

**Animal welfare and the three rs : replacement, refinement and reduction /  
Understanding Animal Research.**

**Contributors**

Understanding Animal Research (Great Britain)

**Publication/Creation**

London : Understanding Animal Research, 2011.

**Persistent URL**

<https://wellcomecollection.org/works/bbsw4x4w>

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Wellcome Collection  
183 Euston Road  
London NW1 2BE UK  
T +44 (0)20 7611 8722  
E [library@wellcomecollection.org](mailto:library@wellcomecollection.org)  
<https://wellcomecollection.org>

ANIMAL WELFARE AND THE THREE RS: REPLACEMENT,  
REFINEMENT AND REDUCTION

#### ABOUT US

Understanding Animal Research aims to achieve understanding and acceptance of the need for humane animal research in the UK, by maintaining and building informed public support and a favourable policy climate for animal research.

The information provided by Understanding Animal Research is based on thorough research and understanding of the facts, historical and scientific.

Understanding Animal Research seeks to engage with and inform many sectors to bring about its vision. Key stakeholders include members of the public, the media, policy makers, schools and the scientific research community.



# ANIMAL WELFARE AND THE THREE RS: REPLACEMENT, REFINEMENT AND REDUCTION

"We have one of the most stringent systems in the world to regulate animal procedures and ensure appropriately high standards of animal welfare are maintained. This government wants to take this further, and this is why we have committed to work to reduce the use of animals in scientific research."  
*Home Office Minister, Lynne Featherstone, 18 July 2011*

#### ALSO AVAILABLE IN THIS SERIES:

Why do we use animals in medical research?  
Animal research benefits us - and animals too  
How much animal research is done in the UK?  
How is animal research regulated?

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Understanding Animal Research  
Telephone: 020 7685 2670  
Email: [info@uar.org.uk](mailto:info@uar.org.uk)  
Web: [www.UnderstandingAnimalResearch.org.uk](http://www.UnderstandingAnimalResearch.org.uk)



SEPTEMBER 2011



"Why don't we use people? We do. Why don't we use molecules? We do. But there is an absolute essential link between the two: the work on animals. That we do under very controlled conditions and we have the welfare of animals very much at heart." Professor Roger Morris, Head of the School of Biomedical Sciences, Kings College London, July 2011



"Good animal welfare and full implementation of the 3Rs are essential for good science and for retaining the support of the public in the use of animals in research." Medical Research Council, 2011

WWW.understandinganimalresearch.org.uk

## ANIMAL RESEARCH AND ANIMAL WELFARE

Animals cannot – and should not – be used unnecessarily in research, or allowed to experience avoidable suffering. The Animals (Scientific Procedures) Act 1986 enshrines these principles in law, and has at its centre the 'three Rs': replacement, refinement and reduction.

## THE THREE RS AT A GLANCE

**Replacement** of 'protected' animals (all living vertebrates except humans) in research with alternative techniques, lower species, or avoiding animal use altogether.

**Refinement** of scientific procedures to minimise animal suffering, enhancing welfare of animals throughout their lives in the animal house, as well as in research situations.

**Reduction** of the number of animals used by obtaining more information from the same number of animals, or the same amount of information from fewer animals.

**REPLACEMENT** Non-animal research techniques have helped us to reduce the number of situations in which animal procedures are needed. These techniques include the use of statistical data already obtained from animal research, studies of isolated cells and tissues, new scanning methods, computer models that simulate an animal's response to specific experiments, and studies of patients and populations.

Much safety testing can now be undertaken without the use of animals. For example, the Ames test uses bacteria instead of rodents to see whether a chemical is likely to damage DNA or has potential to cause cancer. Similarly, some tests now use less complex animals than before: scientists can check injected medicines for most pyrogens (fever-causing bacterial contaminants) by using blood cells from the horseshoe crab – replacing tests on rabbits. More recently, new pyrogen tests have been developed that use beef and chicken from slaughterhouses.

Unfortunately, some non-animal research methods only give limited information about what happens in a whole, living animal. Researchers will only use – and the law will only allow them to use – animals in research when it is completely unavoidable.

## ANIMAL WELFARE AND THE THREE RS: REPLACEMENT, REFINEMENT AND REDUCTION

**REFINEMENT** Refinement is about improving animal welfare and reducing any potential pain or distress. Simply improving housing and care in research – often through 'environmental enrichment' – means animals live better lives with less stress. This also increases the reliability of research findings.

There are many specific refinement techniques and they apply to almost all aspects of an animal's life. For example, food rewards can be used to train monkeys to sit on weighing scales, or hold out a limb to give a blood sample – reducing any stress. Blood pressure, heart rate and activity levels can be measured by radio-operated implants, so that animals do not have to be repeatedly caught or restrained. Rodents can be housed in a special red plastic 'house' so they feel they're nesting in a dark place (they can't see through red), yet it allows them to be seen and studied. And, of course, animals are routinely kept in social groups and given stimulating environments.

Good animal welfare is not only ethically right, but is good science. It's also against the law for any researcher to cause unnecessary suffering to any animal.

**REDUCTION** Reduction means using fewer animals to obtain the same – or more – research information.

This can be achieved in many ways. Good experimental design and statistical analysis ensure that researchers use the optimum number of animals. Using inbred animals means researchers can get reliable results from fewer of them. Animals get fewer secondary infections or illnesses, which might interfere with studies, if kept in clean environments. New scanning techniques mean that tumours can be tracked non-invasively, with more data collected from the same animal. And measures like freezing embryos mean that fewer rodents are needed for genetic modification breeding programmes – they can be implanted when needed.

Although researchers continually improve studies to reduce the number of animals needed, this may not lead to overall reductions. Often this is simply because more biomedical research is being conducted. Today, many rodents and fish are counted in the total even if they are only used as breeding stock to produce better animal models of serious illness such as heart failure, cancer or Alzheimer's disease. These animals may also be used to replace higher animals like monkeys and dogs.

## INVESTING IN THE THREE RS

The National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) helps co-ordinate best practice on the three Rs throughout the UK and offers an annual prize for original contributions. In 2010 this prize was awarded to a leading scientist who had developed ways to reduce stress and anxiety in laboratory mice.

## DO LABORATORY ANIMALS SUFFER?

Most animal research involves mild procedures such as change of diet, taking a blood sample or giving an injection. If more invasive procedures are necessary, anaesthetics and pain relief are given whenever appropriate.

Animal research must pass an ethical evaluation and be approved by Home Office inspectors – all trained doctors or vets. Any pain or distress is kept to a minimum but, if it cannot be alleviated, the animal must be put down immediately and painlessly – it's the law.

## FURTHER INFORMATION

The NC3Rs has an extensive information portal at [www.nc3rs.org.uk](http://www.nc3rs.org.uk)

Skilled and trained animal technologists provide day-to-day care for animals in laboratories and belong to the professional body Institute of Animal Technology, see [www.iat.org.uk](http://www.iat.org.uk)

We have more information about the three Rs at [www.UnderstandingAnimalResearch.org.uk](http://www.UnderstandingAnimalResearch.org.uk)