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About

Dalan Bailey is a University of Birmingham Research Fellow working on the molecular biology of RNA viruses. He has over 10 years' experience working on the molecular determinants of virulence, with particular focus on morbilliviruses and noroviruses. Since 2005 he has published over 20 manuscripts in this area including publications in PLOS Pathogens and the Journal of Virology.

Dalan is also involved in lecturing in virology, reviewing virology manuscripts and developing novel techniques for use in the lab. He also promotes the development of junior researchers through the supervision and mentoring of students in his lab.

Qualifications

- PhD Virology 2007
- BSc Virology (Hons) 2002

Biography

Dalan graduated from the University of Warwick in 2002 with a BSc Honours degree in Virology. To further his career in virology he undertook a PhD in the lab of Prof. Tom Barrett at the Pirbright Institute (formerly the Institute for Animal Health) where he worked on morbilliviruses. He was the first person to sequence the genome of Peste-des-petits-ruminants virus (PPRV), a close relative of Measles virus (work published in his first paper in 2005 **http://www.ncbi.nlm.nih.gov/pubmed/15845262 (http://www.ncbi.nlm.nih.gov/pubmed/15845262)**). Dalan's work at the institute focused on the development of molecular biology tools, including reverse genetics systems, to dissect the molecular determinants of pathogenesis for morbilliviruses. He was awarded his PhD from the University of Reading in 2007 and soon after began working as a postdoctoral researcher.

During his five year postdoctoral research contract (at Imperial College – London) Dalan worked on noroviruses, small positive sense RNA viruses in the Caliciviridae family. While in the lab of Prof. Ian Goodfellow, Dalan further developed his research into the areas of proteomics and protein-protein interactions while maintaining a keen interest in pathogenesis. The main focus of his work during this time was the murine norovirus pathogen, an excellent surrogate model for the human virus and disease. This virus was identified in 2003 and together with colleagues at Imperial Dalan published research on this virus in many leading virology journals.

This research focused on manipulation of a reverse genetics model for murine norovirus and subsequent analysis of the molecular biology of viral replication and disease. During this time as a postdoctoral researcher Dalan began co-supervising PhD and MSs students in the lab and also became more involved in peer-reviewing academic manuscripts.

In 2012 Dalan began his independent research career at the Pirbright Institute, working again on morbilliviruses with special focus on pathogens with relevance to agriculture. In this year Dalan determined the epithelial receptor for PPRV and also worked on determining the role of SNPs in host-mediated susceptibility to disease.

Subsequently in 2013 Dalan moved to the University of Birmingham to take up a fellowship role in the School of Immunity and Infection. His major area of research at the University is on the negative sense RNA viruses, especially the paramyxoviruses – a broad group of pathogens that infect multiple species and cause a great health and economic burden across the globe.

Dalan is a member of the Society for General Microbiology and the Veterinary Research Club. He is also an Advisory Board member for the Archives of Virology.

Postgraduate supervision

Dalan is interested in supervising doctoral research students in the following areas:

- The molecular virology of paramyxoviruses (e.g. Measles, RSV, hPIV3, Mumps, Hendra)
- Enveloped virus attachment and entry
- Viral budding and release

If you are interesting in studying any of these subject areas please contact Dalan at the email address listed above

Research

PARAMYXOVIRUSES

The Paramyxovirus family of viruses encompasses two sub-families and seven genera. Classified viruses within this family include the human pathogens measles, mumps, respiratory syncytial virus and human parainfluenza. Pathogens of animals are also significantly represented including rinderpest (now eradicated), peste des petits ruminants and Newcastle disease. There are also important emerging zoonotic viruses in this family including Hendra and Nipah. Collectively these viruses are a great health and economic burden across the globe resulting in numerous deaths and considerable hardship, yet there is a lack of effective vaccines and antivirals.

Paramyxoviruses all have non-segmented negative sense RNA genomes and are enveloped. This plasma membrane is itself stolen from the host cell during the process of virion release (budding). Embedded in the membrane of these viruses are virally encoded proteins that permit the attachment of the virus to uninfected cells and the subsequent entry of the viral genome.

RESEARCH ACTIVITY

The core aims of the Bailey laboratory are to improve understanding of paramyxovirus virology and basic cell biology and highlight the integral role of proteomics and systems biology in modern virology. Systematic analysis of the paramyxovirus family will improve knowledge of virus-host interactions, host restriction, pathogenesis and host range. This basic research will then be applied to the development of novel antivirals and vaccines.

Using novel proteomics techniques, as well as established molecular virology tools, the laboratory focuses on the following aspects of paramyxovirus biology:

Virus-host interactions:

Like all viruses the paramyxoviruses rely on hijacking cellular machinery in order to replicate and spread. Identifying the protein-protein and RNA-protein interactions underpinning this paradigm is an important focus of the laboratory. The Bailey laboratory has previously identified the epithelial receptor of a ruminant paramyxovirus (PPRV), an important step in understanding the molecular determinants of pathogenesis for this virus.

Attachment and entry:

The interaction between virus particles (virions) and their hosts (cells) is often determined by the specific affinities of viral attachment proteins for host receptors. The strength and specificity of these interactions plays an important role in determining the host range and cell-specificity (tropism) of viruses. This, in turn, has an important effect on the nature and severity of disease caused by the virus. Determining the restrictions and mechanism involved in these virus-host interactions is an on-going area of research in the Bailey laboratory.

Budding and release:

Paramyxoviruses have evolved two distinct strategies to spread from infected to uninfected cells. The classical strategy is via the formation and release of enveloped infectious particles while the other employs cell to cell fusion, allowing spread without virion production. Understanding the mechanisms behind these two processes is a key goal of the research in the Bailey laboratory.

Other activities

- Member of the Society for General Microbiology (2004-present)
- Member of the Veterinary Research Club (2008-present)
- Advisory board member for Archives of Virology (2010-present)
- External lecturer at: LSHTM, Surrey, Imperial College universities (on-going).

Publications

McFadden N, Arias A, Dry I, **Bailey D**, Witteveldt J, Evans DJ, Goodfellow I, Simmonds P. Influence of genome-scale RNA structure disruption on the replication of murine norovirus--similar replication kinetics in cell culture but attenuation of viral fitness in vivo. Nucleic Acids Research. 2013 Apr 29. **http://www.ncbi.nlm.nih.gov/pubmed/23630317 (http://www.ncbi.nlm.nih.gov/pubmed/23630317)** .

Pope RA, Parida S, **Bailey D**, Brownlie J, Barrett T, Banyard AC. Early events following experimental infection with Peste-Des-Petits ruminants virus suggest immune cell targeting. PLoS One. 2013;8(2):e55830. **http://www.ncbi.nlm.nih.gov/pubmed/23418464 (http://www.ncbi.nlm.nih.gov/pubmed/23418464)** .

Birch J, Juleff N, Heaton MP, Kalbfleisch T, Kijas J and **Bailey D**. Characterization of ovine nectin-4, a novel peste des petits ruminants virus receptor. **http://www.ncbi.nlm.nih.gov/pubmed/23388720 (http://www.ncbi.nlm.nih.gov/pubmed/23388720)** . Journal of Virology. 2013 Apr;87(8):4756-61.

Thorne L, **Bailey D** and Goodfellow I (2012). High-Resolution functional profiling of the murine norovirus genome. Journal of Virology. 2012 Nov;86(21):11441-56. **http://www.ncbi.nlm.nih.gov/pubmed/22915807 (http://www.ncbi.nlm.nih.gov/pubmed/22915807)** .

Arias A, **Bailey D**, Chaudhry Y and Goodfellow I (2012). Development of a reverse genetics system for murine norovirus 3; long-term persistence occurs in the caecum and colon. Journal of General Virology 93(Pt 7):1432-41. **http://www.ncbi.nlm.nih.gov/pubmed/22495235 (http://www.ncbi.nlm.nih.gov/pubmed/22495235)** .

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Bailey D, Urena L and Goodfellow I (2012). Identification of protein interacting partners using tandem affinity purification. Journal of Visualized Experiments 25(60). **http://www.ncbi.nlm.nih.gov/pubmed/22395237 (http://www.ncbi.nlm.nih.gov/pubmed/22395237)** .

McFadden N*, **Bailey D* (joint first authors)**, Carrara G, Benson A, Chaudhry Y, Shortland A, Heeney J, Sosnovtsev S, Yarovinsky F, Simmonds P, Macdonald A and Goodfellow I (2011). Norovirus regulation of the innate immune response and apoptosis occurs via the product of the alternative open reading frame 4. PLOS Pathogens 7(12):e1002413. **http://www.ncbi.nlm.nih.gov/pubmed/22174679 (http://www.ncbi.nlm.nih.gov/pubmed/22174679)** .