

# EFFECTIVE SEARCHING FOR THE 3RS: A COMPILATION OF WEBSITES, DATABASES AND ON-LINE JOURNALS

## BUREAU OF ANIMAL WELFARE 2005

### Effective searching

Please note that ‘Alternatives’ may often refer to alternatives to animal use and alternative methods and thus may encompass all 3Rs: Replacement, Reduction and Refinement of the use of animals in research, testing and teaching. Two recent articles provide some very useful tips!

Article 1. ‘Effective searching of the scientific literature for alternatives : search grids for appropriate databases’<sup>(8)</sup> refers to a starter website which provides lists of some main free and proprietary literature databases, separating them firstly into two main groups. 1. Animal Models and 2. Topics (with emphasis on refinement). The searcher needs to be aware of the scope and emphasis of such databases, particularly bibliographic databases. For example: PubMed emphasises articles that pertain to biomedical work rather than a comprehensive search for an animal model. AGRICOLA may be useful for accessing animal science and veterinary literature, but emphasises the USA journals, whereas CAB covers also the European literature. There are also other search engines not mentioned or proprietary, such as EMBASE.com, Scirus, Medline and BIOSIS. This is still, however, a good place to start your search:

[http://www.vetmed.ucdavis.edu/Animal\\_Alternatives/databaseapproach.html](http://www.vetmed.ucdavis.edu/Animal_Alternatives/databaseapproach.html).

Article 2. ‘The use of databases, information centres and guidelines when planning research that may involve animals’<sup>(9)</sup> provides well considered background and comment on the main information sources, their capacity and scope, as well as an extensive categorised list of information sources with web access. Suggestions are also given for search strategies when using these information sources. There are also links from the UK based forum Focus on Alternatives which provide an excellent poster and worked example of a simple strategy for incorporating the 3Rs when planning projects that may involve the use of animals. These can be found at:

<http://www.focusonalternatives.org.uk/pdfs/earlyplanningposter.pdf>

and

<http://www.focusonalternatives.org.uk/PDFs/Early%20Plannig%20PosterB.pdf>

There are also some other main searching starter websites with guidance on how to search for alternatives at:

<http://www.frame.org.uk/Searching%20for%20Information/Search%20Guide%20Index.htm>,

<http://altweb.jhsph.edu/searchalt.htm>

and

<http://www.nal.usda.gov/awic/alternatives/searches/altwksht.pdf>

### AEC applications - investigators and teachers reporting on 3Rs searches

The US Department of Agriculture has a specific Policy #12 that refers to Consideration of Alternatives to Painful/Distressful Procedures. This policy provides further information in support of their Animal Welfare Regulations. These “require principal investigators to consider alternatives to procedures that may cause more than momentary or slight pain or distress to the animals AND provide a written narrative of the methods used and sources consulted to determine the availability of alternatives, including refinements, reductions and replacements”.

<http://www.aphis.usda.gov/ac/policy/policy12.pdf>

“When a database search is the primary means of meeting this requirement, the narrative must at a minimum, include:

1. The names of the databases searched
2. The date the search was performed
3. The period covered by the search
4. The key words and/or the search strategy used”

There are requirements in the mandatory Australian Code to 'list any potential alternatives to animal use' under Replacement (Section 2.2.16 viii). The above-mentioned criteria could be similarly used to demonstrate this search, before explanation as to which alternatives would be used or deemed unsuitable.

## **Contents**

The following compilation attempts to collate international 3Rs databases and websites.

### **Replacement**

- **General Research/Medical**
- **Toxicity Testing**
- **Education and Training**

### **Reduction**

- **General**

### **Refinement**

- **General Assessment and Management of Pain and Distress**
- **Administration of Substances**
- **Blood Collection**
- **Antibody Production**
- **Behavioural Experiments**
- **Environmental Enrichment**
- **Euthanasia**
- **Housing and Husbandry**
- **Humane Endpoints**
- **Induction of Tumours**
- **Surgical Care**
- **Animal Models in Biomedical Research**
- **Genetically Modified / Cloned Animals**
- **Wildlife and Aquatic Animals**

### **Other**

- **Some on line journals and newsletters**
- **Some primary reference sources**

To the extent permitted by law, while all due care has been taken in compiling the information provided in this 3Rs resource information, the State of Victoria, represented by the Department of Primary Industries and its agents give no warranty as to its accuracy or completeness. The State of Victoria and its agents accept no liability for any loss or damage arising out of or in connection with the use of or reliance upon any information provided in this document. The content and opinions expressed by any mentioned organisations do not necessarily reflect the opinions of the Department of Primary Industries. © State of Victoria, Department of Primary Industries 2005

## **REPLACEMENT**

Replacement as one of the 3R's is defined as the substitution for conscious living higher animals of insentient material. <sup>(1)</sup> There are a number of alternative methods that can be used to replace the use of live animals in either all or part of a project. Replacement may be relative, where animals are still required to provide cells or tissue, but experiments are conducted *in vitro* -

- tissue culture
- perfused organs
- tissue slices
- cellular and
- subcellular fractions

These methods are well suited to studies at the tissue, cellular or subcellular level and, in these circumstances, can be cost-effective and time-saving. They also provide a level of knowledge that complements studies in whole animals. A number of organisations around the world are working towards the development and validation of replacement methods. Many of them have informative web sites:

*The European Centre for the Validation of Alternative Methods (ECVAM)*

<http://ecvam.jrc.it/index.htm> and ECVAM Science Information Service <http://ecvam-sis.jrc.it/>

*Interagency Coordinating Committee on the Validation of Animal Models (ICCVAM)*

<http://iccvam.niehs.nih.gov/>

*Interagency Coordinating Committee on the Validation of Animal Models (ICCVAM)*

<http://ntp-server.niehs.nih.gov/htdocs/ICCVAM/ICCVAM.html>

### **General Research/Medical**

*ALTWEB - Johns Hopkins University - Center for Alternatives to Animal Testing (CAAT)*

This site provides a very substantial database and linkages to many other databases. There are also specific databases for Humane Endpoints and Pain Management plus news, information, discussion and resources from the field of alternatives to animal testing.  
<http://altweb.jhsph.edu/databases.htm>

*NCA-Netherlands Centre for the Alternatives*

[www.nca-nl.org/](http://www.nca-nl.org/)

*Animal Welfare Information Center (AWIC) - National Agriculture Library (USA)*

<http://www.nal.usda.gov/awic/alternatives/alternat.htm>

*Fund for Replacement of Animals in Medical Experiments (FRAME)*

<http://www.frame.org.uk/>

NB: FRAME and the AWIC sites give guidance on how to search other databases, such as Medline, for information on Replacement Alternatives.

*UC Davis Center for Animal Alternatives*

[http://www.vetmed.ucdavis.edu/Animal\\_Alternatives/main.htm](http://www.vetmed.ucdavis.edu/Animal_Alternatives/main.htm)

*Norwegian Reference Centre for Laboratory Animal Science and Alternatives*

<http://oslovet.veths.no/databases.html>

*Academie Tierschutz<sup>(4)</sup>*

[Akademie.fur.Tierschutz@fbmev.de](http://Akademie.fur.Tierschutz@fbmev.de) c. 150000 references –German and English

3Rs Research Foundation based in Switzerland.

[www.forschung3r.ch/](http://www.forschung3r.ch/)

3Rs link provides a comprehensive list of databases

#### *PREX*<sup>(4)</sup>

A subscription-based database host specialising in alternatives and animal welfare at Utrecht University. Databases available include Agricola, CSA Life Sciences, a veterinary subset of the CAB database, Current Citations (article details from contents pages of over 10,000 most frequently requested journals held by the British Library) and Laslite, a database covering articles which have been published in journals of laboratory animal science.

<http://prex.las.vet.uu.nl/>

#### *ZEBET*

Database produced by ZEBET, Berlin with over 4,000 bibliographical references to about 300 replacement, refinement and reduction alternatives in all fields of biomedicine. The record for each method includes an expert analysis and validated information of the method and the animal-based method that it replaces. This valuable information is not often available from most on-line databases. The ZEBET Database is hosted by DIMDI where it may be searched free of charge either alone or simultaneously with Medline and Towlne. There is a maximum number of users supported at any one time and access is denied once this limit is reached. This site offers information in both English and German.

<http://www.dimdi.de/>

### **Toxicity Testing**

*National Library of Medicine (NLM) (USA)- ALTBIB and TOXNET*

NLM publishes a regular annotated bibliography on alternatives to animal testing that incorporates access to nine different toxicology-related databases.

<http://toxnet.nlm.nih.gov/altbib.html> and <http://toxnet.nlm.nih.gov/>

#### *INVITTOX*

This is a direct and concise site listing numerous in vitro protocols for toxicity testing.

<http://embryo.ib.amwaw.edu.pl/invittox/list.html>

#### *MECI/ MEMO*<sup>(4)</sup>

These databases arose out of the MEIC study (Multicentre Evaluation of *In Vitro* Cytotoxicity) in which the same 50 chemicals were tested by a large number of laboratories worldwide in their own in vitro systems. The MEIC database contains this in vitro data together with information on the methodology of the assays used to generate the data. Both the MEIC data base and the associated MEMO database contain published and unpublished human toxicity data for the same substances, obtained from a large variety of sources.

<http://www.cctoxconsulting.a.se/>

#### *INVITRODERM*<sup>(4)</sup>

Database of some 200 references to in vitro alternatives to the use of animals in skin irritation testing. [www.invitroderm.com/](http://www.invitroderm.com/)

#### *ECOTOX*

The ECOTOX (ECOTOXicology) database provides single chemical toxicity information for aquatic and terrestrial life. ECOTOX is a useful tool for examining impacts of chemicals on the environment. Peer-reviewed literature is the primary source of information encoded in the database. Pertinent information on the species, chemical, test methods, and results presented by the author(s) are abstracted and entered into the database. Another source of test results is independently compiled data files provided by various United States and International government agencies. Prior to using ECOTOX, you should visit the "[About ECOTOX/Help](#)" section of this Web Site. In addition, it is recommended that you consult the original scientific

paper to ensure an understanding of the context of the data retrieved from the ECOTOX database.

## **Education and Training**

### *UC Davis Center for Animal Alternatives- for Veterinary Education*

This location is a good start as it links to many (but not all) of the other sites listed below.

[http://www.vetmed.ucdavis.edu/Animal\\_Alternatives/index.htm](http://www.vetmed.ucdavis.edu/Animal_Alternatives/index.htm)

### *AVAR (Association of Veterinarians for Animal Rights) Alternatives in Education Database*

AVAR maintains an extensive database on alternatives to animal use in education that can either be searched online or viewed under categories (anatomy, anaesthesia, pharmacology, physiology and surgery).

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

### *EURCA (European Resource Centre for Alternatives in Higher Education)*

EURCA was established in 2000 to actively promote the use of alternatives to using animals in higher education and as a mechanism for effective dissemination of useful information about alternatives to the higher education community. It comprises a collection of (mostly) technology-based alternatives, in particular specialist alternatives for teaching physiology and pharmacology. Product information can be found on the EURCA website including basic descriptive information supplemented by peer-reviews and evaluations. Information about EURCA projects also can be found on the website.

<http://www.eurca.org>

### *ERIC* <sup>(4)</sup>

The world's largest bibliographic database on education research and practice. Contains over one million records from 1966 onwards.

<http://ericir.syr.edu/Eric/>

### *LAWTE (Laboratory Animal Welfare Training Exchange)*

The Laboratory Animal Welfare Training Exchange (LAWTE) aims to promote an information exchange among those involved in delivering animal welfare programs to those who work with laboratory animals. Information about LAWTE activities can be found on its website as well as information about training programs, materials and services. A LAWTE listserv allows members to share ideas and to discuss specific issues.

<http://www.lawte.org>

### *NORINA- Norwegian Inventory of Alternatives*

This site provides information on approximately 4000 audiovisual aids and other products that may be used as alternatives or supplements to animal use in teaching and training at all levels from junior school to University.

<http://oslovet.veths.no/NORINA/> The site also links to various loan systems such as:

### *Interniche*

InterNICHE is the International Network for Humane Education that aims for a high quality, fully humane education in biological science, veterinary, and human medicine. InterNICHE supports progressive science teaching and the replacement of animal experiments by working with teachers to introduce alternatives, and with students to support freedom of conscience. InterNICHE offers a range of resources to provide information and support to teachers and students including information about alternatives. InterNICHE has set up a web-based network to facilitate sharing experiences regarding the use and implementation of alternatives.

<http://www.interniche.org>

The Interniche publication '*from guinea pig to computer mouse: alternative methods for a progressive, humane education*' is a very comprehensive resource for current information on, and

availability of, an extensive range of alternative methods and models. This publication and the accompanying video, 'Alternatives in Education' that showcases examples where conventional animal use has been replaced by alternative methods in life science education can be obtained from Animals Australia

<http://www.animalsaustralia.org>

#### *Humane Society US (HSUS)*

This site also provides a loan system for alternatives to animal use in teaching, particularly dissection.

[http://www.hsus.org/animals\\_in\\_research/animals\\_in\\_education/](http://www.hsus.org/animals_in_research/animals_in_education/)

### **REDUCTION**

The goal of reduction, the second of the 3R's, is to reduce the numbers of animals used to obtain information of a given amount and precision <sup>(1)</sup>. To achieve this, the Australian Code of Practice requires that:

- studies are designed to be scientifically and statistically valid
- only the minimum numbers of animals are used
- studies should not be repeated unnecessarily.

There are two important caveats:

- the principle of reduction of numbers of animals should not be applied at the expense of greater suffering to individual animals
- the number of animals used must satisfy statistical requirements -neither too few nor too many.

Remember - if reducing the numbers of animals makes it impossible to reach a valid conclusion from the experiment, this does NOT achieve the goal of Reduction. To proceed with such an experiment is inherently unethical.

On-line resources to assist in applying the principle of reduction can be found at:

[FRAME Reduction Committee](#) Training Materials on Experimental Design and Statistical Analysis.

A new website to provide modelling concepts, methodologies and data to reduce, refine or replace animals used in medical science. <sup>(3)</sup> [www.bath.ac.uk/mech-eng/ark/index.html](http://www.bath.ac.uk/mech-eng/ark/index.html)

#### *ETHITEX*

A new subscription based resource for global ethical tissue and whole animal sharing.

[www.ethitex.com](http://www.ethitex.com)

### **REFINEMENT**

The third of the 3R's – Refinement is any decrease in the incidence or severity of 'inhumane' procedures applied to those animals that still have to be used. <sup>(1)</sup>

There are two key issues:

- To assess the impact of any procedure or condition on the well-being of the animal
- Strategies to eliminate or minimise that impact.

### **General Assessment and Management of Pain and Distress**

#### *Assessment of pain and distress*

Kuiper and Allen have compiled a comprehensive list of literature on the assessment of animal welfare and animal distress. This site offers a diverse range of topics and a variety of species are covered. Topics include: animal pain and distress, management of pain in production animals behaviour, welfare and environmental design, assessing welfare and suffering, assessment of housing systems, response patterns of fish production to stress and crib biting in horses. Species

include: laboratory rodents, cattle, pigs, horses, rabbits, fish, poultry, domestic animals, farmed silver foxes and dogs.

<http://www.vetinfo.demon.nl/aw/index.html>

#### *Recognition and alleviation of pain and distress in laboratory animals*

A comprehensive overview about behaviour, pain, and distress in laboratory animals. The volume explores: (a) Stressors in the laboratory and the animal behaviours they cause, including in-depth discussions of the physiology of pain and distress and the animal's ecological relationship to the laboratory as an environment. (b) A review of euthanasia of lab animals-exploring the decision, the methods, and the emotional effects on technicians. Also included is a highly practical, extensive listing, by species, of dosages and side effects of anaesthetics, analgesics, and tranquillisers.

<http://www.nap.edu/catalog/1542.html>.

#### *Pain management database*

This database includes information about anaesthesia and analgesia for most commonly used laboratory animals, including: rats, mice, primates, dogs, cats, rabbits, pigs, guinea pigs, birds, sheep, fish, and exotic species. It provides information about available drugs and the side effects of commonly used drugs. Citations are from publications that have published laboratory animal studies or human clinical studies with relevance to animal research. This database covers the period 1990 to the present, and is updated quarterly.

[http://www.altwebsearch.org/aadb/aadb\\_search.cfm](http://www.altwebsearch.org/aadb/aadb_search.cfm)

#### *Pain and Distress: Recommended resources*

A comprehensive bibliography of recommended resources pertaining to pain and distress in animal research. The listing includes - peer-reviewed journal articles, books, CD-ROMS, websites and videos and covers topics including definitions, biology of pain and distress, recognition and assessment, alleviation and prevention, philosophical and ethical issues, analgesia and anaesthesia, euthanasia and neonatal and foetal pain.

<http://www.hsus.org/ace/18787>

Strategies to achieve the goal of refinement often need to be customised to a specific set of circumstances. With increasing knowledge and experience, a number of useful guidelines have been developed to assist in minimising the impact of particular procedures and practises. This is an area where knowledge is rapidly expanding. The resources and links below, highlight the latest in these developments.

#### **Administration of Substances**

##### *A Good Practice Guide to the Administration of Substances and Removal of Blood, including Routes and Volumes.*

European Federation of Pharmaceutical Industries Association and the European Centre for the Validation of Alternative Methods. Contains information on administration volumes considered good practice for the mouse, rat, rabbit, dog, marmoset and mini-pig, animal welfare issues with different routes, repeated intravenous infusions and vehicles for administration. Includes an extensive bibliography.

<http://www.eslav.org/efpia.htm>

##### *Refining procedures for the administration of substances*

Morton, D. B.; Jennings, M.; Buckwell, A.; Ewbank, R.; Godfrey, C. Holgate, B.; Inglis, I.; James, R.; Page, C.; Sharman, I.; Verschoyle, R; Westall, L.; Wilson, A. B.

<http://www.lal.org.uk/pdf/files/refinement.pdf>

## **Blood Collection**

### *Removal of blood from laboratory mammals and birds*

This is the first report of the BVA/FRAME/RSPCA/UFAW joint working group on refinement. Each workshop was intended to address a single topic, the proceedings being published in the scientific press. This report, is the first of the series. It aims to describe in detail, the most humane methods for taking blood samples from the common laboratory animal species. Methods of venepuncture are described for the following animals: cats, cattle, chickens, dogs, ferrets, gerbils, goats, guinea pigs, hamsters, horses, marmosets, mice, pigs, rhesus, rabbits, rats and sheep.

<http://www.lal.org.uk/pdf/BLOOD.PDF>

### *Refinement of blood sampling techniques*

The following papers are from *Laboratory Animals* 32(4) 1998.

- *Saphenous vein puncture for blood sampling of the mouse, rat, hamster, gerbil, guineapig, ferret and mink.* A. Hem, A. J. Smith & P. Solberg. This method is described for blood collection from the lateral saphenous vein. It allows rapid sampling, which if necessary can be repeated from the same site without a need for new puncture wounds. The method is a humane and practical alternative to cardiac and retro-orbital puncture, in species where venepuncture has traditionally been regarded as problematic.
- *Refinement of blood sampling from the sublingual vein of rats.* W. Zeller, H. Weber, B. Panoussis, T. Bürge & R Bergmann. A refined method of repeated blood sampling in rats is described in this report.

The papers shown above can be accessed from <http://www.lal.org.uk> Go to on-line reprints/working party reports and guidelines to download these reports.

### *Blood collection using the saphenous vein*

A method is described for blood collection from the lateral saphenous vein. This enables rapid sampling, that if necessary can be repeated from the same site without a need for new puncture wounds. It is a humane and practical alternative to cardiac and retro-orbital puncture in species such as mouse, rat, hamster, gerbil, guinea pigs, ferret and mink. Description and slides of technique can be viewed at [http://www.uib.no/vivariet/mou\\_blood/Blood\\_coll\\_mice.html](http://www.uib.no/vivariet/mou_blood/Blood_coll_mice.html)

### *Blood collection using the facial vein*

A method is described for blood collection from the mandibular facial area. [http://www.medipoint.com/html/directions\\_for\\_use2.html](http://www.medipoint.com/html/directions_for_use2.html)

### *Blood sampling in sheep*

A detailed description of collecting blood samples from the jugular vein including a series of illustrations. Can be downloaded in PDF format.

<http://www.agcom.purdue.edu>

The Animal Research Review Panel Guidelines on [Blood Collection](#) that can be found at the link to NSW Research Procedures under Policies and Guidelines, outlines specific strategies to achieve the goals of refinement when using these methods. <sup>(1)</sup>

## **Antibody Production**

### *Information Resources for Adjuvants and Antibody Production: Comparisons and Alternative Technologies*

An overview of adjuvants briefly explains the function of adjuvants; guidelines for use of adjuvants, particularly Freund's adjuvants; and to introduce alternative adjuvants. Topics covered include the need, function, advantages and disadvantages of adjuvants and a list of alternate adjuvants.

<http://www.nal.usda.gov/awic/pubs/antibody/>

### *Canadian Council on Animal Care: Guidelines on antibody production*

Guidelines for production of both polyclonal (pAb) and monoclonal antibodies (mAb) to assist investigators and research support personnel to achieve an acceptable immunological result with minimal discomfort for the animals involved. Selection of the species used for polyclonal antibody production includes; rabbits, chickens, hamsters and guinea pigs. When large volumes of antisera are required, animals used include horses, sheep and goats. Rats and mice are used for monoclonal production with the overall consideration to minimise pain and/or distress to the animals.

<http://www.ccac.ca/english/gdlines/antibody/antibody.pdf>

### *NH&MRC, Guidelines on Monoclonal Antibody Production*

National Health & Medical Research Council (2001). Contains information on Replacement and Refinement of techniques and outlines issues that should be considered in AEC review.

<http://www.nhmrc.gov.au/research/awc/monosyn.htm>

### *Alternatives in Monoclonal Antibody Production (1997)*

The Johns Hopkins Center for Alternatives to Animal Testing (CAAT) has worked with scientists since 1981 to find new methods to replace the use of laboratory animals in experiments, reduce the number of animals tested, and refine necessary tests to eliminate pain and distress. The Centre promotes humane science by supporting the creation, development, validation, and use of alternatives to animals in research, product safety testing, and education.

<http://caat.jhsph.edu/>

### *Monoclonal Antibody Production*

A report of the committee on methods of producing monoclonal antibodies, National Research Council (1999). Includes detailed discussion of the advantages and disadvantages of in vitro and in vivo methods and animal welfare issues relating to the use of the ascites method to produce monoclonal antibodies in mice. Contains an extensive bibliography.

<http://grants2.nih.gov/grants/policy/antibodies.pdf>

### *The Antibody Resource Page*

This is a source of information on antibodies for both researchers and educators and includes information on antibody suppliers, contract antibody services, educational resources, immunology/biotechnology, databases and software and antibody news.

<http://www.antibodyresource.com/>

Further information on how to achieve the goals of Refinement in the NSW Animal Research Review Panel [Guidelines on Monoclonal Antibodies](#) can be found at the link to Research Procedures under Policies and Guidelines at the NSW Animal Ethics infolink site.

## **Behavioural Experiments**

### *Methods and Welfare Considerations in Behavioural Research with Animals*

This handbook is useful to the researcher who is considering different methodologies for behavioural experiments. The report contains chapters on manipulation of access to food or fluids; experimental enclosures/physical restraint; pharmacological studies; aversive stimuli; social variables; ethological approaches; and teaching with animals. An introductory chapter reviews the contributions of behavioural research to understanding a variety of medical and psychological problems, such as stress, cognitive deficits with aging, behavioural problems stemming from early deprivations, sleep disorders and pain.

<http://www.nimh.nih.gov/research/animals.cfm>

### *Guidelines for Ethical Conduct in the Care and Use of Animals*

Developed by the American Psychological Association's Committee on Animal Research and Ethics (CARE) for use by psychologists working with non-human animals.  
<http://www.apa.org/science/anguide.html>

### *Guidelines for the Care and Use of Mammals in Neuroscience and Behavioural Research*

This new book provides current best practices for animal care and use and discusses how the regulations and guidelines can be applied to neuroscience and behavioural research. The book treats the development, evaluation, and implementation of animal-use protocols as a decision-making process, not just a decision. It encourages the use of professional judgment and careful interpretation of regulations and guidelines to develop performance standards that ensure animal well-being and high-quality research.

Material covered includes ethical considerations, protocol development strategies including pilot studies, sample size, pain and distress and humane endpoints, prolonged survival studies, studies of neural injury and disease, and perinatal and behavioural studies.

Copies may be purchased from [National Academies Press](#).

## **Environmental enrichment**

*General principles and information on enrichment* <sup>(2)</sup>:

<http://www.dpi.qld.gov.au/animalwelfare/9944.html>

### *Refinement of Housing and Handling Conditions and Environmental Enrichment for Laboratory Animals (including database)*

Primates, rodents, rabbits, cats, dogs, ferrets, farm animals, horses, birds, fish, amphibians and reptiles. [http://www.awionline.org/lab\\_animals/biblio/laball.htm](http://www.awionline.org/lab_animals/biblio/laball.htm)

### *Environmental Enrichment Information. Resources for Laboratory Animals 1965-1995*

A joint project of AWIC and UFAW; covers birds, cats, dogs, farm animals, ferrets, rabbits and rodents.

<http://www.nal.usda.gov/awic/pubs/enrich/intro.htm/>

### *Primate Info Net*

The University of Michigan, National Primate Research Centre, hosts this site. It contains publication search for alternatives, enrichment and other primate care, fact sheets and the option to subscribe to an on line forum. Primate Lit is a recommended bibliographic database.

<http://pin.primate.wisc.edu/infoserv/forums/pef/>

### *The Shape of Enrichment* <sup>(2)</sup>

Particularly wildlife and exotic animals:

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

## **Euthanasia**

### *Euthanasia Working Party Report – Part 1 and 2 (1996)*

This report was produced to assist personnel in assessing which method of euthanasia is the most humane and appropriate for the species of animals that are being used.

There are three main sections to this report. Section 1 deals with legislative requirements. Section 2 provides information on methods of euthanasia used for vertebrates and section 3 covers groups of species such as fish, reptiles, rabbits, rodents, birds, carnivores, large mammals, exotics and primates.

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

*Humane Society- review of carbon dioxide use for euthanasia (and anaesthesia) 2002*

[http://www.hsus.org/animals\\_in\\_research/pain\\_distress/concerns\\_about\\_carbon\\_dioxide\\_use\\_in\\_euthanasia\\_and\\_anesthesia/](http://www.hsus.org/animals_in_research/pain_distress/concerns_about_carbon_dioxide_use_in_euthanasia_and_anesthesia/)

*ANZZCART news December 2004 and review of carbon dioxide use for euthanasia of rodents:*

<http://www.adelaide.edu.au/ANZCCART/news/AN%2017.3.pdf>

*Report of the American Veterinary Association Panel on Euthanasia (2000)*

From the Journal of the Veterinary Medical Association, 218: 669-696. The recommendations in this report are intended to give veterinarians guidance in relieving pain and suffering of animals that are to be euthanased. Information is given on euthanasia of animals in research and animal care and control facilities. Expanded information on exothermic, aquatic and fur-bearing animals and added information on horses and wildlife are some of the issues covered in this report. Special considerations are given to equine euthanasia and to non-conventional species in zoos, as well as amphibians, fish, reptiles, marine animals and birds.

<http://www.avma.org/resources/euthanasia.pdf>

*Victorian Code of Practice for the Housing and Care of Laboratory Mice, Rats, Guinea Pigs and Rabbits<sup>(5)</sup>*

[www.dpi.vic.gov.au/animalwelfare/](http://www.dpi.vic.gov.au/animalwelfare/) and go to codes of practice or scientific procedures

## **Housing and Husbandry**

*Refining rodent husbandry: the mouse*

This report is the third in the workshop series. It describes ways in which existing husbandry and care of mice can be improved with the emphasis on providing environments that allow animals to express a wide range of behaviours.

<http://www.lal.org.uk/pdf/files/lab1566.pdf>

*Refinements in rabbit husbandry*

Second report of the BVA/FRAME/RSPCA/UFAW joint working group on refinement. This report describes ways in which the current systems of housing rabbits can be improved by group housing or by enriching the environment of individual cages.

<http://www.lal.org.uk/pdf/files/RABbit.PDF>

*Annotated Database on Refinement of Housing and Handling Conditions and Environmental Enrichment for Laboratory Animals The Animal Welfare Institute is a non-profit organisation based in Washington.*

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

*Victorian Code of Practice for the Housing and Care of Laboratory Mice, Rats, Guinea Pigs and Rabbits<sup>(5)</sup>*

[www.dpi.vic.gov.au/animalwelfare/](http://www.dpi.vic.gov.au/animalwelfare/) and go to codes of practice or scientific procedures

## **Humane Endpoints**

*Pain Management and Humane Endpoints Workshop and Database*

<http://altweb.jhsph.edu/topics/humane-endpoints.htm>

*Humane Endpoints in laboratory animal experiments CD ROM<sup>(6)</sup>*

This is an excellent interactive CD ROM for education and training purposes that was presented at the 5<sup>th</sup> world congress for Alternatives in the life sciences. For further information:

[C.F.M.Hendriksen@vet.uu.nl](mailto:C.F.M.Hendriksen@vet.uu.nl)

### *Pain & Distress Report*

A quarterly newsletter published by the Humane Society of the United States. This is a valuable resource for researchers, members of AEC's, and animal care personnel. It provides current information on issues relating to the assessment and relief of pain and distress including summaries of recent developments in policies and perspectives, articles from the technical and scientific literature, publications, resources, services, upcoming conferences and web sites.

[Download copies of the newsletter, including back issues.](#)

### *Humane Endpoints for Animal Experiments for Biomedical Research*

Proceedings of the 1998 International conference held in the Netherlands. Edited by Coenraad Hendriksen and David Morton, contents include: human neonates and pain; criteria for humane endpoints; an applied approach to the assessment of severity; practical use of distress scoring systems; relating criteria for humane endpoints to objectives; and discussions of issues in toxicity testing, cancer research, vaccine production and re-use of animals.

[Download copies of the proceedings.](#)

### *Pain Management and Humane Endpoints.*

An information resource published by the Animal Welfare Information Centre (USDA) which includes a discussion paper on setting acceptable endpoints in invasive experiments, assessment and alleviation of post-operative pain, guidelines for euthanasia of mouse and rat fetuses and neonates and an extensive bibliography. Copies can be download from:

<http://www.nal.usda.gov/awic/pubs/IACUC/pain.htm>

### *Canadian Council on Animal Care*

*Guidelines for choosing appropriate endpoints in experiments using animals for research, teaching and testing (1998).* The purpose of this document is to present guidelines for selecting an endpoint that reduces animal pain and/or distress in laboratory animals, while still satisfying the experimental design requirements for objective evaluation when animals are used in biomedical research, teaching and testing. These guidelines should be used as a guide to the ongoing process of refinement in animal experimentation.

[http://www.ccac.ca/english/gui\\_pol/gdlines/endpts/app9to10.htm](http://www.ccac.ca/english/gui_pol/gdlines/endpts/app9to10.htm)

### *Organisation for Economic Co-operation and Development (OECD).*

The purpose of this Guidance Document is to apply the principles of the Three Rs to the use of animals in regulatory toxicity tests. This document is a guide to the recognition, assessment, and use of clinical signs as humane endpoints for experimental animals used in safety evaluation. The general principles contained in this document are specifically designed to be applicable for all mammalian species used in toxicity testing and other experimental studies.

[http://www.olis.oecd.org/olis/2000doc.nsf/LinkTo/env-jm-mono\(2000\)7](http://www.olis.oecd.org/olis/2000doc.nsf/LinkTo/env-jm-mono(2000)7)

## **Induction of Tumours**

### *UKCCCR Guidelines for the Welfare of Animals in Experimental Neoplasia*

Animals with local or disseminated tumours are likely to experience pain and/or distress, thus justifying special care and attention. Associated techniques including surgical preparation, irradiation and drug administration may increase the severity of an experimental procedure. Recognising this, the United Kingdom Coordinating Committee on Cancer Research (UKCCCR) in 1988 set up an ad hoc committee to develop guidelines for research workers using animals in experimental neoplasia. A second revision of these guidelines was published in July, 1997.

<http://www.ncrn.org.uk/Csg/publications.htm>

### *FDA –Center for Drug Development and Research - Oncology Tools*

Oncology Tools contains a variety of information related to cancer and approved cancer drug therapies. To make it easier for consumers and patients to obtain information about different types of cancer and treatment, this web page can be searched by specific types of cancer and by

approved drug therapies. Clinical trials and patient support groups are also available on this site.  
<http://www.fda.gov/cder/cancer/>

## **Surgical Care**

### *Guidelines on Rodent Survival Surgery*

National Institutes of Health Intramural Program. Outlines operative procedures as well as issues which need to be considered in pre-operative planning and post-operative management, includes helpful information about disinfectants, instrument sterilization and suture selection.

<http://oacu.od.nih.gov/ARAC/surguide.htm>

### *Applying principles of Aseptic Surgery to Rodents.*

AWIC Newsletter, Vol.4, No.2, pp3-6. Terry Cunliffe-Beamer

<http://www.nal.usda.gov/awic/newsletters/v4n2/4n2.htm>

### *Rodent Surgery*

Application of aseptic technique and peri-operative care. Nicole Duffee

[http://dcminfo.wustl.edu/education/rodent\\_surgery\\_ho.doc](http://dcminfo.wustl.edu/education/rodent_surgery_ho.doc)

## **Animal Models in Biomedical Research (see also GM/cloned animals)**

### *Model animals for biomedical research.*

This is a web site that has been developed by the National Institutes of Health and provides information about national and international activities and major resources that are being developed to facilitate biomedical research using the animal models listed here. Species include mouse, rat and non-mammalian models in the round worm fruit fly, zebra fish and frog.

<http://www.nih.gov/science/models/>

### *European mouse Mutant archive (EMMA)*

[www.emma.rm.cnr.it/](http://www.emma.rm.cnr.it/)

### *Zebrafish International Resource Centre*

[www.zfin.org](http://www.zfin.org)

## **Genetically Modified / Cloned Animals**

*NHMRC Guidelines for the creation, breeding, care and use of genetically modified and cloned animals for scientific purposes.*

Pending

### *Guidelines for Transgenic Research*

Canadian Council on Animal Care- guidelines for transgenic animals are provided: to assist Animal Care Committee (ACC) members and investigators in evaluating the ethical and technological aspects of the proposed creation, care and use of transgenic animals.

[http://www.ccac.ca/english/gui\\_pol/gdlines/transgen/transge1.htm](http://www.ccac.ca/english/gui_pol/gdlines/transgen/transge1.htm)

### *Transgenic animal web* <sup>(7)</sup>

This site has links to useful resources. It has been developed by the University of Michigan and includes a very useful guide to searching the web for mouse models of human disease and genetically altered mouse strains.

<http://www.med.umich.edu/tamc/links.html>

### *Gene Knockout Database* <sup>(7)</sup>

[www.bioscience.org](http://www.bioscience.org)

### *Mouse Genome Informatics, Jackson Laboratories* <sup>(7)</sup>

[www.informatics.jax.org](http://www.informatics.jax.org)

*MRC Mammalian Genetics Unit* <sup>(7)</sup>

[www.mgu.har.mrc.ac.uk](http://www.mgu.har.mrc.ac.uk)

*The Mouse Transgenic List* <sup>(7)</sup>

[www.med.ic.ac.uk/db/dbbm/tglist.htm](http://www.med.ic.ac.uk/db/dbbm/tglist.htm)

*The Mouse Catalogue* <sup>(7)</sup>

[www.rodentia.com/wmc/index.html](http://www.rodentia.com/wmc/index.html)

*NetVet Information Services* <sup>(7)</sup>

<http://netvet.wustl.edu/>

*Refinement and reduction in production of genetically modified mice*

This is the sixth report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement and is published as a supplement to *Laboratory Animals* (Volume 37, Supplement 1, July 2003). This fifty-page report covers the techniques and stages involved in the production of GM mice, tissue biopsy techniques, identification methods, assessment of animal welfare, reducing the numbers of surplus mice, and strategies to refine these procedures.

For further information go to <http://www.lal.org.uk>, follow the links to 'journals' then 'on line' and 'contents'.

*Refinement in the collection of tail tissue for genotyping*

Monash University has a practical protocol that includes promoting the collection of tissue by less invasive methods than tail tipping. Such methods include ear notching and buccal mucosal cell swabbing.

<http://www.monash.edu.au/research/ethics/animal/regguide/muawc.html>

## **Wildlife including aquatic animals**

*NSW Ethics Infolink*

This site provides some very practical guidelines for captive wildlife, wildlife surveys, trapping and radio tracking, collection of voucher specimens, opportunistic research on free living wildlife and use of feral animals in research.

<http://www.animaletics.org.au/reader/6>

*Guidelines on the care and use of wildlife*

Canadian Council on Animal Care - a 65-page document covering issues relating to field studies, collecting vertebrates, restraint, marking, medical and surgical procedures, transport and housing, euthanasia and human safety. <http://www.ccac.ca>

*Guidelines on the care and use of fish*

Canadian Council on Animal Care - these guidelines on the care and use of fish in research, teaching and testing cover a wide range of issues including the special requirements for the management, operation and maintenance of facilities and water supply. Quality monitoring capture and transport of fish, husbandry, health and disease and experimental procedures such as surgery, administration of substances, collection of body fluids and euthanasia are also covered. Copies can be downloaded from the following website.

<http://www.ccac.ca>

*Fish welfare*

A briefing paper prepared by the Fisheries Society of the British Isles which includes sections on how fish respond to natural stressors and assessing fish welfare.

<http://www.le.ac.uk/biology/fsbi>

*Guidelines for the Use of Live Amphibians and Reptiles in Field Research*

<http://199.245.200.110/pubs/herpcoll.html>

*Guidelines for the Use of Fish in Field Research (2004)*

A policy regarding the use of fish in field research that includes all phases of handling fish. Published by the American Institute of Fishery Research Biologists and the American Society of Ichthyologists and Herpetologists. Copies can be downloaded from:  
[http://www.fisheries.org/html/Public\\_Affairs/Sound\\_Science/Guidelines2004.shtml](http://www.fisheries.org/html/Public_Affairs/Sound_Science/Guidelines2004.shtml)

*Guidelines for the Capture, Handling and Care of Mammals*

The objective of these guidelines is to identify field methods in mammalogy that meets standards of the American Society of Mammalogists, the oldest scientific organisation devoted to the study of mammals.

<http://www.mammalsociety.org>

*Guidelines for the Use of Wild Birds in Research*

These Guidelines are formulated with consideration of animal welfare and research needs.  
<http://www.nmnh.si.edu/BIRDNET/GuideToUse/index.html>

*Live Animal Capture and Handling*

Guidelines for wild mammals, birds, amphibians and reptiles  
<http://srmwww.gov.bc.ca/risc/pubs/tebiodiv/capt/index.htm>

*NSW Animal Research Review Panel Guidelines on Wildlife Research*

The NSW Animal Research Review Panel Guidelines on Wildlife Research outlines specific strategies to achieve the goals of refinement when using these methods. The guidelines can be found at the Animal Ethics infolink under [Policies and Guidelines](#).

WildPro (Wildlife Information Network), Wildlife and Ecology Studies Worldwide, Fish and Fisheries Worldwide, Aquatic Sciences and Fisheries Abstracts (AFSA) and Zoological Records may also be useful for information and literature searching.

## **SOME ON LINE JOURNALS AND NEWSLETTERS**

A number of journals and newsletters are available on-line, either as full text articles or as abstracts or indexes. The following sites publish information that relates to the care and use of animals for scientific purposes, including the 3Rs. <sup>(1)</sup>

Furthermore, the emergence of 'open access' publications where a complete version of the journal is available on line with free access and unrestricted distribution rights, ensures that research papers can be read by anyone from the day they are published <sup>(9)</sup>. See [www.earlham.edu/~peters/fos/overview.htm](http://www.earlham.edu/~peters/fos/overview.htm) and Biomed Central: [www.biomedcentral.com/independent/starting](http://www.biomedcentral.com/independent/starting)

*Animal Welfare*

UFAW (Universities Federation for Animal Welfare) publish this subscription only. It has various 3Rs special editions.  
[www.ufaw.org.uk/](http://www.ufaw.org.uk/)

*ANZCCART News*

Published since 1988; complete index on-line. Full published on-line since September, 1999.  
<http://www.adelaide.edu.au/ANZCCART>

*Animal Welfare and Technology*

Journal of the Institute of Animal Technology and the European Federation of Animal Technologists (IAT previously published Animal Technology). List of contents available on-line. <http://www.iat.org.uk>

*ATLA (Alternatives to Laboratory Animals)*

Published by FRAME; index to current issue available on-line.

<http://www.FRAME.org.uk>

*AWIC Bulletin*

First published in 1990; full text and all back issues available on-line.

<http://www.nal.usda.gov/awic/newsletters/awicnews.htm>

*Contemporary Topics and Comparative Medicine*

Published by the American Association for Laboratory Animal Science (AALAS). Free on-line access to abstracts and index for Contemporary Topics from volume 32 (1993) and Comparative Medicine from volume 50 (2000). Full articles available by subscription.

<http://aalas.org>

*ILAR Journal – (previously ILAR News)*

PDF files of articles are available on-line from volume 38, (1997).

<http://dels.nas.edu/ilar/>

*IVIS (International Veterinary Information Services)*

The IVIS website provides free access to original, up-to-date publications organised in electronic books each edited by highly qualified editors: proceedings of veterinary meetings; short courses; continuing education (lecture notes, manuals, autotutorials and interactive websites); an international calendar of veterinary events; image collections, and much more with the help of private and corporate sponsors. International Veterinary Information Service (IVIS) is a not-for-profit organisation established to provide information to veterinarians, veterinary students and animal health professionals world wide. On-line texts of particular interest include:

- Recent Advances in Anaesthetic Management of Large Domestic Animals (E.P.Steffey)
- Recent Advances in Anaesthetic Management: Companion Animals (R.D.Gleed & J.W.Ludders)
- Zoological Restraint and Anaesthesia (D.Heard)
- Laboratory Animal Medicine and Management

<http://www.ivis.org/default.asp?CK=0>

*Journal of Applied Animal Welfare Science*

Table of contents and abstracts available on-line from volume 1 (1998). The site also has a search capability for journal articles.

<http://www.psyeta.org/jaaws/index.html>

*Lab Animal*

Lab animal is a peer-reviewed journal emphasising proper management and care. Editorial features include animal models, breeding and research methods, animal care and nutrition, personnel and facility management, facility design, education and training and new equipment. Some articles available on-line. Search capability for full index from 1972.

<http://www.labanimal.com>

*Laboratory Animals*

Published by Laboratory Animals Ltd (UK). Access to articles on-line available to subscribers. Free access to abstracts and index of issues since January 2001 (vol 35) available at:

<http://www.catchword.co.uk/rsm/00236772/contp1-1.htm>

*Scandinavian Journal of Laboratory Animal Science*

Publication of the Scandinavian Society for Laboratory Animal Science (Scand-LAS) Online access to abstracts and index from 2001, (volume 20) can be found at: <http://biomedicum.ut.ee/sjlas/index.html>

### **SOME PRIMARY REFERENCE SOURCES**

1. NSW Ethics Infolink: <http://www.animaethics.org.au/reader/6>
2. Qld DPI Ethics website: <http://www.dpi.qld.gov.au/animalwelfare/10185.html#7>
3. NZ NAEAC newsletter
4. ANZCCART: <http://www.adelaide.edu.au/ANZCCART/>
5. Victorian Bureau of Animal Welfare: [www.dpi.vic.gov.au/animalwelfare/](http://www.dpi.vic.gov.au/animalwelfare/)
6. 5<sup>th</sup> World Congress for Alternatives & Animal Use in the Life Sciences. Berlin 2005
7. Australian Code of Practice for the Care and Use of Animals for Scientific Purposes 2004
8. Hart L.A et al. Effective searching of the scientific literature for alternatives: search grids for appropriate databases: *Animal Welfare* 2005, 14:287-289
9. Smith A.J. and Allen T. The use of databases, information centres and guidelines when planning research that may involve animals. *Animal Welfare* 2005, 14:347-359