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# **New Research Projects Funded in 2012 grant round**

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# Dr Simon Carpenter

## Institute for Animal Health

*Vector parameters determining risk and mitigation of African horse sickness spread at a local scale*



Research priority: Improved prevention of current and emerging infectious diseases by the development of more effective vaccines, diagnostic tools, biosecurity and management strategies.

Biting midges are known vectors of emerging horse viruses such as African horse sickness. Culicoides are a type of midge and are major vectors of horse diseases worldwide. This project examines the impact of biting rates of these insects on horses and examines the effect of this parameter on a series of modelling exercises. It additionally examines ways to mitigate transmission in an effort to protect horses from this exotic infectious disease. It builds on previous HBLB funding and continues to support the industry and government collaboration on infectious disease strategy.

# Dr Janet Daly

## University of Nottingham

*Development of rapid and reliable West Nile virus antibody assays based on pseudotyped virus*

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Research priority: Improved prevention of current and emerging infectious diseases by the development of more effective vaccines, diagnostic tools, biosecurity and management strategies.

West Nile virus (WNV) infection in horses can cause inflammation of the brain resulting in neurological damage and even death. Although it has not yet been found in the UK, there is a constant risk that WNV could spread from America or continental Europe, where there have been increasing numbers of cases in recent years. In a disease emergency situation, a rapid and reliable diagnostic assay is critical to outbreak control. The gold standard for diagnosis of WNV is detection of antibody by a plaque reduction neutralisation test, but few places in the UK are equipped to perform this assay. The aim of this project is to develop assays that do not require high levels of biosafety and can be performed as rapid high-throughput tests based on pseudotyped viruses (viruses that have the exterior protein of WNV but a harmless virus at their core). This project has direct practical application, by creating a rapid diagnostic test in the high priority area of infectious disease.

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New project: Started March 2013

Prj: 761

# Professor Jose Vazquez-Boland

## University of Edinburgh

*Genome-based identification of candidate vaccine and serodiagnostic antigens to combat Rhodococcus equi.*



Research priority: Improved prevention of current and emerging infectious diseases by the development of more effective vaccines, diagnostic tools, biosecurity and management strategies.

Rhodococcus equi is a pathogenic bacterium that causes a life-threatening respiratory illness in foals. Rhodococcosis has a major economic impact in the thoroughbred industry and remains an unresolved problem due to the lack of an effective vaccine and of diagnostic tools for the early detection of the disease. To gain a better understanding of the biology and mechanisms of infection of R. equi, the HBLB previously funded the group to decipher the composition of its genome (the catalogue of genes that defines the organism). Using sophisticated, state-of-the art analytical techniques, this project will exploit the R. equi genome to discover key bacterial products recognised by the immune system and which could form the basis of a protective vaccine and rapid blood test to identify infected foals. It has added value, building on research previously funded by HBLB ([Prj712](#)).

New project: Started October 2013

Prj: 764

# Dr Andrew Waller

## Animal Health Trust

*Streptococcus equi evolution: quantification of the importance of key genome acquisition events*



Research priority: Improved prevention of current and emerging infectious diseases by the development of more effective vaccines, diagnostic tools, biosecurity and management strategies.

*Streptococcus equi* is the causative agent of equine strangles and its ongoing evolution has major implications for animal health. By comparing the genomes of *Streptococcus equi* strain 4047 and *Streptococcus zooepidemicus* strain H70 the genetic events that have shaped the evolution of *S. equi* from an ancestral *S. zooepidemicus* strain can be identified.

The researchers will examine what elements are required for the full virulence of *S. equi* and will quantify the ability of strains lacking each of these virulence functions to cause strangles using a well established infection system in the host species. The importance of these factors can be used to provide an indication as to the efficacy of protective vaccines aimed at these bacterial molecules. This builds on previous studies that have been funded by HBLB ([Prj733](#)), adding value and continuing towards the aim of an effective vaccine.

# Dr Thomas Witte

## Royal Veterinary College

*Apprentice to Journeyman: the influence of jockey technique on Thoroughbred racehorse locomotion (1)*



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Research priority: Improved training environment and racecourse design and surfaces, riding strategies, tack and equipment to enhance the safety, health and well-being of racehorses.

The additional mass of a jockey increases the energetic cost of locomotion and reduces performance of thoroughbred racehorses. It is proposed that more skilled jockeys minimise the detrimental effect on the horse, and the risk of injury when unseated, by improved stability during galloping.

Potential targets for optimum riding technique include reduced movement stride-to-stride, symmetry of load in the stirrups and avoidance of sudden changes in posture or loading.

In collaboration with the British Racing School the interaction of horse and rider will be measured in jockeys with different levels of expertise. Targets for improved training of jockeys will be identified and applied.

# Dr Thomas Witte

## Royal Veterinary College

*Apprentice to Journeyman: the influence of jockey technique on Thoroughbred racehorse locomotion (2)*

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Research priority: Improved training environment and racecourse design and surfaces, riding strategies, tack and equipment to enhance the safety, health and well-being of racehorses.

A more scientific approach to the training of horses and riders has potential impact on horse welfare and the public perception of the sport of horse racing, including the important and contentious use of the whip.

Measuring the effects of the jockey in a scientific way is unique to this laboratory and also cements collaboration between the racing school and scientists.

More information on this research project is at <http://www.rvc.ac.uk/Research/News/HBLB-Jockey-Grant.cfm>

# Dr Debbie Guest

## Animal Health Trust

*Comparing tendon generation by equine pluripotent stem cells*



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Research priority: Improved methods of identification, management and prevention of musculoskeletal disease and injury in racehorses.

Tendon injuries occur frequently in race horses and repair by forming scar tissue instead of healthy tendon tissue which leads to high re-injury rates. This group have already shown in studies funded by HBLB, that horse embryo-derived stem cells (ESCs) turn into tendon cells after injection into an injured tendon and that these cells can form a tendon tissue matrix in the laboratory. Horse induced pluripotent stem cells (iPSCs) have recently been derived and show many similar properties to ESCs.

In this project the researchers will use their laboratory model to compare the ability of horse ESCs and iPSCs to form tendon tissue to ensure the best performing cell type is used in future therapies. This project builds on previous studies that have been funded by HBLB ([Prj738](#)), adding value by comparing the ability of horse stem cells to make tendons to facilitate further advances for future stem cell-based treatments of tendon injuries in horses.

# Professor Janet Patterson-Kane

## University of Glasgow

*Fine-tuning of endogenous tendon cells to matrix stiffness and type: the key to optimising repair?*



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Research priority: Improved methods of identification, management and prevention of musculoskeletal disease and injury in racehorses.

Repair of superficial digital flexor tendon (SDFT) injuries in racehorses does not typically result in regeneration of normal tissue, resulting in high re-injury levels. To effectively repair tendon, cells must migrate in, multiply, and make type I collagen. The “matrix” around them critically affects their behaviour. Protein types and matrix stiffness are key factors; their effects on SDFT cells may be particularly finely-tuned but are currently undefined. It is proposed that controlling the nature of this insoluble matrix is a “smarter” way of optimising cellular repair than currently fashionable approaches of injecting stem cells into unknown tissue environments. The researchers will model systems in the laboratory to determine what type and stiffness of matrix attracts the cells, and encourages proliferation and appropriate collagen synthesis. Tendon injury is an important disease of racehorses and this project will examine optimising tendon cell repair activity by controlling the surrounding matrix which will contribute to the basis of ongoing work to improve current therapies.

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New project: Started March 2013

Prj: 760

# Professor Roger Smith

## Royal Veterinary College

*Developing essential tools for equine regenerative medicine*



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Research priority: Improved methods of identification, management and prevention of musculoskeletal disease and injury in racehorses.

The popularity of stem cell therapy has dramatically increased the number of products being developed by different companies using different sources and different isolation protocols. These cell products are not well characterised because most antibodies used to characterise human stem cells do not cross-react with the horse. There is therefore a need to develop these tools specifically for the horse for increasing legislation, and for evaluation, refinement and standardisation of the technology. To achieve this, the project will test large libraries of established antibodies and develop new ones in collaboration with one of the best human regenerative medicine laboratories. By comparing the ability of different cell types to change into different cell types and to influence the immune system, it will support the development of a well-characterised cell line capable of being used effectively in any horse. This will bring uniformity and rigour to this important treatment method.

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New project: Started March 2013

Prj: 765

# Dr Neil Bryant

## Animal Health Trust

*Modelling EHV-1 induced abortion – factors affecting virus spread from leukocytes to endothelial cells*



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Research priority: Improved male and female reproductive efficiency.

EHV-1 causes abortion, neonatal death and neurological disease in horses and can result in significant financial losses to the thoroughbred breeding industry. Commercially available vaccines against equine herpesvirus type 1 (EHV-1) based on inactivated virus induce high levels of antibody and are able to reduce the levels of virus shed from infected horses. However, these vaccines do not prevent viraemia (infection of blood cells) and do not protect against abortions and neurological disease.

In order to design improved vaccines or novel drugs to prevent these disease outcomes, knowledge is needed about how EHV-1 spreads to endothelial cells and why endothelial cells in the brain or in the placenta and uterus of pregnant mares appear to be specifically susceptible to EHV-1. Establishing a system to measure the attachment of infected blood cells to endothelial cells and subsequent spread of EHV-1 will facilitate a detailed study of the factors involved and enable EHV-1 induced abortion and neurological disease to be modelled. This will facilitate further studies to design improved vaccines or novel drugs.