



## AUSTRALIAN AND NEW ZEALAND COLLEGE OF VETERINARY SCIENTISTS

### MEMBERSHIP GUIDELINES

#### *Medicine and Management of Laboratory Animals*

#### INTRODUCTION

These Membership Guidelines should be read in conjunction with the *Membership Candidate Handbook*.

#### ELIGIBILITY

Refer to the *Membership Candidate Handbook*.

#### OBJECTIVES

To demonstrate that the candidate has sufficient knowledge of and experience in medicine and management of laboratory animals, to be able to give sound advice in this field to veterinary and technical colleagues and research scientists.

#### LEARNING OUTCOMES

For the purposes of this document “Laboratory Animals” are defined as those species commonly encountered in laboratory facilities in Australia and New Zealand. These can be divided into core species and other species:

Core species include:

- Mice
- Rats
- Rabbits
- Sheep

Other species that are used less commonly for research purposes include:

- |               |                      |
|---------------|----------------------|
| • Dogs        | • Non-human Primates |
| • Cats        | • Chickens           |
| • Zebrafish   | • Wild life species  |
| • Guinea pigs | • Horses             |
| • Pigs        |                      |

1. The candidate will have a **sound**<sup>1</sup> knowledge of:
  - a. Anatomy, reproduction, and natural ethology of core species of laboratory animals.
  - b. Nutritional requirements of core species laboratory animals including: dietary formulations; methods of dietary supplementation; common nutritional deficiencies and intoxications; microbiological standards for laboratory animal foods; sterilisation of foods by autoclaving, fumigation, or gamma irradiation, and effects on nutrient value; provision of roughage.
  - c. Breeding requirements and breeding systems for core species of laboratory animals. This includes mating, weaning, identification, breeder replacement, cross-fostering, record keeping, pedigrees, and planning production to meet orders. Breeding systems includes inbreeding, outbreeding, cross breeding monogamous or harem systems,; the genetic and management advantages and disadvantages of these breeding systems; related genetic considerations such as the development of congenic mutant strains; maintenance of mutant reproductively unsound strains e.g. athymic mice; development of recombinant inbred strains; the advantages or disadvantages of F1 hybrids compared to inbred and outbred animals; commonly used inbred strains and outbred stocks of laboratory animals, and their experimental applications.
  - d. The principles of genetically modified (GM) animals including various methods of genetic production and monitoring, and experimental use of genetically modified animals: the range of techniques used to create GM animals; the artificial breeding techniques that complement the production of GM animals; the techniques used for routine monitoring of the genotype of GM animals; phenotype assessment strategies and monitoring procedures for development of phenotype; the ways in which GM animals can be used for research; the welfare concerns associated with the creation, production and use of GM animals for research purposes; the NHMRC and the OGTR guidelines associated with the housing and use of GM animals.
  - e. Epidemiology, pathology, diagnosis, and control of diseases including:

**for all core species of laboratory animals: common** internal and external parasites e.g. *helminths*, mites, lice and ticks;

**for rabbits:** *Pasteurella multocida*, coccidiosis, *Encephalitozoon cuniculi* infection, myxomatosis, fibromatosis, venereal spirochaetosis, enterotoxaemia, Tyzzer's disease, yersiniosis, mucoid enteropathy, hypervitaminosis D, avitaminosis E, traumatic injuries and pododermatitis, dental malocclusion, gastric hairballs, rotavirus infection, coronavirus infection, salmonellosis, caecal impaction

**for sheep:** Q fever, brucellosis, salmonellosis, Johnes disease, clostridial diseases, caseous lymphadenitis, foot rot and foot abscess, bacterial arthritis, dermatophilus congolensis, scabby mouth, grain overload, metabolic diseases (pregnancy toxemia, hypocalcemia)

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<sup>1</sup> **Knowledge Levels:**

**Detailed knowledge** - candidates must be able to demonstrate an in-depth knowledge of the topic including differing points of view and published literature. The highest level of knowledge.

**Sound knowledge** – candidate must know all of the principles of the topic including some of the finer detail, and be able to identify areas where opinions may diverge. A middle level of knowledge.

**Basic knowledge** – candidate must know the main points of the topic and the core literature.

**for rats:** *Mycoplasma pulmonis* infection and bacterial respiratory pathogens, coronavirus infection, bacterial intestinal infections, yersiniosis, Kilham rat virus and Toolan H-1 virus (parvoviruses), Sendai virus, Hantaan virus. Ringtail, chromodacryorrhoea, malocclusion of teeth, neoplasia, nephrosis, barbering;aging, degenerative disorders.

**for mice:** *Corynebacterium kitcheri*, *Pasteurella pneumotropica*, mycoplasmosis, Tyzzer's disease, pathogenic protozal infections, bacterial intestinal infections and septicaemias, helicobacter, murine hepatitis virus, murine parvovirus, rotavirus, coronavirus infections, ectromelia, lymphocytic choriomeningitis virus, 'latent' virus infections (pneumonia virus, Reovirus 3, Sendai virus, norovirus, minute virus of mice, adenovirus, murine encephalomyelitis virus,). Barbering, alopecia, traumatic injury, conjunctivitis, malocclusion of teeth, mouse urological syndrome; aging, degenerative and common congenital abnormalities of inbred strains (hydrocephalus, malocclusion, vaginal septal defect).

- f. Application of commonly used anaesthetics for core species of laboratory animals including inhalation anaesthetics, tranquillisers, and associated drugs in core species of laboratory animals; anaesthetic monitoring; pre-emptive and post operative use of analgesics, pre-operative and post operative considerations, prevention of hypothermia, fluid administration; pain management including identification of pain and distress; chemical and physical methods of euthanasia, advantages and disadvantages, ethical and welfare issues.
- g. Handling, manual restraint, and use of restraining devices in core species of laboratory animals; injection techniques and collection of body fluid samples (venous, arterial, and heart blood; urine); welfare and safety issues associated with techniques used.
- h. Health monitoring and disease diagnosis techniques in core species of laboratory animals including post mortem and collection of swabs from important sites for microbial culture; parasitological examination of faeces for ova and protozoan cysts and identification; examination and identification of external parasites; serum collection, commercially available serological tests for viral and mycoplasma antibodies, ELISA methodology; PCR and other molecular techniques for the identification of microbiological antigens; colony health surveillance including use of sentinels, statistical methodology for colony monitoring, selecting range of pathogens to be excluded.
- i. Laboratory animal housing - Species specific housing requirements for the core species of laboratory animals including.
  - i. Environment requirements such as air temperature and humidity, lighting levels and light/ dark cycle.
  - ii. Cage construction materials, cage designs and types to meet behavioural and physiological needs and industry standards including criteria such as cage space requirements, bedding and nesting materials and environmental enrichment materials; provision of water and automatic watering systems; design of feed hoppers; advantages and disadvantages of floor pens for rabbits; cleaning, sterilisation, and rotation of cages, feed, bedding, water, staff, visitors; chemical and physical methods of disinfection and sterilisation; applicable operational WHS standards.

- iii. Social requirements – Group housing and optimal group sizes. Potential problems associated with group housing including fighting, identification, catching and restraint; alternatives such as visual contact in sheep; impact of extended social isolation in each core species and how to minimise the impact when research requires social isolation.
  - iv. Specialised restraint and transport housing- Restraining crates for sheep; housing for metabolic testing and food and water consumption; transport options for core species including transport shippers and meeting species specific need for access to food and water during transport.
- j. General husbandry and management of microbiologically defined laboratory animals:
- i. Definition, designation, and classification of microbiologically defined laboratory animals.
  - ii. Methods of rederivation of animals by hysterectomy, embryo transfer; use of isolators, hand rearing or foster rearing.
  - iii. Operating procedures and general management of SPF barrier units; cage cleaning and rotation, sterilisation of food, water and bedding, staff procedures; effect of food sterilisation on nutrient value of foodstuffs and use of supplementation; use of change stations for cage change and biosafety cabinets for SPF experimental procedures; principles of fumigation of barriers and methods used; techniques for monitoring sterilisation and fumigation procedures; transport of SPF animals and entry to barriers, barrier cage systems or isolators.
  - iv. Sources of animal supply and in Australia, New Zealand for core species of laboratory animals; Quarantine importation/exportation guidelines for core species of laboratory animals, quarantine and treatment of introductions, conditioning and release from quarantine.
  - v. Applications of SPF animals for experimental purposes, advantages over conventional animals, economic production considerations.
- k. Legislation associated with animal experimentation, welfare and ethics applicable in **any one state/territory of Australia or in New Zealand.**
- i. The “Australian Code for the Care and Use of Animals for Scientific Purpose” ( 8th Edition, 2013); the role and recommended constitution of Animal Ethics Committees; compliance with the 3Rs; methods of ensuring compliance with provisions of the Code and the AEC including relevant state/territory legislation.
  - ii. The New Zealand “Users Guide to Part 6 of the Animal Welfare Act 1999 – The use of animals in research, testing and teaching current edition)”; the role and recommended constitution of Animal Ethics Committees; compliance with the 3Rs; the role of an institutional Animal Welfare Officer; Codes of ethical conduct, preparation and use; Good Practice Guide for the use of animals in research, testing and teaching June 2010.

2. The candidate will have a **basic** knowledge of:
- a. Epidemiology, pathology, diagnosis, and control of common diseases of the other (non-core) laboratory animal species (beyond mice, rats, sheep, rabbits), maintained in a research environment.
  - b. The biology, management, housing, breeding, nutrition and major diseases of the other laboratory animal species commonly used in bio-medical research.
  - c. Common surgical procedures in core species such as nephrectomies, ovariectomies, adrenalectomies, vasectomies, splenectomy, cannulation of carotid artery and jugular vein, osmotic pump implantation; ultrasound examination; and embryo transfer surgery.
  - d. Laboratory animal facility design and use:
    - i. Building standards and finishing materials for the housing of laboratory animals that meet the needs of the species to be held and are safe and sustainable from a construction and operational perspective; design and construction of safe, effective and efficient service (cage wash, euthanasia, autopsy) and preparation areas (food, bedding, environmental enrichment supplies), deliveries, stores, animal dispatch and transport areas and building standards for staff e.g. amenities, change rooms;
    - ii. Plant including lighting types and control systems; heating, ventilation and air conditioning (HVAC); humidification systems; fire and security alarm systems; water quality and supply systems; noise mitigation systems, telecommunication and intercom systems; how each of the plant systems must be adjusted for individual species;
    - iii. Equipment including sterilising options and units, cage washers, fumigation units, storage and handling systems, incubators, refrigerators and freezers, waste disposal units, euthanasia chambers, computer stock and breeding management systems.
    - iv. Design of support facilities such as experimental procedures rooms, operating theatres, instrument wash/pack, surgical autoclave, anaesthetic/pre-surgical preparation, computer access areas.
    - v. Housing and selection of specialist equipment units including recovery cages, anaesthetic machines, pulse oximeters, ventilators, x-ray units, ultrasound units, MRI/CT, microinjection facilities.
    - vi. Design and establishment of SPF protective, isolation or quarantine barriers, maintenance procedures and support equipment such as autoclaves, fumigation chambers, air supply, filtration and balancing, dunk tanks, ultraviolet/ air curtain “pass through” boxes and entry ports, staff entry facilities; systems for microbiological and GM organism protection of animals and/or environment, including cabinet units eg isolators, individually ventilated cage systems (positive and negative air pressure), HEPA filtration at room level, bioBubble systems, biosafety cabinets, change stations; advantages and disadvantages of facility, room or cage level barrier systems all to prevent the introduction of contamination on incoming materials.

- e. Other relevant Australian or New Zealand legislative compliance or controls:
  - i. Australian legislative and regulatory compliance and controls in any one Australian state or territory or in the commonwealth including Gene Technology Act (OGTR), Quarantine Act and requirements for Quarantine Approved Premises; Drugs and Poisons; Work Health and Safety; AA/EEO.
  - ii. New Zealand legislative and regulatory compliance and controls including Health and Safety in Employment, Radiation Protection, Misuse of Drugs, Biosecurity Act 1998; Hazardous Substances and New Organisms Act 1996, Agricultural Compounds and Veterinary Medicines Act 1997, MAF Standard 154.03.03: Containment Facilities for Vertebrate Laboratory Animals 2002.
  - iii. The role of other bodies in the community in the debate on the ethics and welfare of laboratory animals e.g. RSPCA/RNZSPCA, ANZCCART, Australian/New Zealand Animal Welfare Strategy, NCCAW/NAWAC, Animals Australia/SAFE, Animal Welfare Chapter ANZCVSc, AVAWE;
- f. Laboratory animal staff management and training, occupational safety and animal house administration:
  - i. Work health and safety considerations: laboratory animal allergy, bedding inhalation, zoonoses, protection from experimental infections, toxic substances (chemical hazards) used in animal houses and research laboratories (eg disinfectants, formaldehyde, peracetic acid, ethylene oxide, ether, chloroform, xylene, isoflurane, restricted drugs); manual handling risks; particular considerations for staff protection from primate borne zoonoses; the concept of risk analysis and application to occupational safety.
  - ii. Training of laboratory animal technicians: systems in place in Australia or New Zealand, education requirements, skills to be transmitted to technicians in training.
  - iii. Training of researchers in animal ethics, handling and procedures for animals, aseptic surgery, anaesthesia and analgesia, monitoring of animals including detection of pain, discomfort and other abnormal behaviours, animal facility inductions, record keeping including use of animal management software, reporting of adverse events.
  - iv. Economic considerations in laboratory animal management including labour and operations, forecasting requirements, budgeting, matching supply with demand, problems of one-off orders and strategies to supply.
- g. Research design including:
  - i. Principles of statistical design, appropriate selection of species, genotype, phenotype, controls, sex, use of appropriate housing, bedding, diet, environment, attention to behavioural requirements, disease status;
  - ii. Non-experimental variables, the confounding effects on research data of a range of factors including the common pathogens, temperature and humidity, light intensity and duration, noise, anaesthetics, analgesics and antibiotics, pheromones, restraint and handling stress.

3. The candidate will **be able to**:

- a. Apply this knowledge to ensure that management of laboratory animal facilities demonstrates best practice, experimental variability is limited, scientific validity is enhanced, the use of the animals for the research is justifiable and the welfare of all animals used for research and teaching is preserved.

## **EXAMINATIONS**

For information on both the standard and format of the Written and Oral examinations, candidates are referred to the *Membership Candidates Handbook*. The Membership examination has **two separate components**:

1. **Written Examination (Component 1)**  
**Written Paper 1** (two hours): Principles of the Subject  
**Written Paper 2** (two hours): Applied Aspects of the Subject
2. **Oral Examination (Component 2)**  
**Oral** (one hour)

The written examination will comprise of two separate two-hour written papers taken on the same day. There will be an additional 15 minutes perusal time for each paper, during which no writing on the examination paper is permitted. In each paper you are provided with four (4) questions to answer, each worth 30 marks, giving a total of 120 marks per paper. Questions may be long essay type or a series of shorter answer sub-questions. Marks allocated to each question and to each subsection of questions will be clearly indicated on the written paper.

For Australian and New Zealand candidates, any questions concerning acts, regulations, guidelines, codes of practice and codes of ethical conduct, should be answered as they relate to the country in which they reside and work. Candidates working outside of either Australia or New Zealand may choose from which country perspective they will answer such questions.

### **Written Paper 1:**

This paper is designed to test the Candidate's knowledge of the principles of medicine and management of laboratory animals as described in the Learning Outcomes. Answers may cite specific examples where general principles apply, but should primarily address the theoretical basis underlying each example.

### **Written Paper 2:**

This paper is designed to (a) test the Candidate's ability to apply the principles of medicine and management of laboratory animals to particular cases/problems or tasks and (b) test the Candidate's familiarity with the current practices and current issues that arise from activities within the discipline of medicine and management of laboratory animals in Australia and New Zealand.

### **Oral Examination:**

This examination requires the candidate to demonstrate achievement of the above-mentioned Learning Outcomes. The duration of this examination is approximately one (1) hour. Images associated with; 1) management of laboratory animals, laboratory animal facilities and experimental situations and 2) diagnosis and treatment of diseases commonly found in laboratory animals may be used during this examination. Five (5) situations or aspects of laboratory animal management and/or medicine are presented with supporting questions asked verbally in a face-to-face setting. The oral examination has a total of 100 marks with each case allocated 20 marks.

## RECOMMENDED READING MATERIAL

The candidate is expected to read widely within the discipline, paying particular attention to areas not part of their normal work experiences. This list of books and journals is intended to guide the candidate to some core references and other source material. Candidates also should be guided by their mentors and should not necessarily limit themselves to only studying material on the list. *The list is not comprehensive and is not intended as an indicator of the content of the examination.*

### Recommended Texts

Allen, M., Borkowski, G., *The Laboratory Small Ruminant*. CRC Press (1999)

*Australian Code for the Care and Use of Animals for Scientific Purposes*. 8th edition  
Endorsed by NH&MRC, ARC, CSIRO, Universities Australia. Australian Government Publishing Service (2013)

The New Zealand “Users Guide to Part 6 of the Animal Welfare Act 1999 – The use of animals in research, testing and teaching current edition”

*Good Practice Guide for the use of animals in research, testing and teaching* 2010. MAF/NAEAC, New Zealand Government

Fox, JG., Anderson, LC., Loew, FM., Quinby, FW., *Laboratory Animal Medicine*, Second Edition (American College of Laboratory Animal Medicine) (2002)

Fox, JG., Barthold, S., Davisson, M., Newcomer, CE. *The Mouse in Biomedical Research*, Volume 1, Second Edition: History, Wild Mice, and Genetics (American College of Laboratory Animal Medicine) Academic Press (2006)

Fox, JG., Barthold, S., Davisson, M., Newcomer, CE. *The Mouse in Biomedical Research*, Volume 2, Second Edition: Diseases (American College of Laboratory Animal Medicine) Academic Press (2006)

Fox, JG., Barthold, S., Davisson, M., Newcomer, CE. *The Mouse in Biomedical Research*, Volume 3, Second Edition: Normative Biology, Husbandry, and Models (American College of Laboratory Animal Medicine) Academic Press (2006)

Flecknell P *Laboratory Animal Anaesthesia* 3rd Edition, Academic Press 2009

*Harkness and Wagner's Biology and Medicine of Rabbits and Rodents*, 5th Edition  
Harkness, J., Turner, P., Vandewoude, S., Wheler, S. Wiley-Blackwell 2009

Hubrecht, R., Kirkwood, J., *The UFAW Handbook on the Care and Management of Laboratory and Other Research Animals*, 8<sup>th</sup> Ed. Wiley- Blackwell (2010)

Sharp, P., Villano J., *The Laboratory Rat*, 2<sup>nd</sup> Ed. CRC Press ( 2012)

Suckow, M., Schroeder, V., Douglas, F. *The Laboratory Rabbit*. CRC Press ( 2010)

Sundberg, J., Ichiki, T., *Genetically Engineered Mice Handbook*. CRC Press (2006)

### Additional References

ANZCCART, *Euthanasia of Animals Used for Scientific Purposes* (ed J Reilly) 2<sup>nd</sup> Edition  
Adelaide (2001)

ANZCCART, *Housing for Laboratory rats, mice, guinea pigs and rabbits* (A Hargreaves)  
Adelaide (2000)

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- Baker, D.G. *Natural Pathogens of Laboratory Animals: Their Effects on Research*, ASM Press, Virginia, USA (2003)
- Courtney,A. *Pocket Handbook of Non-human Primate Clinical Medicine*. CRC Press (2012)
- Canadian Council on Animal Care. Guidelines on the Care and Use of Animals for Scientific Purposes (2004)
- Harper, C, Lawrence, C. *The Laboratory Zebrafish*. CRC Press (2011)
- Hedrich H. (ed). *The Laboratory Mouse*. Elsevier Academic Press London 2004.
- Hendriksen CFM, Morton DB, (ed) *Humane Endpoints in Animal Experiments for Biomedical Research*. Proceedings of the International Conference 22-25 Nov 1998, Zeist, the Netherlands. Laboratory Animals Ltd. London 1999.
- Krinke G J. (ed). *The Laboratory Rat*.Academic Press London 2000.
- Lyon, M., Raston S, Brown S., *Genetic Variants and Strains of the Laboratory Mouse* 3rd Ed, Oxford University Press (1996)
- Noga, E., *Fish Disease, Diagnosis and Treatment*. Wiley- Blackwell 2<sup>nd</sup> Edition (2010)
- Pease, S., Saunders, T., *Advanced Protocols for Animal Transgenesis*. Springer (2011)
- Petrie,A., Watson,P. *Statistics for Veterinary and Animal Sciences*. 3rd Edition. Wiley-Blackwell (2013)
- Percy, DH., Barthold, SW. *Pathology of Laboratory Rodents & Rabbits* Iowa State Press (2001)
- Quesenberry, KE.,Carpenter, JW. *Ferrets, Rabbits, and Rodents, Clinical Medicine and Surgery*. Second Edition, Saunders, USA. (2003)
- Radostits,O., Gay,C., Hinchcliff,K.,Constable,P. *Veterinary Medicine-A textbook for the diseases of cattle,horses,sheep, pigs and goats*. 10th Edition. Saunders (2007)
- Ruys,T. (Editor) *Handbook of Facilities Planning*. Volume 2: Laboratory Animal Facilities. Van Nostrand Reinhold New York. (1991)
- Silverman, J. *Managing the Laboratory Animal Facility*, CRC, Second Edition (2008)
- Suckow, MA., Weisbroth, SH, Franklin, CL. *The Laboratory Rat* (American College of Laboratory Animal Medicine) Academic Press (2005)
- Wolfensohn S., Lloyd, M. *Handbook of Laboratory Animal Management and Welfare* 3rd Edition, Wiley, (2003)
- Wood, M. *Health And Safety in Laboratory Animal Facilities (Laboratory Animal Handbooks)* 1<sup>st</sup> Edition, Royal Society of Medicine Press, (1999)
- Subcommittee on Laboratory Animal Nutrition,, Committee on Animal Nutrition, Board on Agriculture,, and National Research Council., *Nutrient Requirements of Laboratory Animals*, Fourth Revised Edition, National Academy Press, (1995)

## **Journals**

*Animal Technology*. Quarterly Journal of the Institute of Animal Technology. Secretary: J. Gregory, Zoology Department, Royal Post Graduate Medical School, London, W12 OHS.

*Laboratory Animals*. Quarterly. Publication of the Laboratory Animal Science Association (UK). Publications Subscriptions Department, Royal Society of Medicine Services Ltd., 1 Wimpole Street, London, W1M 8 AE, UK.

*JAALAS Journal of the American Association for Laboratory Animal Science*. Bi-monthly. 9190 Crestwyn Hills Drive, Memphis, TN 38125-8538, USA

*Comparative Medicine*. Bimonthly. Published by the American Association for Laboratory Animal Science, 9190 Crestwyn Hills Drive, Memphis, TN 38125-8538, USA

## **Websites**

American Association for Laboratory Animal Science. Premier forum for the exchange of information and expertise in the care and use of laboratory animals operating since 1950 and dedicated to the humane care and treatment of laboratory animals and the quality research that leads to scientific gains that benefit people and animals.

<http://www.aalas.org/index.aspx>

American College of Laboratory Animal Medicine. Recognised officially by the American Veterinary Medical Association as the certifying organisation for laboratory animal medicine

<http://www.aclam.org/>

American Committee on Laboratory Animal Diseases. Advances and communicates knowledge about diseases of laboratory animals for the benefit of laboratory animal science and comparative medicine

<http://www.aclad.org/>

Animal Ethics Infolink. A site providing comprehensive information on the regulatory framework that governs animal research. Although the emphasis is on NSW legislation, there is also much information of general relevance. [www.animaethics.org.au](http://www.animaethics.org.au)

Animals in Laboratories, Animal Welfare Institute US resource for care of laboratory animals

[http://www.awionline.org/lab\\_animals/](http://www.awionline.org/lab_animals/)

Australian and New Zealand Council for the Care of Animals in Research and Teaching.

ANZCCART promotes informed debate and education in animal research.

[www.adelaide.edu.au/ANZCCART/](http://www.adelaide.edu.au/ANZCCART/)

Australian Quarantine. Provides information on import/ export requirements and Quarantine Approved Premise certification. [www.agriculture.gov.au](http://www.agriculture.gov.au)

European Centre for the Validation of Alternative Methods (ECVAM) and the Interagency Coordinating Committee on the Validation of Alternative Methods. Major initiatives by the European Commission and the USA (respectively) aimed at reducing animal use in the regulatory testing of new products.

<http://ecvam.jrc.it> and <http://iccvam.niehs.nih.gov>

Federation of European Laboratory Animal Science Associations (FELASA)

<http://www.felasa.eu>

FELASA Reports

<http://www.lal.org.uk/felasa.html>

Institute for Laboratory Animal Resources. Prepares authoritative reports on subjects of importance to the animal care and use community; develops and makes available scientific and technical information on laboratory animals and other biological research resources.  
[http://dels.nas.edu/ilar\\_n/ilarhome/](http://dels.nas.edu/ilar_n/ilarhome/)

Johns Hopkins University Center for Alternatives to Animal Testing. Includes Altweb which is an extensive database of alternatives to the use of animals. <http://caat.jhsph.edu/>

National Centre for the Replacement, Refinement and Reduction of Animals in Research. A major, multi-disciplinary effort to advance “the 3Rs” through improved education, research and public information. [www.nc3rs.org.uk/](http://www.nc3rs.org.uk/)

Nuffield Council on Bioethics report, ‘*The Ethics of Research Involving Animals.*’ Probably the most comprehensive multi-stakeholder review of the ethics of animal research ever undertaken. [www.nuffieldbioethics.org/go/ourwork/animalresearch/introduction](http://www.nuffieldbioethics.org/go/ourwork/animalresearch/introduction)

Office of the Gene Technology Regulator. Responsible for certification for use of GM animals and GM microorganisms. [www.ogtr.gov.au](http://www.ogtr.gov.au)

Patients’ Voice for Medical Advance. An example of a patients’ advocacy group.  
[www.patientsvoice.org.uk](http://www.patientsvoice.org.uk)

Public Responsibility in Medicine and Research (PRIM&R). Dedicated to advancing the highest ethical standards in the conduct of research  
<http://www.primr.org/>

Research Defence Society. Founded a century ago, the RDS provides information on advances that have come from animal research.  
[www.rds-online.org.uk](http://www.rds-online.org.uk)

The Jackson Laboratory. Has a goal to discover the genetic basis for preventing, treating and curing human disease, and to enable research and education for the global biomedical community using mouse models and genetics research that leads the world to solutions for cancer and other complex and intractable diseases  
<http://www.jax.org/>

Universities Federation for Animal Welfare. Works to develop and promote improvements in the welfare of all animals through scientific and educational activity worldwide  
<http://www.ufaw.org.uk/>

## **FURTHER INFORMATION**

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