

FIRST PERSON

First person – Min Jae Kim

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. Min Jae Kim is first author on 'Basal-type lumenogenesis in extraembryonic endoderm stem cells models the early visceral endoderm', published in JCS. Min Jae is a PhD student in the lab of Bert Binas at Hanyang University, Republic of Korea, investigating stem cell differentiation and organoid establishment.

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

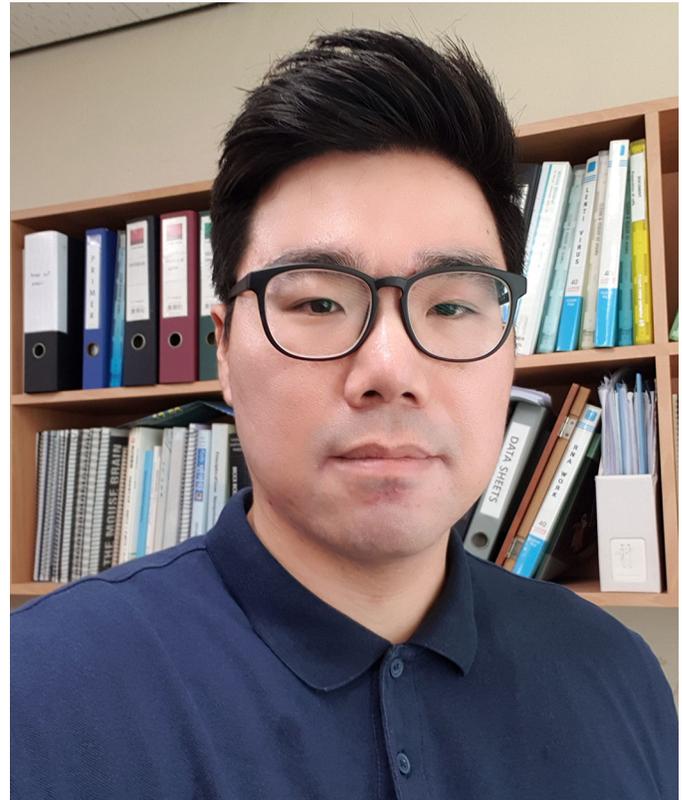
When sperm and eggs are fertilized, embryo development begins and after several divisions, a blastocyst arises. The blastocyst consists of cells that differentiate into the embryo, and peripheral cells that help embryonic development. These peripheral cells again divide into two types of cells, depending on whether they affect early or late embryonic development. The primitive endoderm is composed of the cells that affect early embryonic development, which surround the embryo and play important roles in nutrient supply, waste discharge, gas exchange and blood formation. Therefore, many researchers have studied the role and function of primitive endoderm lineage, but in the absence of any *in vitro* models, this research was somewhat limited. In this study, we showed a potential three-dimensional primitive endoderm lineage model and property of morphogenesis, based on the previously discovered vacuolization and multicellular vesiculation in the primitive endoderm lineage. First, we found that vacuolization is an intrinsic property of these cells, and when cell–cell contacts are well tuned, they formed multicellular vesicles. Then, these vesicles showed primitive endoderm lineage genes and polarity, which is already pre-structured in ground state primitive endoderm stem cells.

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

The challenge of this work was making the connection between vacuolization and vesiculation. Because even though these structures were found previously, it was poorly studied. So, I tried various combinations of culture conditions including culture components, inhibitors and extracellular matrixes for a long time to figure out how vacuoles contribute to vesicles. Then, finally, I found the 'three cell stage', which we later called the nascent vesicle, and further growth by fluid uptake and mitosis. To track this generation, I used live cell imaging, but it was not easy to capture the right moment owing to the handling of cells and lighting. Cells easily move around in suspension culture and even went out of focus. The lighting from the device also affected viability of cells. To solve this problem, I continued to experiment until I got the result I wanted and eventually captured the wonderful moment.

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

We predicted that pXEN cells were already pre-structured for basal type lumenogenesis, but the apical marker, Pdx1, was not exhibited at



Min Jae Kim

the ground state, but appeared at nascent vesicles. Therefore, we spent lots of time interpreting these results and even drew the wrong conclusion. Eventually, I suggested using the new anti-Pdx1 antibody to make sure that Pdx1 successfully marked the outer membrane of ground state pXEN cells. These results allowed us to demonstrate the above original hypothesis and that moment was my 'eureka'.

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

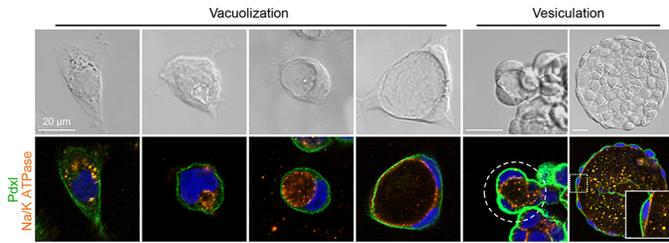
My supervisor, Prof. Bert Binas. Since I was a master's degree student, Prof. Binas has generously taught me about the details of experiments from basics to how to interpret the results and plan the experiments. He also helped to produce scientifically meaningful results through practical advice and ideas based on his own abundant experience whenever I had any curiosities or questions about the experiments. Thanks to his support, I have become a scientist who can lead experiments with independent scientific thinking.

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?

When I was a third-year university student, I once participated in a large-scale symposium with a friend who had already been an intern in the laboratory. There, I was able to see many participants

Min Jae Kim's contact details: Stem Cell Laboratory, Department of Molecular and Life Science, Hanyang University, ERICA Campus, Hanyangdeahak-ro, Sangnok-gu, Ansan City, Gyeonggi-do 15588, Republic of Korea.

E-mail: hoochi98@hanyang.ac.kr



Formation of vesicles from vacuolated cells. Confocal images showing localization of podocalyxin (Pdx1) and Na/K ATPase through all stages of vacuolization and vesiculation. From left to right: non-vacuolated 'ground state' cell; cell with small vacuole; cell with middle vacuole; cell with giant vacuole (non-lumen-forming); nascent vesicle ('3-cell-stage'); true vesicle.

concentrated on the presentation and discussed it with interest. That moment was very impressive and I began to think more deeply about science. The most interesting moment was the discovery of the rapid morphogenesis of pXEN cells by Chir99021, a Wnt signal activator. Although pXEN cells originally had a mesenchymal-like morphology, they were directly transferred to epithelial morphology by Chir99021 and at the same time expressed several interesting

genes found in the differentiated lineage of primitive endoderm. With this discovery, I could publish the current paper and prepare the next one.

What's next for you?

I have now reached the final journey of my PhD course and currently seek a position in stem cell differentiation and organoid culture in both industry and academia. I am also preparing the next paper about organogenesis in a dish of pXEN cells.

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

I sometimes enjoy weight training at the gym for free time. This activity helps me relieve stress and maintain a positive and proactive mind-set for scientific study, through achievement of a healthy body.

Reference

Kim, M., Zhong, Y., Jung, K. H., Chai, Y. G. and Binas, B. (2019). Basal-type lumenogenesis in extraembryonic endoderm stem cells models the early visceral endoderm. *J. Cell Sci.* **132**, jcs230607. doi:10.1242/jcs.230607