University of Birmingham

Dr Vassiliy Bavro PhD

Birmingham Fellow

School of Immunity and Infection (/schools/immunity-infection/index.aspx)

Contact details

Telephone +44(0)121 414 6566 (tel:+44 121 414 6566)

Email v.bavro@bham.ac.uk (mailto:v.bavro@bham.ac.uk)

School of Biosciences
University of Birmingham
Edgbaston
Birmingham
B15 2TT
UK

About

Vassiliy Bavro joined the School of Immunity and Infection at University of Birmingham in February 2012 as a Birmingham Fellow. Dr Bavro is a structural biologist with a strong track-record in membrane protein research and is currently setting up his independent research group at Birmingham.

His interest is in fundamental principles of membrane protein function and dynamics, and specifically structural determinants underlying the function of multidrug efflux pumps and bacterial protein secretion machinery. Dr Bavro is also actively involved in development of novel methods for structural biology research in application to membrane proteins, and has pioneered the use of X-ray radiolytic footprinting technique.

His other achievements include X-ray structure solution of several high-profile membrane proteins.

Dr Bavro is part of the new Institute of Microbiology and Infection and his office is located in the Biosciences building S118.

Qualifications

- PhD in Structural Biology and Nanobiology, European Molecular Biology Laboratory (EMBL), Grenoble, France, 1999-2003
- MSc in Biochemistry and Microbiology, University of Sofia, Bulgaria/University of East London, UK, 1991-1996
- Introductory Certificate in First-Line Management, University of Cambridge, UK, 2006

Biography

Vassiliy Bavro qualified with an MSc in Biochemistry and Microbiology from the University of Sofia, Bulgaria in 1996, having done a major part of his MSc thesis in the University of East London, UK under EU TEMPUS funding. He then enrolled for the Structural Biology PhD programme at the European Molecular Biology Laboratory (EMBL) as a Louis-Jeantet Fellow from 1999 to 2003. There he conducted structural research on proteins involved in postsynaptic clustering of neurotransmitter receptors under the supervision of Prof. Winfried Weissenhorn. After successful completion of his PhD Dr Bavro moved for to the Dept of Biochemistry, University of Cambridge, where in the laboratory of Prof. Ben Luisi he started his work on multidrug efflux pumps, which remain one of his main interests to this day. He stayed in Cambridge for a total of 4 years from 2003 to 2007, during which time he was also a Marie-Curie Research Fellow. Following that Dr Bavro pursued his interest in structural biology of membrane proteins further by joining the lab of Dr Stephen Tucker at the Dept of Physics, University of Oxford, where, in parallel to X-ray crystallography he focussed on application of novel structural biology approaches to study of membrane proteins. In particular he actively participated in the development and pioneering use of non-dissociative and ion-mobility mass spectrometry and X-ray radiolytic footprinting (XRF) methodology to ion channels.

Dr Bavro has joined the new Institute of Microbiology and Infection in February 2012 after being awarded one of the Birmingham Research Fellowships.

His current research focuses on large membrane -protein complexes involved in bacterial drug resistance such as the tripartite pumps and protein secretion systems.

Postgraduate supervision

For a full list of available Doctoral Research opportunities, please visit our **Doctoral Research programme listings (http://www.bham.findaphd.com/?es=y&apl=y&aplt=&show)** .

Research

RESEARCH THEMES
Structural biology, Membrane proteins, Multidrug resistance mechanisms, Multi-drug efflux pumps, Antimicrobials, Protein secretion, Cell envelope biology, Bacterial cell adhesion, Ion Channels.

RESEARCH ACTIVITY

Multi-drug efflux pumps

The main emphasis of Dr Bavro's work for the past 10 years has been the study of the structure of multidrug efflux pumps in Gram-negative bacteria.

These are multicomponent membrane protein assemblies spanning both the inner and the outer membrane and are composed of a trimeric outer membrane pore belonging to the TolC-family. The inner membrane components could be diverse transporters, energised by ATP (ABC transporters) or H+ gradients (RND transporters).The inner and outer membrane components are thought to be bridged by the so called membrane fusion proteins (MFPs), but their mode of interaction and indeed even the stoichiometry of the assembly remain unclear.

Dr Bavro previous work has elucidated the structure of the open state of the TolC molecule central in the assembly, and also has produced experimental evidence and models of assembly for a number of pump systems, including AcrAB-TolC RND transporter assembly from E.coli, MtrCDE RND transporter from Neisseria, as well as the MacAB-TolC ABC transporter complex.

His current work is aimed at solving the stoichiometry of these complexes experimentally and reconstructing the full complex structure based on integration of high resolution X-ray crystallographic data on isolated components and medium- to low resolution approaches such as EM, non-dissociative mass spectrometry and X-ray radiolytic footprinting (XRF).

Outer membrane protein biogenesis

A highly connected topic of research is the □-barrel protein assembly machinery (BAM) complex, which is involved in the folding and insertion of the outer membrane proteins into the membrane.

BAM is a multiprotein complex the exact stoichiometry and interprotein interactions of which are still debatable, and which is assembled around a central component, BamA, of a yet unknown structure. Dissecting the interactions between the components of this complex is one of the strategic goals of Dr Bavro that will allow for a precise reconstruction of the whole assembly.

Development of novel structural biology methodology for membrane protein research

In the context of the above studies one of the directions we are pursuing is to develop new and refine the existing toolkit for structural biology of membrane proteins, in particular the application of the X-ray radiolytic footprinting and mass-spectrometric techniques as a part of a wider collaborative network.

Ion channel studies

Dr Bavro is also continuing his work on conformational dynamics of ion channels, in collaboration with the group of Dr Stephen Tucker, University of Oxford. This research has recently revealed the first structure of a bacterial inward-rectifier potassium channel in open conformation and we are planning to expand onto structural characterisation of several different mutants and different channel types allowing us to elucidate the structural transitions during ion channel gating.

Publications

Bavro VN, De Zorzi R, Schmidt M, Muniz JR, Zubcevic L, Sansom M, Vénien-Bryan C, Tucker SJ. (2012), Structure of a KirBac Potassium Channel with an Open Bundle□ Crossing Indicates a Mechanism of Channel Gating. Nature Structural and Molecular Biology, 19 (2), 158-163

Featured in PSI Nature “Research Advances section” for March 2012.

Janganan TK, *Bavro VN, Zhang L, Matak-Vinkovic D., Barrera NP, Venien-Bryan C, Robinson CV, Borges-Walmsley MI, Walmsley AR. (2011), Evidence for the assembly of a bacterial tripartite multidrug pump with a stoichiometry of 3:6:3 Journal of Biological Chemistry , 286(53): 26900-26912. (shared first author)

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Wang SC, Politis A, Di Bartolo N, Bavro VN, Tucker SJ, Booth PJ, Barrera NP, Robinson CV. (2010), Ion mobility mass spectrometry of two tetrameric membrane protein complexes reveals compact structures and differences in stability and packing. Journal of American Chemical Society ,132(44):15468-70

Gupta S, Bavro VN, D'Mello R, Tucker SJ, Vénien-Bryan C, Chance MR.
Structure (Cell Press). (2010), Conformational changes during the gating of a potassium channel revealed by structural mass spectrometry. 18(7):839-46. Featured as a journal cover story

Barrera NP, Isaacson SC, Zhou M, Bavro VN, Welch A, Schaedler TA, Seeger MA, Miguel RN, Korkhov VM, van Veen HW, Venter H, Walmsley AR, Tate CG, Robinson CV. (2009), Mass spectrometry of membrane transporters reveals subunit stoichiometry and interactions. Nature Methods. 6(8):585-7

Lin HT, Bavro VN, Barrera NP, Frankish HM, Velamakanni S, van Veen HW, Robinson CV, Borges-Walmsley MI, Walmsley AR. (2009), MacB ABC transporter is a dimer whose ATPase activity and macrolide-binding capacity are regulated by the membrane fusion protein MacA. Journal of Biological Chemistry, 284(2):1145-54. (shared first author)

Bavro VN, Pietras Z, Furnham N, Pérez-Cano L, Fernández-Recio J, Pei XY, Misra R, Luisi BF. (2008), Assembly and channel opening in a bacterial drug efflux machine. Molecular Cell, 30(1):114-21. cited 60+ times;

For more publications please consult **Pubmed (http://www.ncbi.nlm.nih.gov/pubmed?term=Bavro%20V)** and **Google Scholar (http://scholar.google.com/citations?user=PpV_2B8AAAAJ&hl=en)**