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FIRST PERSON

First person – Shivali Rawat

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. Shivali Rawat is first author on 'Increased supraorganization of respiratory complexes is a dynamic multistep remodelling in response to proteostasis stress', published in JCS. Shivali is a PhD student in the lab of Swasti Raychaudhuri at CSIR - Centre for Cellular and Molecular Biology, Hyderabad, India, investigating protein homeostasis and aggregation in stress and disease-related conditions.

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

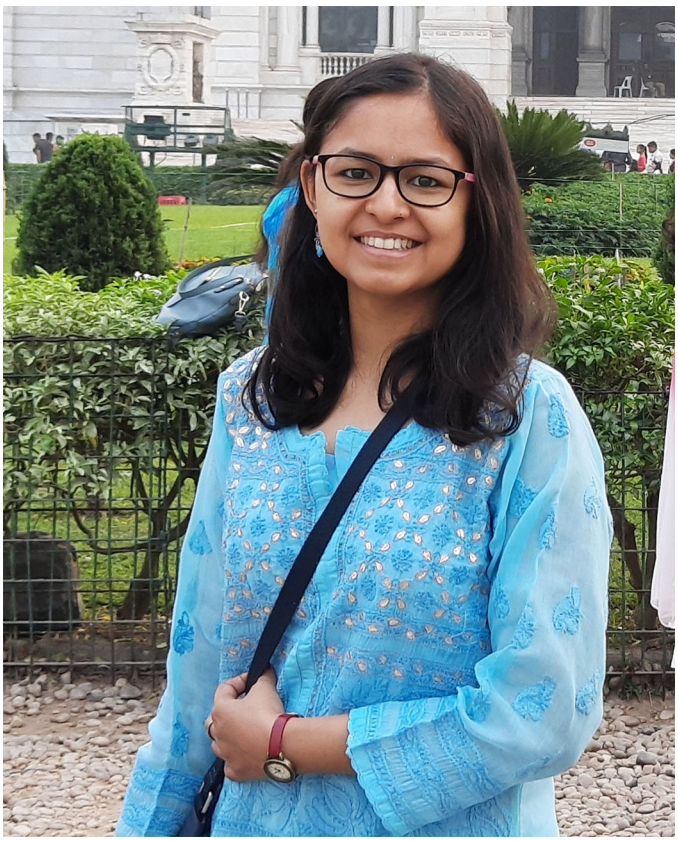
Mitochondria perform the crucial cellular function of energy generation through the oxidative phosphorylation (OxPhos) system. The OxPhos system is comprised of four respiratory complexes (RCs), denoted as CI to CIV. These RCs are made up of several subunits that exist as either individual proteins, small subcomplexes or fully assembled holocomplexes. RCs further interact with each other to form higher-order organizations known as supercomplexes. In our study, we show that these functional supraorganizations are preferred over subcomplexes under stress conditions, as a method to preserve activity of the complex. Upon withdrawal of the stressor, the equilibrium between subcomplexes and higher-order complexes goes back to control conditions. We also propose the possibility that this remodelling of protein complexes stabilizes subunits and prevents their further aggregation during stress.

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

Establishing blue native PAGE analysis and the complexome profiling protocol in our lab was technically challenging. We performed several standardizations and controls before initiating our actual experiments. Because we performed manual cutting of gels, variation between control and treated samples was controlled using SILAC (stable isotope labelling by amino acids in cell culture). Another challenge we faced was showing the incorporation of subcomplexes into holocomplexes and supercomplexes. By reanalysing our mass spectrometry data and utilizing iBAQ values (intensity-based absolute quantification), we showed that RC subunits significantly increase in holocomplexes and supercomplexes. This two-dimensional analysis approach helped to identify and demonstrate the change in relative distribution of RC subunits across subcomplexes, holocomplexes and supercomplexes under stress conditions.

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

In our previously published study, we showed that RC subunits lose solubility and aggregate upon short-term proteasome inhibition. Surprisingly, the respiratory activity and mitochondrial morphology remained unperturbed. To investigate these contradicting observations, we performed complexome profiling and dissected the fate of RC subunits inside mitochondria. The 'eureka' moment was finding that the subunits present in the form of holocomplexes or supercomplexes are protected during stress and, thus, are able to maintain their function. The subcomplexes decrease in abundance as they are incorporated into the higher-order organizations, in addition to simultaneous aggregation of a subset of RC subunits.



Shivali Rawat

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

JCS is a peer-reviewed journal that is highly reputed in the scientific community, publishing wide-ranging research and with a broad readership. I have read several interesting research articles and some comprehensive reviews published in the journal, which have helped increase my knowledge related to my research area and science in general. Therefore, we chose this journal to communicate our research and reach a wider audience.

In science, the more you learn, the more you realize how much more there is to know.

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 inclined towards learning new things. I find nature and biological sciences very fascinating. In science, the more

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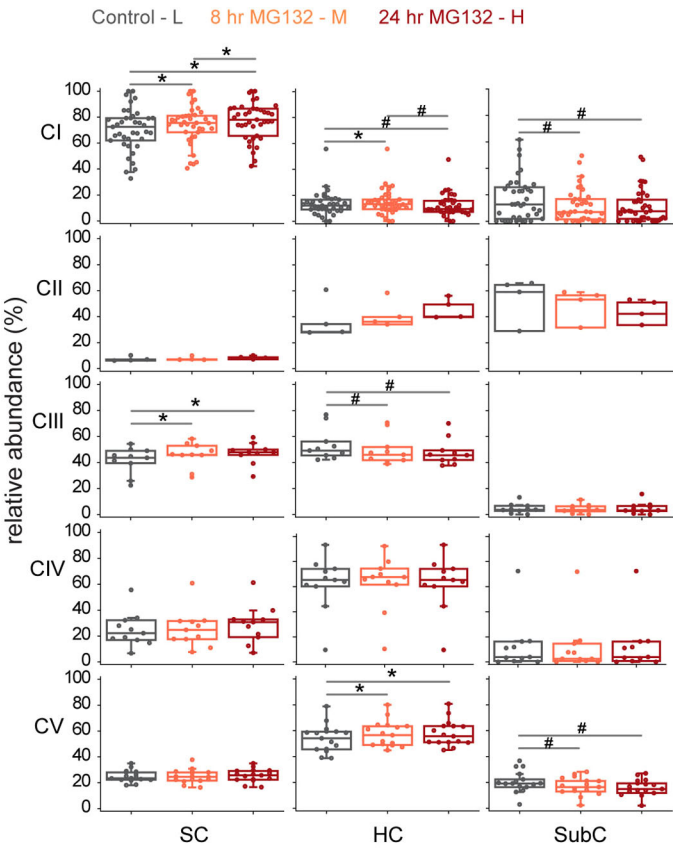

Increased supraorganization of respiratory complexes (iSRC). CII and CV subunits are increasingly incorporated into holocomplexes (HC), whereas CI, CIII and CIV subunits are engaged in supercomplex (SC) formation during proteasome inhibition.

you learn, the more you realize how much more there is to know. Every moment of success and failure during the journey of research has been interesting for me.

Who are your role models in science? Why?

I do not have a specific person to name as my role model. However, I respect and admire every scientist and researcher working and contributing in their respective fields of science with the sole purpose of expanding human knowledge and serving society and nature.

What's next for you?

Currently, I am finishing my PhD thesis. I still have to decide the future path I will be taking.

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

I am an avid nature lover. I enjoy watching videos and documentaries related to nature, and I find every animal fascinating and beautiful, irrespective of phylum. I once cared for a couple of caterpillars and watched them transform into beautiful butterflies. I have my own zoo made up of stuffed toys, ranging from arthropods to molluscs to mammals.

What's the most important piece of advice you would give first-year PhD students?

I think planning of experiments and time management are very important to carry out efficient research work. This also helps with using resources judiciously and reduces the number of failed experiments due to technical reasons. Another piece of advice is to maintain work–life balance, as a PhD can be stressful at times. You can still be completely dedicated to science while taking time out for you and your personal life.

Reference

Rawat, S., Ghosh, S., Mondal, D., Anusha, V. and Raychaudhuri, S. (2020). Increased supraorganization of respiratory complexes is a dynamic multistep remodelling in response to proteostasis stress. *J. Cell Sci*. **133**, jcs248492. doi:10.1242/jcs.248492