Institute for Animal Health

UNIVERSITY OF OXFORD

Jenner Vaccine Foundation News

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HIGHLIGHTS

New TB vaccine begins Phase IIb trials in South Africa

£100m IAH development at Pirbright

Bill Gates visits the Jenner Institute Laboratories

Current challenges in HIV vaccine research

From the Chairman

Brian Greenwood

Welcome to the first edition of the Jenner Vaccine Foundation Newsletter.

The Jenner Vaccine Foundation was established as a charitable organisation in 2005 as a partnership between the Institute for Animal Health and the University of Oxford to foster parallel development of vaccines for human and veterinary use. During its first few years, the primary activity of the Foundation has been the provision of support to scientists working on vaccine development at the two sponsor organisations who constitute the **Jenner Institute**. This support has included a financial contribution to the cost of a new laboratory building on the Churchill Road campus, which now hosts many of the scientists working on vaccines at the University of Oxford, some limited financial support for 24 distinguished scientists working on vaccine development at the two sponsor organisations – **The Jenner Investigators** – and sponsoring seminars and workshops. The Foundation now seeks to expand its activities to include training and advocacy as well as support for research. A fundraising programme will be launched shortly to support these expanded roles and an effective newsletter could facilitate these goals.

The Jenner Vaccine Foundation newsletter has two main purposes. Firstly, it seeks to advertise to a general audience some of the exciting research on vaccine development being undertaken by scientists at the two sponsor organisations. Secondly, it provides a forum for members of the Jenner Institute to express their views on what they see as key features related to the objectives of the Foundation and on vaccine research more broadly.

Newsletters such as this one work only if their readers find them interesting and are prepared to contribute. Please contribute and help to make this a lively forum.

New TB Vaccine Begins Phase IIb Trials

The new TB vaccine, MVA85A, developed by Jenner Investigator Dr Helen McShane has commenced Phase IIb trials in Worcester, South Africa. This is the first efficacy trial of a new TB vaccine in more than 80 years.

TB infects around 2 billion people worldwide (almost a third of the population) and is one of the world's biggest killers causing around 1,8 million deaths per year, with South Africa being one of the most affected countries. The current vaccine (BCG) is given throughout the developing world and parts of the developed world. BCG works well to prevent disease in infants but is not very effective in adults, especially against lung disease, which is the major cause of disease burden; therefore, MVA85A is designed to enhance the immune response to BCG.

The Phase IIb trial in South Africa started earlier this year at the South African TB Vaccine Initiative (SATVI) site at Brewelskloof Hospital in Worcester, around 100 km from Cape Town, making MVA85A the first of the new generation of TB vaccines to enter into a proof-of-concept trial. This trial will involve around 2,800 BCG-vaccinated infants, half of whom will receive MVA85A and half of whom will receive a placebo. The infants will then be followed up for two years to monitor rates of TB in both groups, as well as safety and immunogenicity. Previous trials in the UK, South Africa and The Gambia have already shown that MVA85A is safe and that it induces the type of immune response that is thought to be protective against TB. The results of this study should be available in 2012.

The trial is jointly funded by the Wellcome Trust and the Aeras Global TB Vaccine Foundation. The money from the Wellcome Trust is in the form of a Strategic Award to Dr McShane, based at the Jenner Laboratories at the University of Oxford, and OETC (Oxford-Emergent Tuberculosis Consortium Ltd.). The trial is being run in collaboration with OETC, SATVI and AERAS, who will be the trial sponsor.

Worcester, Cape Town, July 2009 - *Four-month old Janenique Pienaar of Worcester, South Africa, made history on Wednesday 15 July 2009 when she became the first baby in 80 years to be vaccinated in a proof of concept efficacy trial (Phase IIb) of a candidate TB vaccine. The candidate vaccine, MVA85A/Aeras-485, is being tested at the TB vaccine research site of the South African Tuberculosis Vaccine Initiative (SATVI) of the University of Cape Town, in partnership with Aeras Global TB Vaccine Foundation, the Oxford-Emergent Tuberculosis Consortium Ltd. and the Wellcome Trust.*

National Institute for Health Research £1.8m Award

The Clinical Biomanufacturing Facility (CBF), a Jenner Institute unit which provides the key interface between research and clinical medicine and manufactures Investigational Medicinal Products (IMPs) to GMP standards for first in human clinical trials, has been awarded a £1.8 million grant from the NIHR (National Institute for Health Research). The grant will be used to increase the capacity of the CBF to produce vaccines for translational research within the Jenner Institute while also strengthening the BRC's partnership with the NHS, Oxford Radcliffe Hospital Trust and University of Oxford.

Specifically, the grant will improve the unit's infrastructure by providing additional clean room space allowing for more flexible functionality, a filler unit and a semi-automatic fill line.

The Head of CBF, Sarah Moyle, commented on the grant: "Despite a strong record of several types of products for first in human trials, the CBF has been unable to meet all the clinical needs for GMP manufacture of cutting edge biologicals due to lack of suitable manufacturing space. This grant will enable my team to increase the output of cost-effective therapeutic and prophylactic vaccines which are being developed by leading Oxford clinical and academic collaborators. It will also allow us to extend our services to cover other biological materials in addition to viruses; it is essential that we remain as flexibly functional as possible to meet the needs of our users." She continued: "These funds could not have come at a better time; this grant will ensure that we will be able to increase capacity and manufacture multiple products in parallel, whilst meeting the stringent regulatory demands these novel cutting-edge products require".

The new Institute for Animal Health Re-development at Pirbright

The Institute for Animal Health (IAH) Pirbright Laboratory is a world-leader in research into exotic virus diseases of animals, especially cattle, sheep and pigs. As part of its national and international role, IAH-Pirbright currently houses the FAO World Reference Laboratory for foot and mouth disease (FMD) and the World Reference Laboratory for Morbilliviruses; the EU Community Reference Laboratories for FMD, swine vesicular disease and bluetongue; and acts as World Organisation for Animal Health (OIE) Reference/Regional laboratories for eight of the major exotic diseases of livestock which threaten the UK livestock industry. These laboratories provide essential national and global diagnostic services and are in the front-line for handling emergency outbreaks of several major exotic viral diseases of livestock. IAH Pirbright provided key scientific data and advice to the Government during the 2001 and 2007 FMD outbreaks, the 2007 incursion of bluetongue virus and worked with DEFRA and the National Farmers Union to ensure that the UK remained free from bluetongue in 2008 and 2009. IAH-Pirbright is a unique laboratory in the UK due to the portfolio of pathogens studied and the availability of specialist high-containment facilities, both research laboratories and large-animal accommodation, which cannot easily be replicated elsewhere.

Following the 2001 Foot and Mouth outbreak, the various post-outbreak inquiries and reviews concluded there was an urgent need for a major redevelopment of the laboratories and facilities at IAH-Pirbright to meet modern day standards. Building work to upgrade the Pirbright campus began in 2004 and the first phase included a new insectary; a new high-containment animal isolation unit and new site infrastructure. Following the 2007 FMD outbreak in Surrey, progress stalled but on July 27 2009, Treasury approved £100m funding for a new state-of-the art laboratory that will deliver an excellent working environment for scientists in a high-containment laboratory. An artist's impression of the new laboratory is shown below. The new laboratory will house all IAH scientists in a single envelope containment facility and the new investment in state-of-the-art facilities for IAH will ensure the UK remains in position to control, contain and eradicate the threats of established and emerging diseases of animals. This national capability is becoming increasingly important as vector-borne diseases are spreading northwards as a consequence of climate change and global warming and posing greater threats to food supply and food security. Research at the new Pirbright laboratory will also focus on combating diseases that spread from animals to humans, such as the influenzas. The new laboratory is expected to be completed by the end of 2013 and will boast cutting-edge technologies for many engineering solutions required to deliver a high security laboratory.

IAH Common Area

BBSRC
bioscience for the future

Professor Martin Shirley, IAH's Director:

"I am absolutely delighted by the news; it is a clear vote of confidence in the world-class science carried out at IAH and recognises the increasing threats posed by animal diseases such as foot and mouth, bluetongue, and African swine fever, which could cause massive economic and social damage.

The investment in state-of-the-art facilities at IAH will ensure the UK is in a position to control, contain and eradicate the threats of established and emerging diseases of animals. This is particularly important now as vector-borne diseases are spreading northwards as a consequence of the changing climate.

IAH already attracts and trains the best scientific talent in livestock research across the globe and provision of the new laboratory will ensure this remains the case.

Research that contributes to the development of innovative vaccines is integral to the work of IAH and will long be a central pillar for better containment, control and eradication of many infectious diseases of livestock".

Martin Shirley Sep 2009

Gates Visits Global Health Researchers

Bill Gates visited the University in April to see for himself its world-class research on global health priorities, such as tuberculosis, malaria and childhood infections.

Bill Gates set up the informal private visit so that he could meet a number of Oxford's leading researchers, hear about their latest work and ask questions on where it was heading. The Bill and Melinda Gates Foundation funds a number of projects in the University's Medical Sciences Division that aim to tackle some of the leading causes of death worldwide.

The visit coincided with the start of the next stage in clinical trials of the world's leading candidate for a tuberculosis vaccine, developed at Oxford. It is the first new TB vaccine to reach this clinical trial stage since the BCG vaccine was developed over 80 years ago. The Phase IIb trial will be carried out in South Africa and involve 2,800 infants less than one year of age.

Bill gates learns about Oxford's latest vaccine research

A new vaccine is urgently needed, as BCG is currently the only available vaccine against TB, and provides only variable protection against pulmonary tuberculosis, which accounts for most of the worldwide disease burden. More than two billion people are infected with tuberculosis (TB) – approximately one out of every three people on the planet – and 1.8 million die annually from the disease.

"We believe this is the most exciting advance in the field in TB vaccine for over 80 years," Said Dr Helen McShane of the University's Jenner Institute. "We have shown that this vaccine is safe and stimulates immune responses. This trial will hopefully show that the vaccine can protect people from getting TB and enable the global community to begin to control this devastating disease."

Dr Helen McShane originally developed the vaccine working with Dr Sarah Gilbert and Professor Adrian Hill. It was licensed by ISIS Innovation, the University's technology transfer company, to the Oxford-Emergent Tuberculosis Consortium, a joint venture between the University and Emergent Biosolutions Inc. The Aeras Global TB Vaccine Foundation is now working with the Consortium to develop the vaccine with additional funding from the Wellcome Trust.

Professor Tom Barrett, Jenner Investigator: an appreciation

16 APRIL 1947 – 19 SEPTEMBER 2009

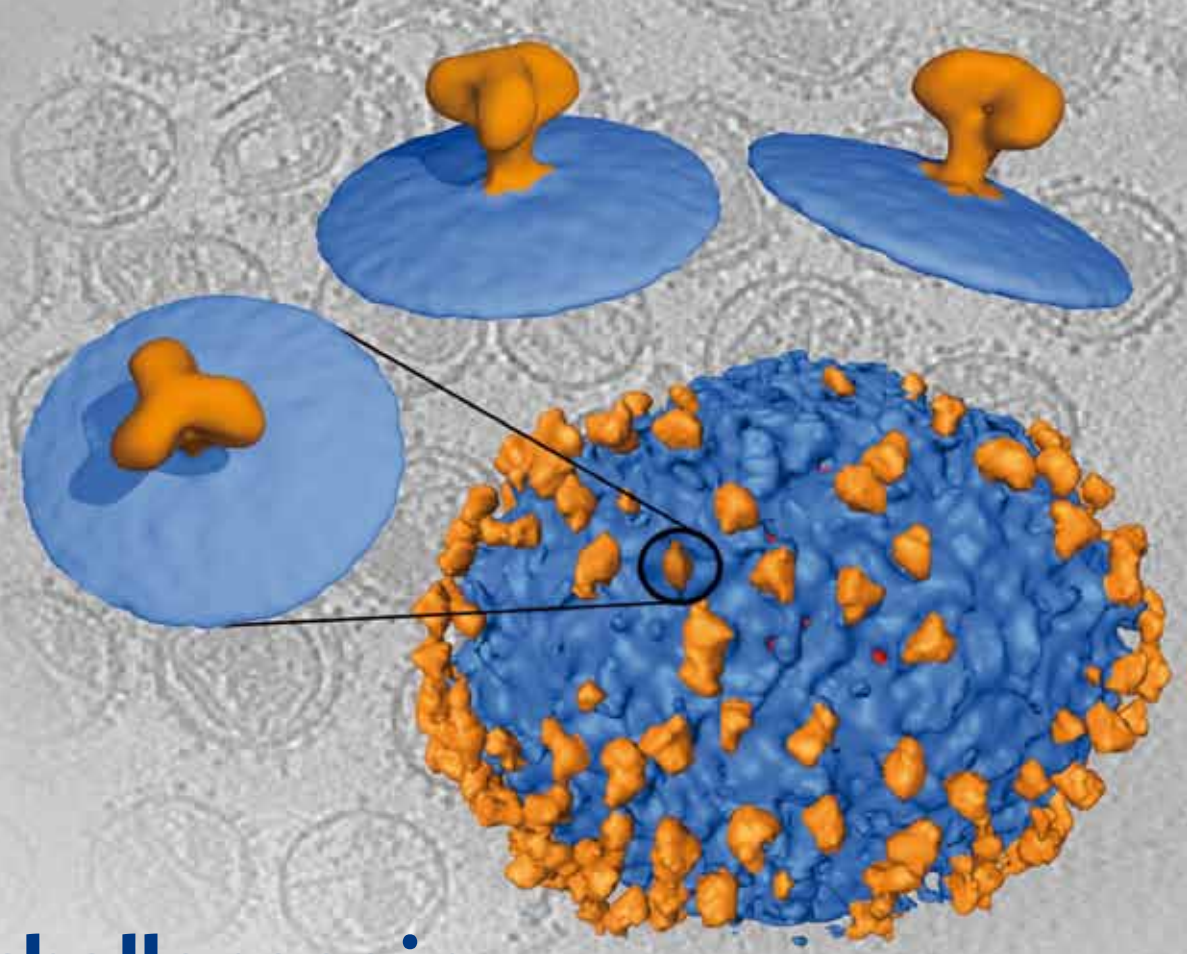
The Institute for Animal Health lost one of its leading researchers, Professor Tom Barrett, on 19 September. Tom was one of the UK's best veterinary virologists with an outstanding track record of delivering the benefits of his science to the UK and, perhaps more laudably, to the developing world. His work on the morbillivirus rinderpest virus (cattle plague) was integral to the success of the Global Rinderpest Eradication Programme and the formal announcement, expected in 2010, that the virus has been eradicated. This will make rinderpest the first virus in veterinary science and only the second virus after smallpox, to have officially been eradicated. As head of the Morbillivirus Group at the Pirbright Laboratory since 1985, Tom personally drove much of the UK effort on rinderpest research.

Throughout his almost 25-year career at IAH, Tom was remarkably productive, including national and international scientific influence and leadership. His interests were focussed on the application of molecular and epidemiological approaches to the study of viruses, including on the development of recombinant vaccines against rinderpest virus and the related peste des petits ruminants virus (PPR). His other achievements include revealing pathogenesis and host range determinants of genetically engineered morbilliviruses; sequencing the genomes of PPR viruses from lineages circulating in the field; the development of reverse genetics systems for studies on virulent strains of PPR virus, and the derivation and practical use of associated diagnostic tests for the morbilliviruses.

But Tom was more than just a highly skilled and innovative scientist – he was a wonderful individual with a demeanour that colleagues loved and respected in equal measure. Tom was in tune with the needs of colleagues and gave time to everyone in ways that made a deep personal impression and engendered feelings of real companionship. Tom was a true gentleman and his scientific prowess, allied to a personality that radiated warmth and humility, made him an outstanding ambassador for IAH and a real pleasure to be with.

Martin Shirley *Director, Institute for Animal Health, Sep 2009*

Friends of Tom have established a web page through which one can donate to a charity, the NSPCC, that was close to Tom's heart.
www.justgiving.com/Tom-Barrett-Tribute/



The image shows a three-dimensional reconstruction of a simian immunodeficiency virus (SIV, in blue), a close relative of the human immunodeficiency virus (HIV) with the envelope glycoprotein (Env) spikes in orange. The three zoomed regions show an individual Env spike from three different orientations, revealing threefold spike symmetry. The Env spike is the only target of neutralising antibodies against HIV, so understanding its structure will help us to design immunogens for vaccine use. This image was obtained using cryo-electron tomography by Dr Giulia Zanetti (University of Berkley California, USA). For more information see: Zanetti et al (2006) Plos Pathogens 2: e83.

Current challenges in HIV vaccine research

QUENTIN SATTENTAU, Jenner Investigator

With an estimated 33 million people infected globally and approximately 2.5 million new HIV-1 infections per year, a preventative vaccine against HIV-1 is a top public health priority. And yet most of those working in the field are not optimistic that a vaccine will be developed in the near future. Why is this?

There are two major types of 'classical' vaccine that have been developed against infectious diseases: killed and live-attenuated. Neither of these are considered suitable for an HIV-1 vaccine, since the killed version does not elicit an immune response of sufficient quantity and quality to protect, and the attenuated version is considered too risky, since weakened HIV-1 might become virulent (full-strength) again and cause disease.

We need to think of new ways to stimulate the immune system to respond to HIV-1. The first question to ask is: what type of immunity do we believe is important in protection against HIV-1 infection? For the past 15 years, there have been two schools of vaccine design thought: those that promote T cell responses and those that promote B cell responses. This distinction was always rather artificial, and most researchers now believe that a combination of both types of immunity will be essential to achieve protection. The second question is: how do we generate protective T and B cell immunity to HIV-1 by vaccination? This is where the scientific struggle is currently taking place. New technologies such as live viral and bacterial vectors ('vaccine shuttles') and rationally-designed and tailored antigens are taking centre stage as experimental vaccine candidates. New knowledge and concepts relating to how the virus first infects the body, where it initially replicates and to where it subsequently disseminates are adding to our understanding of how to attack it locally and systemically. Finally, an explosion in the understanding of how the immune system is triggered is fuelling the discovery of new adjuvants, which are the essential immune-stimulating components of many successful vaccines.

Of course, the excitement of the application of this new science must be viewed in the context of mixed success in clinical efficacy trials. There have been disappointing results over the past decade, but also a recent modest success in the RV144 Thai trial, in which the candidate vaccine was found to be safe and 31% effective at preventing infection. We now have the foundations on which to start building a vaccine to elicit robust protection against this virus.

One Health Initiative

One Health Initiative will be further promoted within the Jenner Vaccine Foundation and the Jenner Institute with the appointment of two **JENNER FELLOWS** in 2010.

It is envisaged that applicants with a background in veterinary medicine will be appointed to take forward One Health research programmes on influenza and tuberculosis. New tuberculosis vaccines in cattle as well as humans will be developed and vaccine safety, immunogenicity and efficacy in poultry and humans (part of the influenza vaccine programme) will be addressed.

The Fellows will be based at the Jenner Institute in Oxford but will be expected to be doing their experimental work at IAH Compton and also potentially at IAH Pirbright.

Enquiries can be directed to Dr Sarah Gilbert, sarah.gilbert@ndm.ox.ac.uk (Flu group) and Dr Helen McShane, helen.mcshane@ndm.ox.ac.uk (TB group).

http://onehealthinitiative.com/mission.php

Profiling: Jenner Investigators

Helen McShane

The HIV epidemic and the emergence of multi and extensively drug-resistant strains of Mycobacterium tuberculosis mean that global control of TB, particularly adult pulmonary TB, remains inadequate. The current vaccine, BCG, confers protection against disseminated disease in childhood, but does not protect against pulmonary disease. It is known that Class II-restricted CD4+ T cells are essential for protective immunity and that class I-restricted CD8+ T lymphocytes may play a role in maintaining the latent state. Over the last 12 years, my group has developed a new TB vaccine, called MVA85A, which is designed to enhance the protective immunity conferred by BCG. This strategy improves BCG induced protection in preclinical models.

Since 2002, we have conducted a series of Phase I and Phase IIa clinical trials with MVA85A in the UK, The Gambia, South Africa and Senegal. In all of these clinical trials, we find that MVA85A is safe and highly immunogenic. In April 2009, a Phase IIb proof-of-concept efficacy trial commenced in South African infants. This clinical trial will allow us to evaluate the protective efficacy of this strategy in humans, and is the first of the new generation of TB vaccines to enter into efficacy testing.

Current projects within my group include the development of a BCG challenge model in humans, evaluating the contribution of pre-existing exposure to environmental mycobacteria on vaccine-induced immune responses, evaluation of the protective efficacy of new antigens in viral vectors and evaluating mucosal routes of vaccine delivery, in both preclinical and clinical models.

Key Publications

Scriba TJ, Tameris M, Mansoor N, Smit E, van der Merwe L, Isaacs F, Keyser A, Moyo S, Brittain N, Lawrie A, Gelderbloem S, Veldsman A, Hatherill M, Hawkridge A, Hill AVS, Hussey GD, Mahomed H, Hanekom WA and McShane H. *MVA85A, a novel TB vaccine, is safe in adolescents and children, and induces complex subsets of polyfunctional CD4+ T cells.* European Journal of Immunology. 2009. In press

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McShane H, Pathan AA, Sander CR, Keating SM, Gilbert SC, Huygen K, Fletcher HA, Hill AVSH. *Recombinant modified vaccinia virus Ankara expressing antigen 85A boosts BCG primed and naturally acquired anti-mycobacterial immunity in humans.* Nature Medicine 2004. 10(11):1240-4.

Quentin Sattentau

I did my BSc in microbiology at the University of Bristol in 1980, and my PhD in the immunology and virology of susceptibility to herpes simplex virus at the University of London in 1985. My first post was as Postdoctoral Researcher then Research Lecturer at the Middlesex Hospital Medical School (1985-1992). During this time, I had a wild 18-month visit to Dr Richard Axel's laboratory in New York. I then took up a tenured position as CNRS Director of Research at the Immunology Centre in Marseille, where I stayed for seven years (1992-1998). I subsequently became Senior Lecturer at Imperial College London (1999-2003), followed by my current post of Lecturer, and now Titular Professor in the Department of Pathology at the University of Oxford. I am also Tutorial Fellow in Molecular Microbiology at Magdalen College, Oxford, where I am Co-ordinating Tutor for Medical and Physiological Sciences. Since my PhD, I have worked on HIV-1, and have focused on its interaction with its cellular receptors and the inhibition of these interactions by receptor blockers and neutralising antibodies. I am interested in areas of viral pathogenesis, particularly the mechanisms by which HIV-1 spreads between immune cells. The work with neutralising antibodies introduced me to HIV-1 vaccine research in the 1990s, leading to the current portfolio of antibody-based vaccine-related projects. These span HIV-1 envelope glycoprotein structure-function relationships, antigen design, adjuvant design and new strategies for formulation and delivery. A parallel research theme relates to how vaccines and other immunogens can induce hypersensitivity and allergic reactions and how these can be avoided, for which I have just received a Leverhulme Research Fellowship Award to take this area of study further. I live in Oxford on a flood-prone island on the Thames with my partner and three children.

Key Publications

Sattentau QJ (2008) Correlates of antibody-mediated protection against HIV infection. *Curr. Opinion in HIV and AIDS*, 10: 211-219.

Montefiori D, Sattentau QJ, Flores J, Esparza J, Mascola J, Working group convened by the Global HIV Vaccine Enterprise (2008). Antibody-based HIV-1 vaccines: recent developments and future directions. *Plos Med 4:* e348.

Sheppard NC, Bates AC and Sattentau QJ (2007). A functional human IgM response to HIV-1 Env after immunization with NYVAC-HIV C. *AIDS* 21: 524-527

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NEWS

Professor Quentin Sattentau is congratulated on receiving a Leverhulme Research Fellowship 2009 for his work *Understanding the Molecular Basis of Allergy*. Professor Sattentau comments "This work is in part related to understanding the mechanisms of vaccine hypersensitivity and how to avoid this unwanted side-effect" (Moghaddam et al, (2006) Nature Medicine 12: 905-907)

Jayne Hope

I obtained a BSc (Hons) degree in Biological Sciences (Microbiology) from the University of Birmingham, UK in 1991, and a PhD degree from the University of Manchester, UK, in 1994. I then carried out postdoctoral research at the University of Manchester (1994-1996) and Kings College School of Medicine and Dentistry (1996-1997). In 1997, I began employment as a postdoctoral researcher at the Institute for Animal Health. I now lead the bovine immune mechanisms group. My group is currently carrying out research into bovine tuberculosis (TB) with the aim of understanding immune mechanisms that lead to protective immunity.

My research group is funded by both BBSRC and DEFRA. A major goal of this research, in collaboration with Professor G Hewinson and Dr M Vordermeier at the Veterinary Laboratories Agency, is to assess the protective efficacy of TB vaccines and to define correlates of protective immunity in cattle that might be targeted by effective vaccination strategies. BCG vaccination of neonatal calves induces a significant level of protection against experimental M. bovis infection. The duration of immunity induced by BCG vaccination of neonatal calves is currently being assessed and has been shown to be at least 12 months. Why neonates are protected more effectively than adults is a major area of research in my group. We are investigating the role of innate immune cells in neonatal calves, including natural killer cells, γδ T cells and dendritic cells (DC). Reciprocal interactions between these cell types in the context of mycobacteria may be pivotal in determining the outcome of infection.

Development of reagents allowing detailed immunological analysis in cattle has been a long term goal of the IAH. My group is part of the multi-site, multi-species BBSRC-funded Immunological Toolbox consortium (www.immunologicaltoolbox.co.uk/). Provision of reagents from such a consortium will enhance future studies of immune mechanisms in veterinary species.

Key Publications

Price SJ, Hope JC (2009) Enhanced secretion of IFNγ by bovine γδ T cells induced by co-culture with *Mycobacterium bovis* infected dendritic cells: evidence for reciprocal activating signals Immunology 126: 201

Sopp P, Coad M, Whelan A, Vordermeier HM, Hewinson G, Howard CJ, Harris J, Ni Cheallaigh C, J Keane, Hope JC (2008) Development of a Simple, Sensitive, Rapid Test which Accurately Discriminates BCG Vaccinated from *Mycobacterium bovis* Infected Cattle. Vaccine 26: 5470-5476

Thom ML, Howard CJ, Villarreal-Ramos B, Mead EB, Vordermeier HM, Hope JC (2008) Consequence of prior exposure to environmental mycobacteria on BCG vaccination and diagnosis of tuberculosis infection. Tuberculosis 88: 324-334

Sopp P, Howard CJ, Hope JC (2006) Flow cytometric detection of gamma interferon can effectively discriminate Mycobacterium bovis BCG-vaccinated cattle from *M. bovis*-infected cattle. Clin Vaccine Immunol. 13: 1343

Hope JC, Thom ML, Villarreal-Ramos B, Vordermeier HM, Hewinson RG, Howard CJ (2005)

Exposure to *Mycobacterium avium* induces low-level protection from M. bovis infection but compromises diagnosis of disease in cattle. Clin. Exp. Immunol. 141 432

Hope JC, Thom ML, Villarreal-Ramos B, Vordermeier HM, Howard CJ (2005) Vaccination of neonatal calves with *Mycobacterium bovis* BCG induces protection against challenge with virulent Mycobacterium bovis. Clin. Exp. Immunol. 139 48

Bryan Charleston

I obtained a BVetMed from the Royal Veterinary College, UK in 1982. After time in large animal practice, I studied for a Master's degree in Molecular Biology at University College London in 1988, then a PhD degree, as a Wellcome Trust Scholar, from the University of London, UK in 1991. As a Wellcome Trust Postdoctoral Fellow at the Royal Veterinary College and the Babraham Institute, Cambridge, I carried out research for three years identifying novel zinc finger domain containing proteins, which play a role in oncogenesis and development. I joined the Institute for Animal Health in 1994 and focussed on studies of the immune response to viral infections in cattle. I was also tasked with developing interactions with academic and commercial partners to establish robust disease models in poultry. The bovine disease models include intrauterine challenge and improved lymphatic cannulation techniques. Novel associated methods, such as new monoclonal antibodies and a sensitive and specific assay to measure type-1 interferon have been developed to analyse the models.

In 2002, I established a second group at Pirbright, in response to the findings of a Royal Society report on the 2001 FMD (foot-and-mouth disease) outbreak in the UK, to address the immune responses to FMD. We have secured considerable funding from external sources, including grants from BBSRC to study FMDV immunology and DEFRA to develop FMDV novel vaccines. The range of work performed in my laboratory and mediated by extensive national and international collaboration, includes studies of the interactions between virus and viral antigens on dendritic cells, natural interferon-producing cells, $CD4^+$ and γδ T cell receptor-positive T cells and B cells. The role of FMDV capsid stability and antigen that persists on follicular dendritic cells in the maintenance of immune responses is currently under investigation.

Key Publications

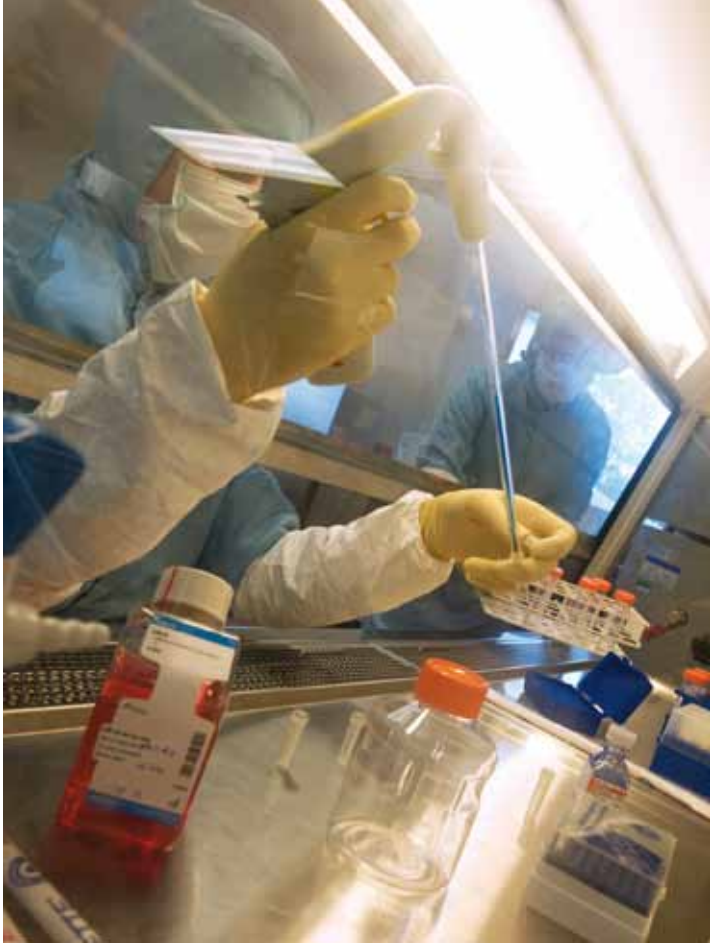
Juleff N, Windsor M, Lefevre EA, Gubbins S, Hamblin P, Reid E, McLaughlin K, Beverley PC, Morrison IW, Charleston B. Foot-and-mouth disease virus can induce a specific and rapid CD4+ T-cell-independent neutralizing and isotype class-switched antibody response in naïve cattle. Journal of Virology(2009) 83 (8):3626-36.

Juleff N, Windsor M, Reid E, Seago J, Zhang Z, Monaghan P, Morrison WI, Charleston B.
Foot-and-Mouth Disease Virus Persists in the Light Zone of Germinal Centres. PLoS ONE (2008) 3(10): e3434. doi:10.1371/journal.pone.0003434

Lefevre EA, Carr BV, Prentice H, Charleston B.
A quantitative assessment of primary and secondary immune responses in cattle using a B cell ELISPOT assay. Veterinary Research. (2008) 3;40(1):3

Lefevre EA, Hein WR, Stamataki Z, Brackenbury LS, Supple EA, Hunt LG, Monaghan P, Borhis G, Richard Y, Charleston B.
Fibrinogen is localized on dark zone follicular dendritic cells in vivo and enhances the proliferation and survival of a centroblastic cell line in vitro. Journal of Leukocyte Biology. (2007) 82:666-77.

Meyers G, Ege A, Fetzer C, von Freyburg M, Elbers K, Carr V, Prentice H, Charleston B, Schurmann EM.
Bovine viral diarrhoea virus: Prevention of persistent foetal infection by a combination of two mutations affecting the Erns RNase and the Npro protease. Journal of Virology (2007) 81, 3327-38.



New Course in Vaccinology at Oxford

With the resurgence of interest in vaccine development, academics from the Jenner Institute at the University of Oxford and the Institute for Animal Health have joined together to offer a state-of-the-art taught Master's level course in both human and veterinary vaccinology. The educational programme will be complemented by the views and experiences of distinguished outside speakers. A major theme will be translational research involving the rapid early-stage development and assessment of new vaccines in clinical trials.

Three courses have been designed in collaboration with industry and are presented in an accessible format consisting of three short modules supported by an online virtual learning environment.

The course participants will be drawn from both industry and academia, ranging from research scientists, programme managers, clinical trial co-ordinators, physicians and veterinarians. Potential candidates who are already working in the field or seeking to enter it, should visit the website **www.conted.ox.ac.uk/cpd/vaccinology/**.

Or contact +44 (0)1865 286958 or **vaccinology@conted.ox.ac.uk**.

There are three courses currently in the Vaccinology Programme:

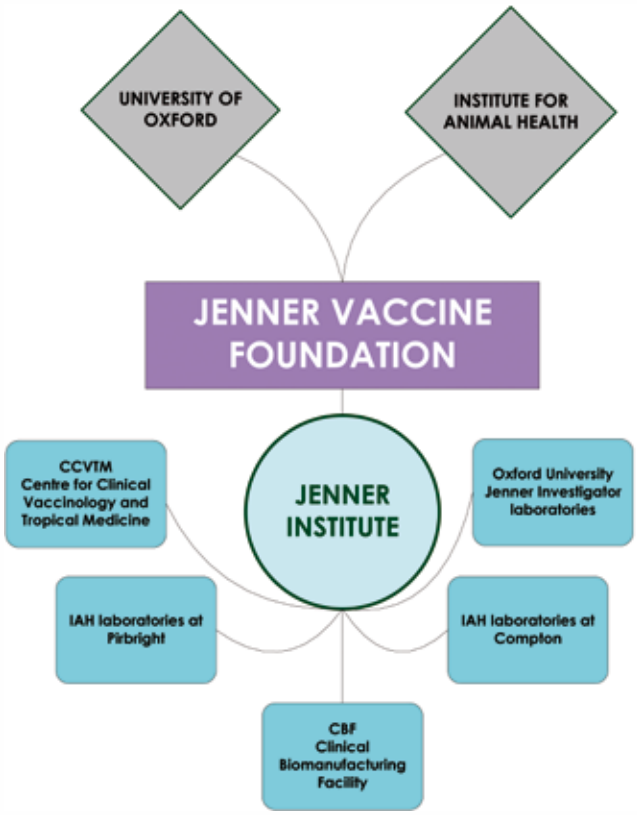
Human and Veterinary Vaccinology
9–13 November 2009 (one-week course)

Clinical Vaccine Development
1–2 March 2010 (two-day course)

Vaccine Biomanufacturing
3–4 March 2010 (two-day course)

Jenner Investigators

Jenner Investigators		Affiliation	Area of Interest
Dr	Paul Barnett	IAH	Foot-and-mouth disease vaccines
Prof	Peter Beverley	OXFORD	Immune memory
Dr	Persephone Borrow	OXFORD	HIV immunity
Prof	Vincenzo Cerundolo	OXFORD	Cancer vaccines
Dr	Bryan Charleston	IAH	Foot-and-mouth disease immunity
Dr	Lucy Dorrell	OXFORD	Therapeutic vaccines
Dr	Darren Flower	IAH	Vaccine bioinformatics
Dr	Sarah Gilbert	OXFORD	Influenza and malaria vaccines
Dr	Tomáš Hanke	OXFORD	HIV vaccines
Prof	Adrian Hill	OXFORD	Malaria vaccines
Dr	Jayne Hope	IAH	Bovine TB vaccines
Dr	Paul Klenerman	OXFORD	Hepatitis C vaccines
Prof	Martin Maiden	OXFORD	Meningitis vaccines
Prof	Andrew McMichael	OXFORD	HIV immunity and vaccines
Dr	Helen McShane	OXFORD	TB vaccine
Prof	Richard Moxon	OXFORD	Paediatric vaccines
Prof	Venugopal Nair	IAH	Poultry vaccines
Dr	Satya Parida	IAH	Foot-and-mouth disease vaccines
Dr	David Paton	IAH	Control of vesicular diseases
Prof	Brian Perry	IAH	Veterinary epidemiology and control
Prof	Andrew Pollard	OXFORD	Paediatric vaccines
Prof	Quentin Sattentau	OXFORD	HIV vaccines
Prof	Martin Shirley	IAH	Coccidiosis vaccines
Dr	Adrian Smith	OXFORD	Coccidiosis immunity
Dr	Geraldine Taylor	IAH	Respiratory syncytial virus vaccines



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