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FIRST PERSON

First person – Amlan Barai

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. Amlan Barai is first author on 'α-Actinin-4 drives invasiveness by regulating myosin IIB expression and myosin IIA localization', published in JCS. Amlan is an Institute Postdoctoral Fellow in the lab of Prof. Shamik Sen at Indian Institute of Technology Bombay, where he uses multidisciplinary approaches to understand cell behavior and cellular dynamic processes including cancer development, metastasis and tumor heterogeneity.

Amlan Barai

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

Actin and myosin can be thought of as the bones and muscles of a cell. Like the skeletomuscular system, which regulates our movements, actin and myosin together form the actomyosin network, which regulates cell movement and dynamics. Actin can form the base central skeleton on top of which the myosin motor activity regulates the dynamics similarly to muscles attached to bones. The actomyosin cytoskeleton, however, is much more complex and involves several additional components that can regulate its functioning. Actinin-4 is one such component, and was known to be involved in actin bundling.

In this work, we have shown that the actinin-4 bundled actomyosin network is much more dynamic and drives fast cell movement. For the first time, we show that actinin-4 regulates invasiveness by modulating expression of myosin IIB, which is involved in squeezing the nucleus through small pores in the matrix. In addition, our results illustrate that an indirect interaction between actinin-4 and myosin IIA is essential for retention of myosin IIA at the cell front, and plays a key role in regulating cell migration. High actinin-4-expressing cancer cells can consequently lead to effective metastasis, that is, the spread of cancer cells from their parent tissue to distant tissues.

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

One of the biggest challenges was focal adhesion dynamics. To obtain dynamic information we needed to transfect control and Actinin-4-knockdown cells with mCherry–paxillin and acquire live-cell movies. However, the transfection efficiency of our mCherry–paxillin construct was quite low; with every round of transfection, we ended up with a very small number of successfully transfected cells. Additionally, our microscope setup suffered drift issues making it difficult to have a steady focus on the focal adhesion plane while recording live cell dynamics. To overcome this, we transfected multiple plates to obtain a sufficient number of cells. Additionally, to overcome the drift issue, we captured *z*-stack images and extracted the best focus from the stack.

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

Live-cell dynamics is something that always fascinates me. We knew that knocking down the actin-bundling protein actinin-4 would naturally cause some alterations in the actin organization. We thought this would also influence myosin dynamics in the actomyosin network. When we found a stark drop in myosin IIA dynamics in live-cell imaging, that was one of the most satisfying moments.

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

Journal of Cell Science publishes high-quality peer-reviewed articles and has a wide and diverse base of readers from the cell biology community. We believe publishing our findings here would allow our work to reach a wide readership. I also appreciate that Journal of Cell Science provides a chance to promote early-career researchers like me alongside our work.

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

I was very lucky to join my PhD program under the guidance of Prof. Shamik Sen. He is a biologist with an engineering background with vast knowledge in both fields. His unique and interdisciplinary approach to research has always fascinated me. The intellectual freedom that I was given, combined with constructive criticism, has

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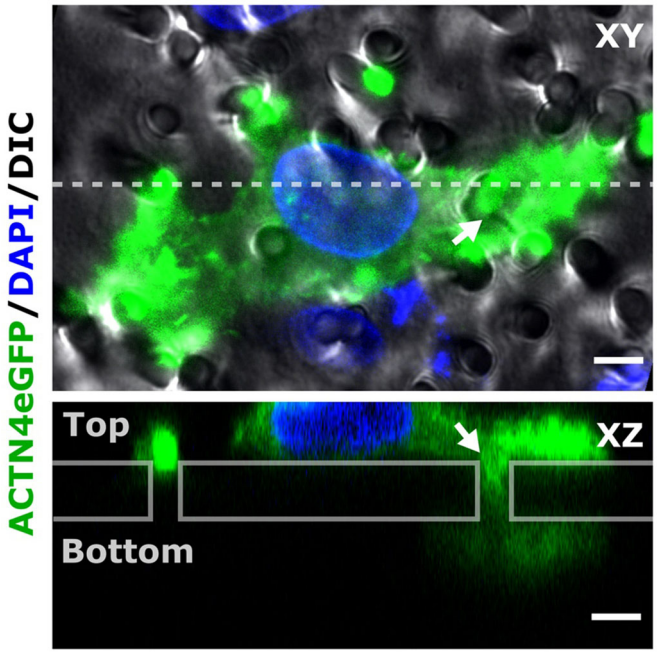

Cancer cells send actinin-4-enriched protrusions at the beginning of translocation through small sub-nuclear-sized pores. *XY* and *XZ* plane orthogonal views (across the dotted line in XY image) of ACTN4–eGFP-transfected cancer cells cultured on top of porous membranes, sending such protrusions (green) at sites of pore entry (white arrow). Scale bar: 5 µm.

not only helped me to grow as a thinker but has resulted in this manuscript, among others. His active input into our regular experiments has always helped to steer our work in the right direction. Additionally, Prof. Sen has included me in multiple projects that helped me to significantly widen my expertise. I have benefited greatly from his meticulous editing. I could not have imagined having a better guide for my PhD.

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 have always been driven by curiosity. From my very early childhood, I had a habit of asking questions – a lot, as my parents say. From breaking and fixing the TV remote control to understand its workings, to observing wild plants and flower patterns, I have always enjoyed exploring things. It is this deep-rooted desire to explore that has naturally made the pursuit of science my preferred career choice. I developed additional skills along the way (such as graphic designing and photography), but none of those gave me as much pleasure as working in science. Now, it has been more than 6 years since I started actively working as a researcher and I have enjoyed every single moment of it. Working as a scientist makes me happy, and I perhaps have found the perfect career for me.

“It is this deep-rooted desire to explore that has naturally made the pursuit of science my preferred career choice.”

Who are your role models in science? Why?

Charles Darwin perhaps had one of the biggest influences on me. His original work, the Neo-Darwinism, along with the works of modern Darwinians like W. D. Hamilton, John Maynard Smith and Richard Dawkins, has laid the foundation of my scientific ideology and has developed the free thinker in me. I have also been deeply inspired by many others like Richard Feynman, Marie Curie, Stephen Hawking and Carl Sagan, to name a few.

What's next for you?

I will shortly be joining the Cell Adhesion and Mechanics lab at Institut Jacques Monod Université Paris Diderot/CNRS as a postdoctoral researcher.

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

I like nature exploration. I often travel with a camera and enjoy photography, with mostly nature, landscape and wildlife as my primary subjects. I love painting and making artworks as indoor activities. I thoroughly enjoy solitude and love to read both fiction and non-fiction.

Reference

Barai, A., Mukherjee, A., Das, A., Saxena, N. and Sen, S. (2021). α-Actinin-4 drives invasiveness by regulating myosin IIB expression and myosin IIA localization. *J. Cell Sci.* **134**, jcs258581. doi:10.1242/jcs.258581