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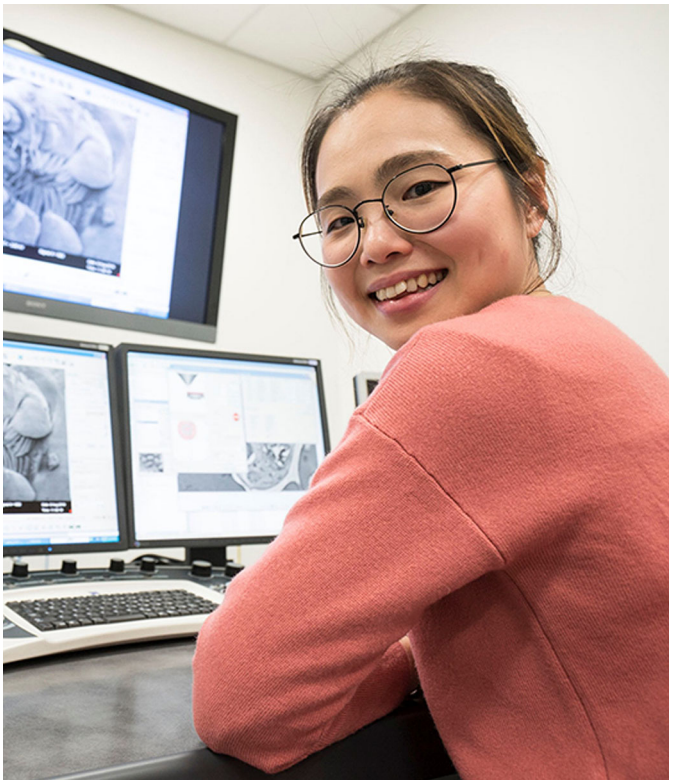
First person – Jiwon Lee

First Person is a series of interviews with the first authors of a selection of papers published in Journal of Cell Science, helping researchers promote themselves alongside their papers. Jiwon Lee is first author on 'Lipid droplet dynamics are essential for the development of the malaria parasite *Plasmodium falciparum*', published in JCS. Jiwon is a PhD student in the lab of Melanie Rug at Centre for Advanced Microscopy/ Research School of Biology, The Australian National University, Canberra, Australia, investigating lipid storing and trafficking mechanisms in various life cycle stages of *Plasmodium falciparum*.



Jiwon Lee

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

Plasmodium falciparum is the deadliest species of malaria parasites that infect humans. It goes through a complex life cycle within human red blood cells (RBCs). During the asexual blood stage (ABS), a heightened demand for lipids arises due to the growth and proliferation of the parasite. In our study, we focused on lipid droplets (LDs), which are lipid storage organelles in the parasite. Using various microscopy techniques (split fluorescence emission analysis and 3D imaging with focused ion beam-scanning electron microscopy, or FIB-SEM), we investigated the size, number, composition and behaviour of these LDs during the ABS. We observed that LDs in *P. falciparum* work closely with other cellular organelles to perform various roles, from storing fats to maintaining lipid balance. We found that LDs are essential for the parasite's survival. Without them, excess lipids can become toxic, and the stored lipids are necessary for creating new membranes for daughter cells. Our work provides visual evidence of the life cycle of LDs and highlights their crucial role in the parasite's development. This detailed understating of LDs in *P. falciparum* could lead to new strategies to combat malaria.

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

One of the main challenges we faced was the dramatic changes in the morphology and cellular structure of the parasite throughout its 48 h developmental cycle. Categorizing specific stages was particularly difficult because of these continuous changes. The schizont stage was especially challenging to categorize because the parasites undergo significant transformations during this phase, such as the multiplication of nuclei, formation of daughter cells and rupturing of host RBCs. These changes greatly affect the dynamics of LDs. By analysing extensive light and electron microscopy data, we were able to divide the schizont stage into three distinct phases: early, mid growth phase and a segmented phase. This approach helped us overcome the challenge and provided clearer insights into the LD dynamics during the parasite's development.

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

While meticulously examining thousands of serial images from FIB-SEM to segment the endoplasmic reticulum (ER), I had a breakthrough moment. I spotted tiny vesicles resembling LDs budding off from the ER. Mature LDs are large and easy to identify, but we were also interested in observing the intermediate stages of LD formation and the ER's potential role in LD biogenesis, as has been observed in other organisms. Seeing these initial LDs connected to the ER was a true eureka moment as it supported the idea that LDs might form in the ER in *P. falciparum*. This discovery confirmed our hypothesis and made all the painstaking work worthwhile!

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

We are passionate about imaging, and when we received an email about a Special Issue on imaging from Journal of Cell Science, we immediately set our sights on publishing our paper there. Our goal was to share our work not only within our specific field but also with the broader scientific community. This Special Issue provided the perfect opportunity to achieve that.

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

Yes, my supervisors and all my fellow lab members have been significant mentors to me. I've been lucky to have such a diverse group of people around me. Their varied perspectives and experiences have helped me think outside the box and they often provided great ideas when I was stuck on a problem. Their support has been invaluable thoughout my PhD work.

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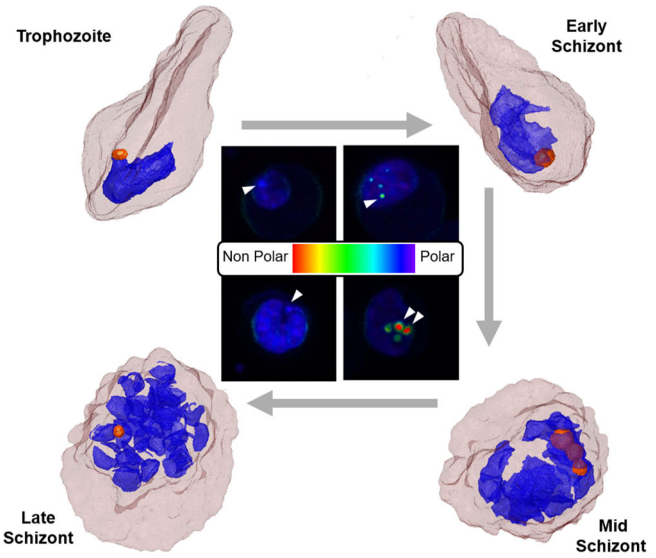

Composition and ultrastructural characterisation of LDs in the asexual stages of *P. falciparum*. Representative polarity ratio map images shown in a rainbow scale, with representative 3D volume images in the different parasite stages from 3D FIB-SEM data. LD, orange; nuclei, blue.

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've been working in the Centre for Advanced Microscopy as biological electron microscopy specialist, dealing with various projects and cell types. The more I work in this field, the more fascinated I become with how intricately and intelligently cells are structured and how they respond to different factors. The continuous learning process in the field of microscopy has been the highlight of my scientific journey, motivating me to explore and understand more about the intricate world of cells.

Who are your role models in science? Why?

My role model in the scientific field is Tu Youyou. She discovered artemisinin, a substance that inhibits the malaria parasite. Tu Youyou's groundbreaking work not only saved millions of lives but also showcased her remarkable dedication – she even tested the substance on herself initially. Despite not having a doctorate or international training, she was awarded the Nobel Prize for her contributions to global health. Her innovative approach, unwavering determination and contribution to global health inspire me deeply and drive my aspirations in the scientific field.

What's next for you?

Through my research and work, I've had the opportunity to engage with various advanced imaging techniques, which has fueled my growing interest in cell biology. Going forward, I'd like to continuously explore the detailed cellular structures of *Plasmodium* to further deepen our understanding of this small yet highly adaptive malaria parasite.

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

My secret hobby is collecting random succulent leaves that I find dropped on the street and successfully propagating them. It's surprising how resilient and adaptable these plants can be, much like the organism I study.

Reference

Lee, J., Matuschewski, K., van Dooren, G., Maier, A. G. and Rug, M. (2024). Lipid droplet dynamics are essential for the development of the malaria parasite *Plasmodium falciparum*. *J. Cell Sci.* **137**, jcs262162. doi:10.1242/jcs.262162