

The Pirbright Institute's Use of Animals in Research

OUR PURPOSE

The Pirbright Institute is a world leading centre of excellence in research and surveillance of virus diseases of farm animals and viruses that spread from animals to humans. We work to predict, detect, understand and respond to these economically and medically important diseases through highly innovative fundamental and applied bioscience. This improves animal health globally through the development of vaccines, diagnostic tests and clinical advice, which helps to prevent and control viral diseases of livestock and those that spread from animals to people (zoonotic diseases). By monitoring the worldwide spread of viral diseases, we are able to identify threats to health and economic prosperity and provide global early warning. This has enabled us to control viral threats before they reach the UK whilst building disease prevention capacity in low and middle income countries.



OUR IMPACT

The Institute's research into viruses of livestock and zoonotic viruses (animal viruses that can infect and cause disease in people) has a global impact on animal and human health and food and economic security. It is these advances in research, vaccine development and new diagnostic tests that help to ensure the world is better prepared to combat outbreaks of viral disease through prevention and control as well as fundamental understanding of the mechanisms used by existing and emerging viruses to infect hosts and spread.

GLOBAL ERADICATION OF RINDERPEST

The Institute played an important role in the eradication of rinderpest, the most economically devastating of all cattle diseases that had a mortality rate of between 80-90 percent. One of our scientists, Walter Plowright, developed a safe, effective rinderpest vaccine, which would not have been possible without animal research. The vaccine was used in most affected countries during the eradication campaign, which resulted in global eradication in 2011.

PREVENTING A BLUETONGUE VIRUS OUTBREAK IN THE UK

We played a pivotal role in the eradication of bluetongue virus (BTV) from the UK following its first arrival in England in 2007. Our animal studies provided vital information for policy makers and informed the awareness campaign that helped vets and farmers to identify BTV cases. Pirbright BTV research was key in devising a successful strategy for defeating the disease, which was estimated to save the UK £485 million and 10,000 jobs during the BTV-8 outbreak in Northern Europe 2006-2010.

CONTRIBUTING TO THE DEVELOPMENT OF COVID-19 VACCINES

Pirbright's research has played a critical role in the development of COVID-19 vaccines, which are now saving lives across the globe. Pirbright's pig studies demonstrated that two doses of the Oxford AstraZeneca vaccine produce a greater antibody response than a single dose. This provided pivotal data that supported human trials of the vaccine, which was approved for UK emergency use in December 2020 with a two-dose vaccination programme. The same pig studies have supplied essential information for the development of two new COVID-19 vaccines, which could provide future vaccine options.

NEW VACCINE TO TACKLE MULTIPLE POULTRY DISEASES

Researchers have created a new method of genetically modifying the Marek's disease vaccine so it can protect against another destructive poultry virus - infectious bursal disease (IBD) - and potentially others such as avian influenza and Newcastle disease. This approach could lead to a reduction in the number of vaccines given to birds.

THE ROLE OF ANIMALS IN OUR RESEARCH

Animal research plays a vital role in scientific and medical advancements and continues to aid our understanding of various diseases of animals and people. The development of new vaccines, new medicines and treatment is made possible by animal research. Researchers use non-animal techniques wherever possible, but the sheer complexity of viral diseases and the hosts' immune responses to them means that research with animals (*in-vivo*) is essential for us to better understand the disease and to develop new methods of control. For example:

- Studying the immune response to foot-and-mouth disease virus (FMDV) in cattle to develop novel vaccines, has only been possible because of our humane work testing vaccines on animals. The development of a new synthetic vaccine against FMDV will particularly benefit people living in low-to-middle income countries as these vaccines do not require a cold chain and are cheaper and safer to produce.
- Since 2013, avian influenza has been responsible for the death of 122 million domestic poultry worldwide, and has caused over 1,000 deaths since 2003. The Institute's research is helping to understand how the virus interacts with the poultry immune system so that better vaccines and diagnostics can be developed. Our scientists are also working to identify mutations that could enable the virus to cross from birds to people efficiently, which helps to track strains that could cause potential human pandemics during surveillance.
- African swine fever is a deadly pig virus that has rapidly spread from Africa to Europe and Asia. The disease is fatal in the majority of cases and resulted in the reduction of China's pig herd by nearly 40% a year after the disease entered the country. There is currently no vaccine or cure, but our scientists are using animal research to develop vital vaccines and antivirals that could help prevent and control this deadly disease.



THE SPECIES USED IN OUR RESEARCH

Our research mainly involves farm animals; the species that will principally benefit from our research e.g. cattle, pigs, goats, sheep and poultry. In common with many UK animal facilities, on occasion there is a requirement for research using mice, rabbits and guinea pigs. We use well-established mouse models of virus infection to provide proof-of-principle for studies on the relationship between virus replication, pathogenesis and induction of immune responses, the evaluation of novel vaccine candidates and antivirals. The knowledge derived from this work allows selected vaccine candidates/antivirals to be taken forward to further studies in the natural target species for the virus. In addition, rabbits or guinea pigs may be used to generate polyclonal antibodies to FMDV for use as diagnostic tools. These reagents are made available to researchers within the Institute and around the world for use in assays to diagnose (and thus control) FMDV outbreaks.

UK LEGISLATION

The UK has some of the strictest animal research regulations in the world which is legislated by the [Animals \(Scientific Procedures\) Act 1986](#) (ASPAs) and regulated through the Home Office. The Act regulates procedures that are carried out on 'protected animals' (any living vertebrate, other than man, and any living cephalopod) for scientific or educational purposes that may cause pain, suffering, distress or lasting harm. The Act regulates the breeding and supply of certain species of animals for use in regulated procedures or for the scientific use of their organs or tissues, and regulates the methods used to euthanise those animals.

It is illegal to use an animal if there is an alternative non-animal method available, and the expected benefits accrued from the research must outweigh any potential animal pain, suffering or distress.

ETHICAL REVIEW OF ANIMAL STUDIES

In accordance with ASPA, which requires every establishment using animals in research to have an Animal Welfare Ethical Review Body (AWERB), our AWERB ensures that animal related activity is carried out with scientific rigour and according to ethical principles, including weighing the potential benefits of the activity against the likely harm to the animals concerned. It is the responsibility of the AWERB to promote awareness of animal welfare and the development and updates to the 3Rs (replacement, refinement and reduction – see below) in animal use, where they exist, and ensuring the availability of relevant sources of information.

We further have a prescribed system in place for the arrangement of individual animal studies. A detailed study form is carefully reviewed at its inception to ensure full consideration has been given to the programme of events, welfare of each animal, compliance with the legislation, the study-specific licences and the ethical implications of the research. Once fully approved, a pre-meeting is then arranged which provides an opportunity to discuss the study in detail and to ensure all aspects of animal care and welfare have been considered and are understood by all. Once the study has finished, a wash-up meeting is arranged which primarily ensures that animal welfare was considered throughout the study and provides an opportunity for making future improvements. These meetings provide a good opportunity to discuss the study and to produce actions, refinements and improvements that can be taken into future studies.



REPLACEMENT, REDUCTION AND REFINEMENT (THE 3RS)

In accordance with ASPA, all research using animals must implement the principles of replacement, reduction and refinement (the 3Rs). Whilst the number of animals used at the Institute is very small compared to the millions of animals that benefit from the Institute's research, we apply the principles of the 3Rs for the benefit of animals used in research and for the quality of the data that they yield. All researchers that use animals recognise that ensuring good animal welfare is not only the right thing to do for the animals, but it is also the best way of getting good quality data.

REPLACEMENT

The complexity of a complete biological system means that there is currently no alternative to the use of animals for certain elements of our research. *In-vivo* studies provide critical data and biological materials that correspond to the outcomes and responses to viral infections in the animal itself. However, our researchers strive to develop opportunities to replace the use of animals in research such as:

Primary chicken bursal cultures have been developed (funded by the UK's National

Centre for the Replacement, Refinement and Reduction of Animals in Research or [NC3Rs](#)), which were used to study gene expression following infectious bursal disease virus (IBDV) infection, *in vitro*, thereby replacing the use of infected birds in such studies. These cells are also used to titrate IBDV and to model IBDV antigenic drift and immune escape, thereby replacing embryonated eggs for virus titration and the use of birds in these experiments. The primary bursal cell system for studying the biology of IBDV has subsequently been adopted by other labs, including ANSES, Ploufragen, France, and the Harbin Veterinary Research Institute, Harbin, China.

REDUCTION

Animal studies are designed to maximise the collection of biological materials/data from each study, and enhance the development and use of *in vitro* and *ex vivo* methods where appropriate such as:

All researchers seek statistical advice which is used in conjunction with current available data to estimate variation between animals in response to variables and inform appropriate effect sizes for use in power calculations. Experiments are designed to ensure the appropriate number of animals are used. Numbers are selected that enable robust experimental design compatible with obtaining reliable and meaningful results. Using too few or too many animals means the animals' lives are effectively wasted - too few animals leads to scientific results which are not robust and cannot be used, and too many animals cannot be ethically justified. For some studies a series of identical repeats are carried out, starting with 1-2 animals per treatment group and then repeating the experiment several times. This approach enables researchers to test if statistical results are being obtained with fewer animals than originally calculated. Experimental design also incorporates random allocation of animals to different groups, and blinding of sample analysis, as far as possible.

REFINEMENT

Where animals are required, we are continually working towards the refinement of procedures to ensure samples are taken in a way that will cause minimum distress and environment to ensure animals are housed and cared for in the most refined way.

All animals are provided with various environmental enrichment items to improve the animals' quality of life by encouraging natural behaviours. For example, cattle naturally spend a large amount of time each day browsing for food and in social interaction. We therefore provide them with ad-lib hay along with a dry lying area (rubber matting and/or straw). They are also given various enrichment items to stimulate interest in their environment including fruit/vegetables, mineral licks and brushes for scratching or rubbing. Our Animal Technicians have developed an enrichment monitoring program to help define which enrichment items are useful, and how frequently they should be rotated.



ANIMAL WELFARE STANDARDS

The Pirbright Institute is committed to high standards of animal care and welfare. The welfare of animals used in scientific research at The Pirbright Institute is of paramount importance to all staff.

We ensure that animal care follows and, where possible exceeds, the requirements of the [Home Office Code of Practice for the Housing and Care of Animals used in Scientific Procedures](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/281211/Home_Office_Code_of_Practice_for_the_Housing_and_Care_of_Animals_used_in_Scientific_Procedures.pdf).

ANIMAL FACILITIES

Our animal facilities are managed by the Animal Services department in collaboration with other in-house departments with expertise in specialist areas. Each facility is staffed by Animal Technicians who are experienced specialists in the care of animals. They are all trained in daily animal handling, husbandry, the recognition of signs of pain, distress and disease and the ethics of the use of animals in research.

We have a Named Animal Care and Welfare Officer (NACWO) to ensure that the highest standards of animal welfare, husbandry and care are in place. A high percentage of Animal Technicians are also trained to NACWO level.

Upon arrival, all animals are given an acclimatisation period to allow them to become accustomed to their new surroundings. This promotes animal welfare and contributes towards reproducible experimental results.

Animals are housed in rooms, pens, cages or isolators which are cleaned and changed frequently to maintain a healthy, clean environment. Animals are also housed in groups where possible to allow for normal social interaction. All animals are provided with nutrition appropriate to their species e.g. ruminants are fed ad-libitum hay and concentrates. Animals are weighed to ensure appropriate volumes are provided.

We provide all species with a range of enrichment items. Large animals are provided with mineral licks, brushes, fruit/vegetables, bedding material and/or rubber matting. Small animals are provided with running wheels, nest boxes and nesting material.

Where possible, animals are trained with positive reinforcement to reward desired behaviour e.g. cooperating with procedures which could include swabbing without restraint. This is a refinement in animal handling methods to improve animal welfare and the ethical value of animals in research.



CULTURE OF CARE

Whilst we have a duty to be compliant with the Act, we strive to go beyond what is legally required. Pirbright is committed to having a culture of care which is an establishment-wide commitment to improving animal welfare, scientific quality and care of staff. It goes beyond simply having animal facilities and resources that meet the minimum requirements of the legislation. A culture of care is vital to ensuring the humane care and use of animals used in research.

OPENNESS

The Institute is a member of [Understanding Animal Research](#) (UAR) and a signatory to the [Concordat on Openness on animal research in the UK](#). Signed by universities, charities, commercial companies, research councils, umbrella bodies and learned societies, the Concordat has a set of commitments requiring organisations to enhance their communication about their use of animals in research.

In 2017 the Institute worked with UAR to create a [unique virtual tour of our animal facilities](#) available to the public. In 2019 the Institute was one of 13 organisations to receive the first Leader in Openness award from UAR. This award recognises our commitment to the Concordat on Openness on Animal Research, and we have continued to hold this status following a successful renomination for the period 2022 – 2025.