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FIRST PERSON

First person – Momoe Nakajo

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. Momoe Nakajo is first author on 'Centrosome maturation requires phosphorylation-mediated sequential domain interactions of SPD-5', published in JCS. Momoe is a PhD student in the lab of Asako Sugimoto at the Laboratory of Developmental Dynamics, Tohoku University, Sendai, Japan, investigating the mechanisms involved in formation of microtubule-organizing centers.

Momoe Nakajo

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

Proper cell division relies on the formation of bipolar mitotic spindles, which consist of fiber-like structures called microtubules. The centrosome is an organelle that is responsible for organizing the mitotic spindle. The centrosome is composed of two centrioles and a surrounding amorphous protein layer called the pericentriolar material (PCM). The PCM expands during mitosis, and PCM scaffold proteins play pivotal roles in recruiting other proteins. In the tiny nematode *Caenorhabditis elegans*, a scaffold protein called SPD-5 forms the PCM scaffold. However, how SPD-5 assembles the PCM scaffold was previously unclear. In this study, we identified three functional domains of SPD-5 and proposed a model of the scaffold assembly mechanism that is mediated by specific amino acid modifications of SPD-5. Our findings also suggest an evolutionarily conserved mechanism of PCM assembly.

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

To reveal the distinct function of each region of SPD-5, we conducted a domain analysis of SPD-5 *in vivo*. Since SPD-5 was expected to interact with other centrosomal proteins, including SPD-5 itself, interpreting the localization phenotype of each GFP-tagged SPD-5 fragment was difficult. To solve this problem, we carefully compared the subcellular localization of each SPD-5 fragment in the presence and absence of endogenous SPD-5 using high-resolution multi-color live imaging. To further confirm the findings obtained *in vivo*, we combined several *in vitro* experiments. The hardest part was the PLK-1 inhibition assay. RNAi was our first choice to knock down PLK-1, but we could not get good results because PLK-1 has multiple functions, and it was difficult to control the exact timing to obtain a full knockdown. Therefore, we decided to use a PLK-1 inhibitor. Although it took time to optimize the experimental conditions to apply the inhibitor in early embryos enclosed in eggshells, in the end we were able to obtain results that strongly supported our hypothesis.

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

I was excited when I obtained the results of the pulldown assay showing that specific SPD-5 domains interact with each other only when one of the domains has been phosphorylated by PLK-1. I thought this result was critical to explain how SPD-5 assembles the PCM scaffold in a PLK-1-dependent manner.

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

Journal of Cell Science publishes a wide range of topics in cell biology, including centrosome biology. Therefore, we thought that JCS was the best choice to make our research widely known to researchers in related fields.

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

I greatly appreciate my mentor, Professor Asako Sugimoto. She has taught me the fundamentals of scientific research and has always encouraged me. I was greatly helped by assistant professor Nami Haruta in the Sugimoto lab, who has given me a lot of technical advice. I am also grateful for the Advanced Graduate Program for Future Medicine and Health Care, Tohoku University, through which I received a lot of interesting and stimulating comments from researchers and graduate students in different fields. This paper wouldn't have been completed without their help!

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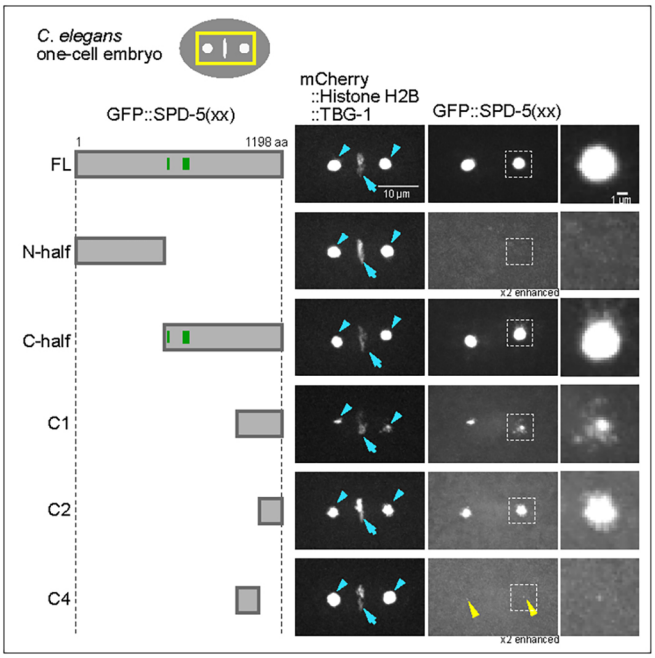

***In vivo* domain analysis of the centrosomal scaffold protein SPD-5.** Images of *C. elegans* one-cell embryos expressing full-length or truncated versions of the GFP::SPD-5 protein [GFP::SPD-5(xx)].

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?

I became interested in science when I learned the basis of molecular biology in high school, and the pure interest in the mechanisms of life still drives me. I was attracted to the beautiful hierarchical structure of the centrosome. When I discovered the interaction between the specific region of SPD-5 and PCMD-1, I was excited that I had revealed an important part of the centriole–PCM connection.

What's next for you?

During my PhD course, I am planning to analyze non-centrosomal microtubule-organizing centers to further understand the mechanisms of microtubule-organizing center formation. After that, I am considering leaving academia to use my research experience and skills in the industrial sector.

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

I like reading, cooking and hiking! These activities are good for refreshing and broadening my horizons.

Reference

Nakajo, M., Kano, H., Tsuyama, K., Haruta, N. and Sugimoto, A. (2022). Centrosome maturation requires phosphorylation-mediated sequential domain interactions of SPD-5. *J. Cell Sci.* **135**, jcs259025. doi:10.1242/jcs.259025