpk1 suppress degradation of methanol-induced peroxisomes in methylotrophic yeast. *J. Cell Sci.* **134**, jcs254714. doi:10.1242/jcs.254714