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FIRST PERSON

First person – Taisuke Seike

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. Taisuke Seike is first author on 'The asymmetric chemical structures of two mating pheromones reflect their differential roles in mating of fission yeast', published in JCS. Taisuke conducted the research described in this article while a Postdoctoral Fellow in Hironori Niki's lab at Genetics Strains Research Center, National Institute of Genetics, Mishima, Shizuoka, Japan. He is now a Special Postdoctoral Researcher in the lab of Chikara Furusawa at Center for Biosystems Dynamics Research, RIKENOsaka, Japan, investigating the mechanism and evolution of pheromone recognition systems in yeast.

Taisuke Seike

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

Many organisms, from microbes to mammals, use pheromones to attract a potential partner of the opposite sex. Therefore, the specificity between pheromones and their corresponding receptors is extremely important for sexual reproduction. Most yeasts produce two classes of peptide pheromone: one is a peptide that has been modified with a lipid; the other is a simple unmodified peptide. This asymmetry in the chemical modification of pheromone peptides is highly conserved across ascomycete fungi, which reproduce via spores that are produced inside zygote cells or 'asci'. In this study, we examined the distinct roles of the two sex pheromones (P-factor and M-factor) of the fission yeast *Schizosaccharomyces pombe*. By constructing 'autocrine cells' that can sense their own pheromones, we found that it is not necessarily essential to have the different chemical characteristics of both types of pheromone, that is a lipid (M-factor) and a simple (P-factor) peptide, for successful mating; however, the lipid peptide is required for successful mating. We speculate that the hydrophobicity of the lipid pheromone peptide is probably beneficial for ascomycete fungi such as *S. pombe* that live in a semi-liquid environment, enabling them to find an appropriate mating partner.

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

Our main finding was that M-cells expressing the M-factor receptor (Map3) mated with P-cells, whereas P-cells expressing the P-factor receptor (Mam2) failed to do so. At first glance, this experimental observation suggested that M-factor communication is essential for mating; however, it was also possible that the autocrine P-cells were not generating a sufficiently strong pheromone signal to induce mating. Therefore, we needed to exclude the latter possibility. First, we verified that the autocrine P-cells exhibited sufficient sexual agglutinability and polarized growth, which was almost the same as the autocrine M-cells; second, we showed that the ability of the autocrine P-cells to mate with M-cells was not restored by exogenously added synthetic P-factor. These data confirmed that the autocrine P-cells could be activated by receiving strong pheromone signals from their own secreted P-factor. We speculate that the large difference in the conjugation step observed between the autocrine M- and P-cells may be explained by the different chemical properties of the mating pheromones. M-factor plays an essential role in promoting cell fusion between cells that are in contact with each other.

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

To examine the distinct roles of the two peptide pheromones in *S. pombe*, we constructed P- and M-cells that are auto-stimulated by swapping the receptor genes. My 'eureka' moment was when I observed these autocrine cells on nitrogen-free medium. The cells showed an amazing morphological response; that is, marked shmoo formation induced by their own secreted pheromone. While the autocrine M-cells were immediately elongated and some were readily autolysed, the autocrine P-cells were gradually elongated and no cell lysis was observed. This is probably due to the different mechanisms underlying cellular pheromone signaling in P- and M-cells.

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

We chose Journal of Cell Science because we want to share our interesting findings about the roles of peptide pheromones with researchers from many fields. This journal has a high impact because it covers the complete range of topics and reports new thinking and scientific excellence in cell biology, presenting novel perspectives and approaches to understanding the field.

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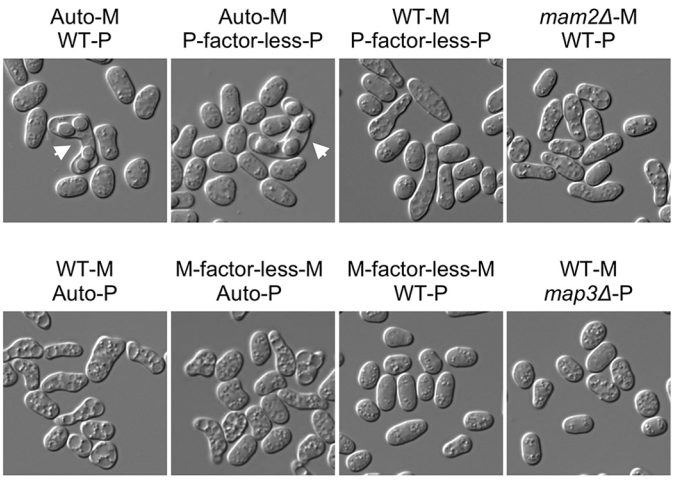

Morphology of *S. pombe* asci (arrows) resulting from various mating combinations of two haploid strains. Autocrine M-cells (Auto-M) responding to their own M-factor mate with P-cells, whereas autocrine P-cells (Auto-P) responding to their own P-factor fail to mate with M-cells. mam2, gene encoding the P-factor receptor; map3, gene encoding the M-factor receptor.

Who are your role models in science? Why?

Professor Chikashi Shimoda is the scientist whom I respect the most. His enthusiasm for science is so infectious, and he is full of experimental ideas that no one else could ever imagine. I have learned a lot of things from him; especially, the importance of planning ahead and thinking things through. It will be over 10 years since I first collaborated with him, but he has remained my role model ever since.

What's next for you?

Last year, I transferred to the Laboratory for Multiscale Biosystems Dynamics at the Center for Biosystems Dynamics Research, RIKEN (PI, Dr Chikara Furusawa). In my recent study, I demonstrated an 'asymmetric' pheromone recognition system in *S. pombe*: among the two pheromone/receptor pairs in this yeast, recognition between one pair (M-factor/Map3) is extremely stringent, while that between the other pair (P-factor/Mam2) is rather relaxed. In the near future, I would like to develop experimental models and explain why this asymmetric setting is beneficial in the evolutionary process of reproductive isolation. I hope that this approach will provide new insight into the evolutionary mechanisms underlying the diversification of pheromones.

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

My hobbies are watching movies and traveling; in particular, I love to stroll through the streets of foreign cities, where I can relax deeply. At such times, fortuitous ideas may just pop into my head.

Reference

Seike, T., Maekawa, H., Nakamura, T. and Shimoda, C. (2019). The asymmetric chemical structures of two mating pheromones reflect their differential roles in mating of fission yeast. *J. Cell Sci.* **132**, jcs230722. doi:10.1242/jcs.230722