

FIRST PERSON

First person – Zofia Ostrowska-Podhorodecka

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. Zofia Ostrowska-Podhorodecka is first author on 'Vimentin tunes cell migration on collagen by controlling β 1 integrin activation and clustering', published in JCS. Zofia is a postdoctoral fellow in the lab of Christopher A. McCulloch, University of Toronto, Canada, where her research focuses on the mechanisms of vimentin-dependent regulation of cell adhesion and cell extension formation.

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

The movement of cells involves their attachment to their underlying foundation, which consists of proteins, such as collagen. Cells form small attachment structures called focal adhesions, which are important for the ability of cells to form protrusions and move forward. Inside cells, specialized types of proteins called vimentin filaments are crucial for cell migration, particularly during wound healing and cancer invasion. Vimentin filaments control the signaling pathways that regulate the attachment of cells to collagen, the formation of cell extensions and cell migration through soft connective tissues. These properties suggest that vimentin may provide a novel target for drug development in which cancer cells invade tissues or produce scar tissue. Using different approaches, we show here that vimentin tunes cell migration through collagen by acting as an adaptor protein for focal adhesion proteins, thereby regulating the proteins that mediate cell attachment to collagen.

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

Tool development is always a challenge, especially when we have to follow up on previous work. The main challenge for us was to create a macro for analyzing integrin cluster distribution in spreading cells. The macro precisely quantifies the size and number of clusters independently of the cell periphery and cell body for each cell that was analyzed. My published work provides the cell biology community with a new tool to enable more quantitative data analysis of integrin clusters.

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

Life comes with many shades and challenges, especially in cell biology. My most striking result was the realization that vimentin tunes cell migration through collagen by acting as an adaptor protein for focal adhesion proteins. Unexpectedly, vimentin thereby regulates β 1 integrin activation, which results in well-organized, mature integrin clusters. These findings indicate that vimentin plays a more central role in the regulation of cell migration than what was known prior to our recent research.

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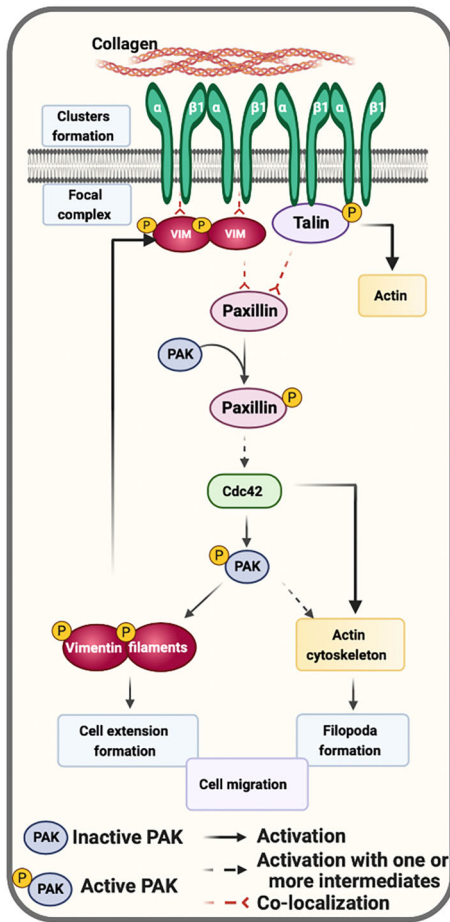
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Why did you choose Journal of Cell Science for your paper?

We hoped to publish our research in a high-quality journal that would reach a wide audience of biologists. The Journal of Cell Science has been a key journal in the cell biology field for decades. We are particularly grateful to the Editor and the truly insightful reviewers at JCS for their comments. They made a big difference in terms of improving the quality of the science.

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

I achieved this work with the total support of Christopher McCulloch (B.Sc., D.D.S., Ph.D., F.R.C.D(C), FCAHS), my postdoctoral supervisor at the Department of Dentistry, University of Toronto, Canada. Joining Dr. McCulloch's lab was a milestone in my career. He saw my potential and trusted me to lead this project and gave me the opportunity and freedom to explore the vimentin role in cell migration. The spark of science in me changed to a full fire during my Ph.D. with Dr. Joanna Moraczewska at the Biochemistry and Cell Biology Institute, Kazimierz Wielki University in Bydgoszcz, Poland, where Joanna taught me how to focus on my project. Not only that, her passion, hardworking and strength showed me the best way to conduct myself in this challenging field and eventually become someone to be remembered.



Collagen-dependent integrin engagement recruits the cytoskeletal proteins talin and vimentin to cell adhesions. Vimentin colocalizes with $\beta 1$ integrin and recruits paxillin to form nascent adhesions. After initial adhesion to the matrix, additional focal adhesion proteins, such as talin, are recruited to form more mature focal adhesions. Paxillin binds several proteins that contribute to Cdc42 activation. Further downstream, Cdc42 and PAK enhance vimentin phosphorylation. PAK is involved in activating Cdc42-stimulated reorganization of the actin cytoskeleton and vimentin filament assembly, which helps to promote cell motility. The diagram was created with BioRender.com.

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?

For as long as I can remember, my curiosity about the nature of things always seemed a little more acute than in my contemporaries. Finding answers to questions that haven't even been asked yet and exploring the possibilities of what we can do with our scientific knowledge are issues that really inspire me. In particular, I find that the application of molecular biology approaches are invaluable and have helped me to address problems and to ask new questions that I would not have dreamed.

Who are your role models in science? Why?

While I do not have a specific person to name as a single role model, my supervisors and each scientist who I have met on my scientific path, have helped me to wonder about what kind of researcher I would like to become. I have learned that diligence, the approach to a research problem, and most importantly, the approach to people, are the critical factors in becoming an effective scientist.

What's next for you?

This is my third year working in the McCulloch lab at the University of Toronto. I have learned a lot of new approaches and am having a great time here. I will continue my research exploration at the McCulloch lab for at least one year longer, focusing on vimentin intermediate filaments and their partners in cell extension formation and cell migration through soft connective tissue. What next? I am torn between academia, to which I have devoted much of my life, and industry, which offers excellent development opportunities. I still need to formulate the future path I will be taking.

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

I enjoy watching documentaries about nature and science. It is astonishing to me how beautiful and mysterious our world is. Besides that, I love spending my free time with my family, biking, hiking or doing yoga.

Reference

Ostrowska-Podhorodecka, Z., Ding, I., Lee, W., Tanic, J., Abbasi, S., Arora, P. D., Liu, R. S., Patteson, A. E., Janmey, P. A. and McCulloch, C. A. (2021). Vimentin tunes cell migration on collagen by controlling $\beta 1$ integrin activation and clustering. *J. Cell Sci.* **134**, jcs254359. doi:10.1242/jcs.254359