

Media Briefing

30 July 2007

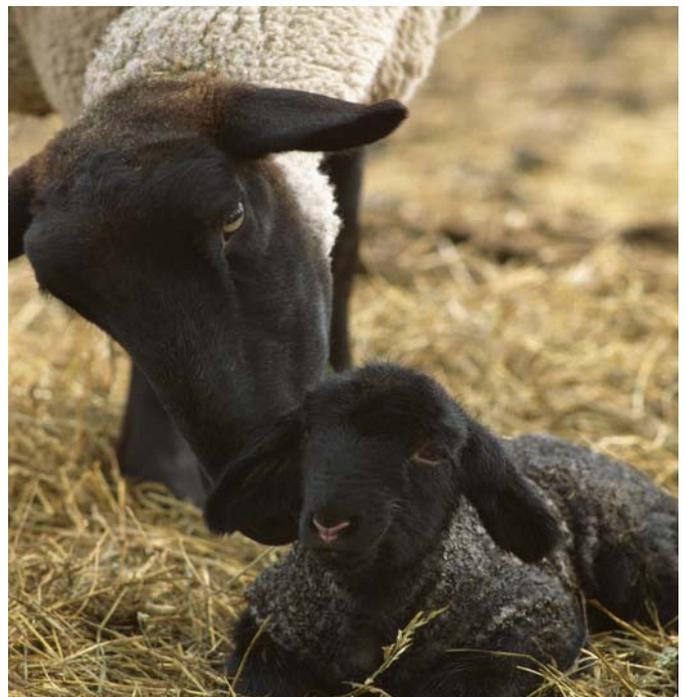
Tackling Damaging Diseases in Farm Animals

An introduction to new research tackling widespread and damaging animal diseases

Endemic animal diseases are undermining the sustainability of UK farming. They cost UK farmers, and indirectly consumers, hundreds of millions of pounds a year and cause significant animal welfare problems. £11.5M of new research launched today (30 July) aims to tackle some of the most harmful and widespread diseases that commonly affect farmed animals in the UK. The initiative will improve the sustainability of UK farming by ultimately reducing the cost of treating diseases and the loss of affected livestock.

The initiative, Combating Endemic Diseases of Farmed Animals for Sustainability (CEDFAS), aims to deploy cutting edge science to deal with the diseases causing the most harm in the UK. The 10 grants awarded to researchers will generate better scientific understanding of the behaviour and spread of the diseases which can then be used to improve their management and control.

CEDFAS is led by the Biotechnology and Biological Sciences Research Council (BBSRC) and is also backed by the Scottish Executive. Some individual projects have additional funding from Defra and industrial partners - The British Pig Executive, Pfizer and BioBest.



Research funded under the new initiative will tackle the following diseases, covered in further detail in this briefing:

Bovine tuberculosis

Bovine mastitis

Lameness: Footrot and Digital dermatitis

Post-weaning multi-systemic wasting syndrome

Infectious bronchitis

Enzootic abortion

Ileitis

Parasitic nematodes

Selected images are available to download from <http://www.bbsrc.ac.uk/media/pressreleases/cedfas.html>

BOVINE TUBERCULOSIS

Can genomics stop the rise of bovine tuberculosis?

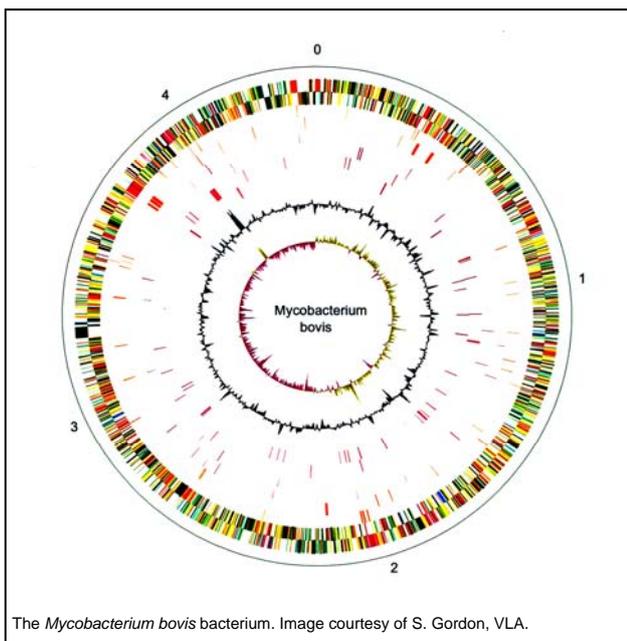
Bovine tuberculosis (bTB) is an infectious respiratory disease of cattle and various wildlife species and one of the most difficult animal health problems facing the UK farming industry today.

Despite sustained and costly attempts at eradication since the 1950s, the number of cattle infected with bTB has been increasing year on year, with serious losses for affected farms. It is estimated to cost the UK economy £31M.

The reasons for the inexorable rise in bTB are complex. One possibility is that new forms of *Mycobacterium bovis* (*M. bovis*), the bacterium that causes bTB, have evolved in the UK that are able to thwart current control measures.

Researchers at the **Veterinary Laboratories Agency (VLA)** and the **Institute for Animal Health (IAH)** will be investigating *M. bovis* using genomic technologies to determine whether these new strains are able to manipulate the bovine immune response to their advantage and hence be more successful bovine pathogens.

Scientists at the **Roslin Institute** and **Queen's University Belfast** will be using novel approaches to identify cattle with increased bTB resistance. DNA will be collected from 1000 bTB cases and controls, and genotyped for 50,000 gene variants



to help identify new approaches to controlling the disease.

Bovine tuberculosis

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BOVINE MASTITIS

Research into new vaccines and therapeutic targets



Bovine mastitis, an inflammatory disease of the bovine udder, results in reduced milk quality and severely impacts the welfare of dairy cattle. Annually in the UK, in excess of 1 million cases of bovine mastitis are diagnosed; each requires therapeutic intervention. The total cost of mastitis to the dairy industry is around £200M per year.

Streptococcus uberis was recently identified as the most common cause of bovine mastitis in the UK and is a common cause of the disease worldwide.

Researchers at the **University of Oxford** and the **Institute for Animal Health (IAH)** will compare, using state-of-the-art technology, naturally occurring and genetically manipulated strains of *S. uberis* that can and cannot cause disease. Bacterial proteins and chemical messages, produced by the host that play a role in development of infection and disease, will be identified. The bacterial proteins will be candidates for inclusion in preventative vaccines and the host's chemical messages will provide targets against which effective therapeutics may be produced.

Bovine mastitis

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LAMENESS: FOOTROT AND DIGITAL DERMATITIS

Research will provide better advice for farmers

Lameness is very painful and of huge economic burden to the farming industry. Two CEDFAS projects will be addressing what causes lameness in sheep and cattle to provide better advice on control and so lower the cost and occurrence of the condition.

Approximately 10% of the 16 million sheep in the UK are lame at any one time, estimated to cost the UK sheep industry £31M per year. Much of this lameness is caused by **footrot**, an infection with the bacteria *Dichelobacter nodosus* that literally rots the sheep's foot. At present, little is known about how this bacterium causes disease.

Researchers at the **University of Warwick** and the **University of Bristol** will analyse existing data using laboratory studies and mathematical modelling to work out which strains of *D. nodosus* cause the most disease and how important differences in the environment and host are in their survival.

Lameness in cattle is estimated to cost the UK £54M per year. **Digital dermatitis** is a leading cause of cattle lameness causing painful foot lesions. In recent years it has also spread to sheep.

Researchers at the **University of Liverpool** will investigate how bacteria called *treponemes* invade the feet to set up chronic infections and hence disease. *Treponemes* are considered important in transmitting and spreading the disease between individual cattle and dairy farms.



When scientists can identify how the organisms cause digital dermatitis, advice can be provided to farmers on how to break the cycle of infection and transmission.

Footrot

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Digital dermatitis

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POST-WEANING MULTI-SYSTEMIC WASTING SYNDROME (PMWS)

Understanding this debilitating disease to develop new veterinary products



A young pig (centre) suffering from PMWS.

Post-weaning multi-systemic wasting syndrome (PMWS) is a common disease of young pigs in the UK. Extremely debilitating and painful, from about the age of 6 weeks, weaned pigs lose weight and gradually become emaciated. With a high mortality rate of up to 20% of the pig population, it is estimated to cost the UK £30M per year. An estimated 83% of British pig farms were affected in March 2007.

A new disease in the UK, it only entered England in 1999 and reached Scotland in 2002. It is still little understood.

Researchers at the **Royal Veterinary College (RVC)** will undertake an interdisciplinary approach to investigate this disease, integrating scientific techniques from epidemiology, genetics, microbiology, pathology, molecular immunology and environmental science, to identify why PMWS occurs and inform new control methods.

British pig farmers will be heavily involved in the project, while collaboration with industry will help ensure that new veterinary products developed as a result of this project will be made available to pig farmers worldwide.

PMWS

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INFECTIOUS BRONCHITIS

How does the virus avoid destruction? Research to inform better vaccines

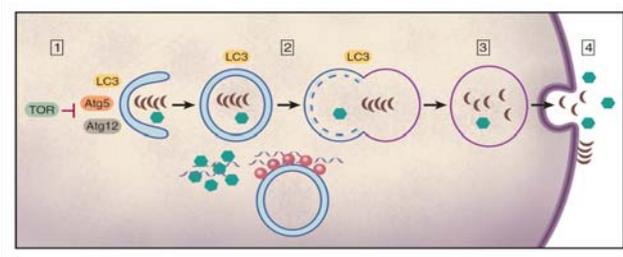
Infectious bronchitis is a global respiratory infection of chickens caused by the Coronavirus, infectious bronchitis virus (**IBV**), and is estimated to be responsible for the death of over 15 million chickens in the UK alone.

The UK Government has listed infectious bronchitis as the number one cause of infectious disease-related economic loss in the UK poultry industry, and has calculated that it costs the UK £24M per year. In addition to the loss of young chickens used in meat production, IBV also causes substantial decreases in egg yields. Despite the use of vaccines, the disease has continued to be of major economic importance in the global poultry industry.

Researchers at **The Institute for Animal Health (IAH)** and the **University of East Anglia (UEA)** are set to increase our understanding of how IBV causes disease in order to help develop more effective vaccines.

The researchers will investigate autophagosomes. These are the membranes that provide a platform

Pictured below, production of autophagosomes as replication sites for coronaviruses. From T.Wileman Science (2006) 312:875-878. Reproduced with permission from AAAS



for the virus to survive, but interestingly also have the ability to destroy the virus. The research will study how IBV can avoid destruction by autophagosomes. This will increase understanding of the processes involved in determining whether a virus is able to cause disease or not.



Infectious bronchitis

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ENZOOTIC ABORTION AND ILEITIS

Study will improve detection, prevention and treatment of two devastating diseases of farmed animals

The disease **Enzootic Abortion** of Ewes results in late-term abortion principally in sheep and goats. Abortion is caused by the bacterium *Chlamydophila abortus* that infects the placenta causing irreversible tissue damage. *C. abortus* is the single most common cause of infectious abortion in sheep in the UK, costing the industry approximately £30 million a year.

Ileitis is very different. It is an intestinal infection in pigs that produces tumour-like lesions in the gut wall resulting in diarrhoea and weight loss, affecting well-being and productivity. The disease is caused by the bacterium *Lawsonia intracellularis*. Infection is very common, affecting around 90% of pig herds.

Researchers at the **Moredun Research Institute** and the **University of Glasgow** will characterise a group of proteins that are involved in causing disease from these two economically important pathogens. This will be accomplished through analysis of their genome sequences, as well as investigating how the proteins vary in different bacterial strains, combined with how they interact with the animals immune defence mechanisms. This will help identify why some individual bacteria are more successful at infection, ultimately leading to improvements in the detection, treatment and prevention of these devastating diseases.

Enzootic abortion and Ileitis

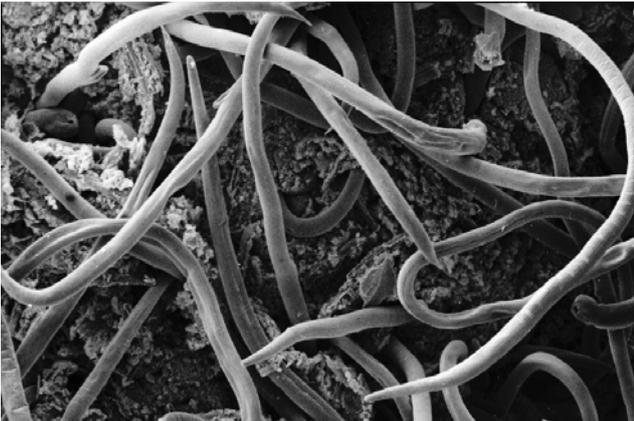
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PARASITIC NEMATODES

Project will help identify new measures to control stomach worm infection

Parasitic nematodes (worms) which infect the stomach, represent one of the most serious and common diseases of sheep in the UK and throughout the world, causing significant disease, animal welfare problems and economic loss. The disease causes the biggest loss of sheep production in the UK through poor food absorption, reduced growth rates, and poor meat and fleece quality, as well as impacting on the welfare of the animals.



Above, larvae isolated from the stomach of a heavily infected sheep. Image courtesy W. David Smith, (Moredun Research Institute)

Control is heavily dependent upon the routine treatment of livestock with anti-parasite drugs (anthelmintics) but parasitic worms have become resistant to these drugs in many regions of the world. In the UK, over 60% of sheep worms are resistant to at least one drug class.

Researchers at the **University of Glasgow**, the **Moredun Research Institute** and the **Sanger Institute** will develop molecular tools which detect and monitor resistance to investigate how it develops and how it may be combated. The genetic diversity of parasites collected from sheep throughout the UK will be recorded to identify mutations in genes that confer resistance and thus help develop better anthelmintics.

Vaccination is a feasible alternative to anthelmintics, but development is hampered by a lack of knowledge of the host-parasite relationship.

Researchers at the **Moredun Research Institute** and the **University of Edinburgh** will seek to define the early interactions between the stomach and incoming larvae in order to contribute to the development of vaccines to bring control by

vaccination a step closer.

Using cutting-edge technology, the host mechanisms required to exclude or expel the incoming larvae or control their development will be identified.



Above, lamb with diarrhoea due to parasitic nematode infection. Image courtesy of Neil Sargison (University of Edinburgh)

Parasitic nematodes

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About BBSRC

The Biotechnology and Biological Sciences Research Council (BBSRC) is the UK funding agency for research in the life sciences. Sponsored by Government, BBSRC annually invests around £380 million in a wide range of research that makes a significant contribution to the quality of life for UK citizens and supports a number of important industrial stakeholders including the agriculture, food, chemical, healthcare and pharmaceutical sectors.

<http://www.bbsrc.ac.uk>

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