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TEMASEK LIFESCIENCES LABORATORY

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The Auditorium (Level 1)

The regulation of protein arginine phosphorylation in cellular signaling

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Reversible protein phosphorylation is a central mechanism of cellular signaling in both eukaryotic and prokaryotic organisms. The most common and best characterized type of protein phosphorylation is O-phosphorylation, where the phosphoryl group is attached to the side chain hydroxyl group of serine, threonine and tyrosine residues to generate a phosphate monoester. Recently, however, we discovered that phosphorylation of arginine can also occur in bacterial proteins. There, the protein kinase McsB specifically phosphorylates arginine residues, while the protein phosphatase YwlE efficiently hydrolyses the generated phosphoramidate (P-N) bond. During my seminar, I will present our intriguing discovery of the first protein arginine kinase and the subsequent biochemical and structural studies performed on the corresponding protein arginine phosphatase. Moreover, I will highlight the development of novel chemical tools to study the biological regulation of protein arginine phosphorylation. Based on these results, I will provide an outlook on the potential physiological role of this novel type of post-translation protein modification.

Dr. Jakob Fuhrmann performed his doctoral studies in molecular/structural biology at the Institute of Molecular Pathology (IMP) and received his PhD from the University of Vienna, Austria, in 2010. His PhD thesis was honored with several awards including the "Award of Excellence" by the Austrian Ministry of Science and Research. In 2012, he started as postdoctoral fellow at the Scripps Research Institute, USA, supported by a Schroedinger as well as an EMBO fellowship.

Recent Publications:

1. Fuhrmann J.*, Subramanian V., and Thompson P.R. Targeting the Arginine Phosphatase YwlE with a Catalytic Redox-Based Inhibitor. ACS Chemical Biology 2013 Sep 20;8(9):2024-32
2. Fuhrmann J.*, Mierzwa B., Trentini D.B., Spiess S., Lehner A., Charpentier E., and Clausen T. Structural basis for recognizing phosphoarginine and evolving residue-specific protein phosphatases in gram-positive bacteria. Cell Reports 2013 Jun 27;3(6):1832-9
3. Fuhrmann J.*, Schmidt A., Spiess S., Lehner A., Turgay K., Mechtler K., Charpentier E., and Clausen T. McsB is a protein arginine kinase that phosphorylates and inhibits the heat-shock regulator CtsR. Science. 2009 Jun 5;324(5932):1323-7