Experimental work involving animals at Aberystwyth University

Aberystwyth University is committed to supporting the best quality scientific research in terms of ethics, conduct and impact. It strongly supports the intention of the Animals (Scientific Procedures) Act 1986, as modified by EU Directive 2010/63/EU, which regulates all experimental work involving animals "with the **potential** to cause pain, suffering, distress or lasting harm". Such research is rigorously controlled and policed by the Animals in Science Regulations Unit (ASRU), a Division of the Home Office (see https://www.gov.uk/research-and-testing-using-animals).

As part of our commitment, we fully endorse the ARRIVE guidelines produced by the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) (see 'Centre-led programmes' at http://www.nc3rs.org.uk/) which focus on improving the design and reporting of animal studies.

All of our animal research is guided by the "three Rs", namely:

Replacement: replacing the use of animals wherever possible with alternatives such as cell/tissue/organ culture and/or computer modelling;

Refinement: improvements to scientific procedures and husbandry which minimise actual or potential pain, suffering, distress or lasting harm and/or improvements to animal welfare in situations where the use of animals is unavoidable;

Reduction: minimising animal use through better experimental and statistical design, obtaining comparable levels of information from fewer animals or obtaining more information from the same number of animals, thereby reducing future use of animals.

Much of our research involving animals is directed at understanding animal behaviour and welfare, the alleviation of human and veterinary disease, environmental protection, or the production of safe, nutritious food for livestock and consumers. A significant proportion involves the use of farm animals where the nature of the research does not meet the thresholds required for it to be covered by the Animals (Scientific Procedures) Act 1986. A similar situation exists for research on behaviour that involves only observational measurements, some with wild species in their native environment.

Each research project involving animals, whether covered by the Animals (Scientific Procedures) Act 1986 or not, is conducted under the same high standards of animal care and welfare required by the Act. Each project is subject to an ethical review

process by the Animal Welfare and Ethical Review Body which includes lay members, external members including veterinary surgeons, and representatives from across the University. This Committee provides ethical advice on proposed experimental designs, advice on standards of animal care, welfare and accommodation, and ensures that all individuals undertaking research with animals receive appropriate training, and are fully aware of their responsibilities and the imperative of adherence to the "three Rs". It also has a key role in commenting upon and approving the suitability of all applications to the Home Office for project licences under the Animals (Scientific Procedures) Act 1986.

The last century has seen major advances in the treatment and prevention of disease in both humans and animals developed using animal experimentation: specific examples include the use of insulin for the treatment of diabetes, the developments of vaccines for the prevention and in some instances the complete elimination of a whole range of diseases, the development of antibiotics for the treatment of a range of disease conditions, the development of anthelmintics for treating parasitic infections, and the development of organ transplantation. None of these would have been possible without the understanding provided by basic research on physiological control systems, much of it derived from animal experimentation. A very useful source of information about how animal research has benefitted mankind can be found at http://www.understandinganimalresearch.org.uk/ .

Specific examples of research projects using animals

This list does not include all animal research conducted within the University. Rather, it is designed to illustrate the nature and breadth of that research. Some of the examples provided relate to work undertaken under the Animals (Scientific Procedures) Act 1986 while others involve research (non-regulated procedures) not covered by the Act by virtue of species (*e.g.* insects), the use of tissue or cell culture rather than live animals, or the use of non-invasive procedures (*e.g.* nutrition studies). Where tissue or cell culture is used to replace live animals, tissues are collected from animals slaughtered for non-research purposes in licensed abattoirs.

- Dietary manipulation to reduce greenhouse gas (methane) emissions and reduce nitrogen pollution from ruminant livestock;
- Dietary influences on the yield, nutritional composition and eating quality of milk, beef and lamb;
- *In vitro* tissue culture studies for investigating innate immune competence of the mammary gland and its relationship to mastitis in dairy cows;
- *In vitro* tissue culture studies for investigating uterine inflammation and its treatment;
- *In vitro* assessment of the influence of diet and dietary additives on rumen function, methane production, and microbial/plant interactions;

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- Genetic diversity of native sheep and horse breeds;
- Potential impact of climate change on immune competence of fish;
- Environmental effects on immune competence and host-parasite dynamics of wild rodents;
- Impact of species and breed of ruminant livestock on biodiversity of grassland pastures;
- Genetic and genomic control of farm animal function (growth, carcass and meat composition, eating quality, disease resistance, maternal ability);
- Novel targets for the development of treatments to control schistosomiasis in humans;
- Host-parasite interactions and the identification of novel targets for the development of treatments to control gastro-intestinal parasites and liver fluke in farm livestock;
- Impact of environmental factors on variability in the development of birdsong;
- Neurophysiology of visual processing and its effect on the behaviour of insects;
- Neuroendocrine control of moulting and the molecular control of biological rhythms in arthropods

Animals in research

Each year the Home Office provide an annual report entitled 'Statistics of Scientific Procedures on Living Animals, Great Britain' (see 'Publications' section of https://www.gov.uk/research-and-testing-using-animals) which provides a series of summary tables of all research during the previous year, as well as an historical perspective going back to 1945. For example, a total of around 4.1 million procedures were started in 2012, down from a peak of around 5.6 million in the early 1970s. This reduction over time is due to stricter legislative controls, together with higher standards of welfare, better experimental design and statistical analyses, and greater use of *in vitro* tissue culture systems to replace live animal studies (the "three Rs"). Of the 4.1 million procedures started in Great Britain in 2012:

- 81.6% involved rats, mice and other rodents, all laboratory species purpose-bred for research;

- 16.3%, most of the remaining procedures, used fish, birds and reptiles / amphibians;

- only 0.4% of procedures involved farm species (cattle, sheep, pigs and deer);

- fewer than 0.2% of procedures involved cats, dogs, horses and non-human primates.

These latter species are all afforded special legal protection under the Animals (Scientific Procedures) Act 1986 within Great Britain, and this will continue under the new EU Directive 2010/63/EU. The use of such species requires a far higher level of justification, and scientists must make a special case for why these species in particular must be used rather than laboratory rodents. Other than the collection and use of hair samples from horses for subsequent genetic diversity studies (not a regulated procedure), none of the research conducted at Aberystwyth University involves such species.