Selected research topics in Biomedical Engineering: Novel Phenotyping and Diagnostic Tools

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A high-resolution subcellular proteome atlas of a model apicomplexan Toxoplasma gondii: the parasite as we have never seen it before.

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Abstract

Apicomplexans, such as *Plasmodium*, *Toxoplasma*, and *Cryptosporidium*, are parasitic protists that invade cells of virtually every animal including human. Through diseases in humans and livestock, they tremendously burden healthcare, food security, and the economy. In adaptation to parasitism, apicomplexans have evolved a complex cell architecture featuring several unique and highly specialised subcellular compartments. These subcellular niches are populated by proteins with specific roles in invasion, propagation, and survival in the host cell. In this intricate landscape of the apicomplexan cell, protein function is tightly linked with its location. Strikingly, the majority of predicted proteins in model apicomplexans are unknowns, greatly limiting our understanding of the biology of these pathogens. To bridge this gap, I applied a novel proteomic technology termed hyperLOPIT to map the subcellular proteome of a model apicomplexan *Toxoplasma gondii*. This provides a revolutionary insight into the organisation and biology of the apicomplexan cell, and adaptations that render apicomplexans such extremely successful parasites.

Curriculum

Dr Konstantin Barylyuk is an Isaac Newton Trust – Leverhulme Trust Early Career Fellow at the Department of Biochemistry of the University of Cambridge, UK.

Konstantin obtained his undergraduate degree in biochemistry from the Department of Biology of the Lomonosov Moscow State University. He then joined the laboratory of Prof Dr Renato Zenobi at the ETH Zurich where he studied fundamentals of electrospray ionization mass spectrometry (ESI-MS) and applications of this method to the analysis of intact proteins and noncovalent interactions in organic and biomolecular complexes. After completing his PhD in 2013, he continued to study large biomolecular complexes by ESI-MS as a postdoc, first with Prof Zenobi and later with Prof Dr Frank Sobott at the University of Antwerp. In 2015, he became a postdoctoral fellow at the University of Cambridge with Dr Ross Waller and Prof Kathryn Lilley where he is currently conducting highly interdisciplinary research focused on mapping the subcellular localisation of proteins in pathogenic microorganisms such as Toxoplasma gondii.