SCIENCE MEETS LIFE

Evolution and system-scale nature of metabolism

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VIB

Monday, November 27 @ 16:00

FSVM2 - Seminar room L5

Host: Kris Gevaert

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Evolution and system-scale nature of metabolism

Life runs on many thousands of different chemical reactions, known collectively as cell metabolism. Metabolic reactions are vital for keeping cells and organisms growing and alive, and problems with cellular metabolism are implicated in ageing and diseases such as cancer, diabetes and brain disorders. Rather than thinking about cell metabolism as a collection of individual reactions, we are working to understand metabolism as a dynamic, interconnected network of processes that adapts in response to changes and stresses in the environment, and that evolves and functions as an entity.

In this lecture, I'll summarize our efforts of conducting hundreds to thousands of analytical measurements at both proteome and metabolome, allowing us to study how these complex metabolic processes are controlled, and how they are reconfigured in response to environmental changes. By taking detailed precision measurements of the genes and molecules involved in metabolic processes and putting the data into computation analysis, we can trace how the cell's metabolism adapts and changes in response to various stresses and strains. I'll also present some recent results on how we use 'functional proteomics' to reconstruct cellular networks and to identify missing gene function.

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Prof. Markus Ralser is an esteemed member of the European Molecular Biology Organization (EMBO). With foundational education in South Tyrol (Italy) and undergraduate studies in Salzburg (Austria), he secured a PhD in Neurobiology from the Max Planck Institute for Molecular Genetics (Germany). Subsequent training in Mass Spectrometry and Newborn Screening at VU Amsterdam (Netherlands) preceded his establishment of a Research Group that transitioned from the Max Planck Institute for Molecular Genetics to the Department of Biochemistry, University of Cambridge (UK), to the MRC National Institute of Medical Research, and later, the Francis Crick Institute (London, UK).

Since 2018, Prof. Ralser has served as the Director of the Institute of Biochemistry and Co-Chair of the Department of Biochemistry at Charité, while also holding fellowships at eminent institutions, including the Nuffield Dept. of Medicine at Oxford University. Further, his entrepreneurial spirit led to the inception of a London-based proteomic startup, focusing on exploring proteomic variations in human populations. His excellence has been acknowledged through numerous accolades, including the BioMed Central Research Award, the Wellcome Beit Prize, the Colworth Medal, the Starling Medal, and the EMBO Gold Medal.

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Relevant literature

- Messner, C.B., Demichev, V., … , Kustatscher, G., & Ralser, M. (2023). The proteomic landscape of genome-wide genetic perturbations. Cell, 186(9), 2018-2034.e21.
- Kamrad, S., Correia-Melo, C., … , Mülleder, M., & Ralser, M. (2023). Metabolic heterogeneity and cross-feeding within isogenic yeast populations captured by DILAC. Nature Microbiology, 8(3), 441-454.
- Correia-Melo, C., Kamrad, S., … , Papp, B., & Ralser, M. (2023). Cell-cell metabolite exchange creates a pro-survival environment that extends lifespan. Cell, 186(1), 63-79.e21.
- Yu, J.S.L., Correia-Melo, C., … , Alam, M.T., & Ralser, M. (2022). Microbial communities form rich extracellular metabolomes that foster metabolic interactions and promote drug tolerance. Nature Microbiology, 7(4), 542-555.
- Messner, C., Demichev, V., … , Tate, S., & Ralser, M. (2021). Ultra-high throughput proteomics with Scanning SWATH. Nature Biotechnology.