

Third World Congress on Alternatives and Animal Use in the Life Sciences

The Third World Congress held in Bologna, Italy from 29 August to 2 September, 1999 was an excellent meeting, well-organised, with a very comprehensive scientific program. It was attended by about 700 delegates, drawn from 39 countries. The host was the European Centre for the Validation of Alternative Methods (ECVAM), part of the Joint Research Centre at Ispra in northern Italy, established by the European Commission. Its Director, Professor Michael Balls, was co-Chairman with Dr Andrew Rowan, Senior Vice-President of the Humane Society of the USA. Dr Rowan will co-chair the Fourth World Congress, to be held in Boston, USA in August, 2002.

Apart from the benefits of scientific and social interaction at a large conference such as this, a very significant outcome was the adoption by delegates of the

Declaration of Bologna, at a special session held in the University of Bologna on 31 August, 1999. The charter was later signed by conference delegates.

In summary, the Declaration

The participants in the Third World Congress on Alternatives and Animal Use in the Life Sciences strongly endorse and reaffirm the principles put forward by Russell and Burch in 1959. Humane science is a prerequisite for good science, and is best achieved in relation to laboratory animal procedures by the vigorous promotion and application of the Three Rs. The Three Rs should serve as a unifying concept, a challenge, and an opportunity for reaping benefits of every kind — scientific, economic and humanitarian..

stated that: ANZCCART's motto is *humane science* and it strongly endorses these principles.

Australia and New Zealand were well represented among the delegates and featured prominently in the scientific program. This reflected our active involvement in the previous two World Congresses (in Baltimore and Utrecht) and in the preparation of the program for this Congress.

The Congress was held over four days, with a plenary session at the beginning and end of each day, interspersed with papers on five concurrent themes:

- A — the development of replacement alternative methods;
- B — the validation and regulatory acceptance of alternative test methods;
- C — reduction alternatives and application of the Three Rs to biologicals;
- D — the refinement of animal procedures; and
- E — education, ethics and databases.

In addition, there were 26 workshops, covering all of the above themes. Many of the workshops involved the point-counterpoint approach, using two speakers giving different points of view on the subject, with interaction from the audience and responses from the speakers.

A special feature of the Congress was the presence of Professor William Russell, co-author with Mr Rex Burch of *The Principles of Humane Experimental Technique*. This year marked 40 years since its publication by UFAW in 1959. It was reprinted in 1992 and is available from ANZC-CART's Adelaide office.

Much of the emphasis in the program was on toxicology and the validation and international harmonisation of alternatives to animal use, particularly in testing of pharmaceuticals and of vaccines. This reflects the large numbers of animals used in these areas, particularly in Europe and North America.

Two of ANZCCART's Australian Board members attended — the Chairman, Professor Mike Rickard and Professor David Mellor, as well as the Director, Dr Robert Baker. Two members of Council, Dr Peter Penson (Victoria) and Associate Professor Margaret Rose (NSW) also attended, as did Dr David Bayvel, a former member of the ANZCCART New Zealand Board. Professor Mellor is Vice-Chairman of the New Zealand Board.

Professor Mellor gave a plenary address on *Learning from refinement techniques applied at low and high levels of noxiousness*, which discussed the effects of experimental manipulations on animals in terms of the types of suffering they can cause. He

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addressed the ethical duty to apply refinement techniques which minimise suffering and provided examples drawn from his own research experience.

Dr Baker gave three papers, chaired a platform session and co-chaired a workshop on the very topical and controversial question, whether cats and dogs should be used as laboratory animals. This comprised two points of view, from Ms Martha Armstrong, Vice-President of the Humane Society of the US and Associate Professor Rosemarie Einstein from the University of Sydney. This workshop attracted about 90 delegates and generated an interesting discussion.

Dr Baker spoke on the following topics:

- *Regulation and classification of the use of animals for scientific purposes in Australia.*
- *Outreach to scientists on the Three Rs in Australia and New Zealand: the role of ANZCCART; and*
- *Careful how you hold me: a new CD/Rom training package for biomedical institutions in Australia and overseas (given on behalf of Dr Lyndall Scott of the University of Melbourne).*

Associate Professor Margaret Rose gave a paper on *Processes and outcomes of animal ethics committees: a review of the Australian experience.*

The Proceedings of the Congress will be published.

A significant outcome of the Congress was the very positive recognition expressed by overseas colleagues, that animal ethics and the principles of replacement, reduction and refinement are taken very seriously in Australia and New Zealand. ANZCCART's activities, particularly *ANZCCART News* and its conference proceedings, were also recognised as valuable reinforcements of these issues.

This was confirmed by very supportive comments from Professor Russell.

DNA sequence similarity: where is the baseline?

The question of DNA similarity as a measure of the similarity of species is now often quoted, particularly in regard to the great apes, in which there is a nucleotide sequence similarity of 98.6% between *Pan troglodytes* and *Homo sapiens* (see Penny, this issue). However, in making such a comparison, some estimate of the baseline of DNA similarity for the group of organisms, in this case the mammals, should be considered. The baseline of sequence similarity for the great apes is so high as to justify at least chimpanzees, gorillas and humans being in a single genus. I favour the name *Pan* for this genus, but anthropomorphic considerations will probably favour *Homo*.

The next obvious question is: how does the baseline fall away with diversion from the higher apes? The first major changes in the DNA will be in the highly repetitive DNA sequences, called Cot-1 DNA because of an annealing characteristic, which comprise about 20-30% of the mammalian genome. There is no apparent sequence similarity of Cot-1 DNA between humans and cattle, sheep, goats, deer, pigs, rats and mice (Webb, unpublished). So it must be assumed that, as speciation progresses, changes to the sequences of Cot-1 DNA are relatively rapid, leading to apparently zero similarity of this DNA between different genera of mammals, and a lowering of the baseline similarity by about 25%.

The next-largest amount of DNA is the non-coding DNA, consisting of regions flanking the genes and spacers, called introns, which would be expected to vary considerably so that probably about 20% similarity is all that can be expected between widely different species. About 65% of the total DNA

is non-coding, so the baseline of similarity between mammals would drop by $0.8 \times 0.65 = 52\%$, to around 23%.

The remaining 10% of the

DNA is in continuous sequences, called exons, which encode the amino acid sequence of proteins, and, to a much lesser extent, non-translated RNA in the ribosomes and at the telomeres of the chromosomes. There being only 20 amino acids and 64 possible codons of three base pairs, or triplets which encode each amino acid, the genetic code is redundant: three of the amino acids are each encoded by six possible codons and only two are encoded by one codon. There can be little variation in the amino acid sequence if proteins in quite widely differing organisms can function similarly, and the redundancy of the code is not applied randomly: particular codons are usually highly favoured for the amino acids encoded by multiple codons. This apparent conservation of DNA sequence leads to the interesting phenomenon of similar DNA sequences encoding the same enzyme proteins or the same anatomical structures in organisms as widely different as fruit flies and humans; with which the author has been occasionally involved (Campbell et al., 1997; Kamei et al., 1998).

Code redundancy and small variations of amino acid sequence lead to the coding DNA of mammals differing by as much as 20%, dropping the baseline of similarity between mammals slightly, by $0.2 \times 0.1 = 2\%$, to a final baseline of around 21%.

It should be noted that the residual 21% similarity in DNA sequence between mammalian genera is largely in the genetically important coding DNA, with most of the difference in sequence in the DNA which is "junk" in genetical terms.

So the question of whether a 99% similarity of DNA sequence is an important character in determining relationship to humans is debatable depending on which type of DNA is in question. The most important, coding DNA, is at least 80% similar for all mammals, which makes a more than 99% similarity of chimpanzee-human seem

less significant than might be assumed from comparison of the whole DNA of differing mammals. By comparison, a couple of "guesstimates" for the similarity of coding region DNA between cattle and humans would be 90-95%, and for human-mouse the similarity would be 80-90%.

The author apologises for the broad ranges of his figures but hopes that they will encompass the whole range of mammalian genera and make allowance for the current literature in the field frequently varying with new developments.

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Humanity and the great apes

Please may I have an iced coffee? - the request came over the voice synthesiser. No, not from Stephen Hawking working on black holes and the origin of the universe. Instead, the request was from Panbanisha, a bonobo (pygmy chimpanzee) who is working in a laboratory study at Georgia State University in Atlanta. Panb-anisha is not the only ape who has learned to use a voice synthesiser; she is already teaching her year-old son Nyota to use it. In addition, an orangutan, Chantek, who already is proficient with a vocabulary of 2000 words in Ameslan (American Sign Language), is using a voice synthesiser in a separate study.

The voice synthesiser has a keyboard with 400 symbols, some representing simple names such as “apple”, others concepts such as “good” or “help”. The keys have to be pressed in the correct order to make meaningful sentences. Communication certainly occurs. Panbanisha’s mother (Matata) can’t use the keyboard, but communicates in sign language to her daughter who passes on the message. Panbanisha watches a video and discusses it with the human researchers who work with her.

The scientific questions

What is happening? Why all the interest? What does it mean that humans and chimpanzees are 99% identical at the protein level? The answer is the breaking down of the philosophy of dualism.

Until the 17th century people assumed a continual gradation from humans to apes to monkeys to other animals, to sensitive plants, to trees, and so on down to rocks. But for the past 300 years Western thought has been dominated by the philosophy of

René Descartes with its rigid distinction between thinking rational humans, and animal automata. The scientific revolution over the past 30 years has shown, as predicted by evolutionary theory, deep similarities between the cognitive abilities of human children and the great apes. More and more researchers are denying the absolute distinction between normal physical matter, and mind matter. The great apes are at least “child-like” in their mental abilities.

Many scientific studies have demonstrated that great apes can be as advanced as human four to five year olds in their mental abilities and emotional make-up. They communicate via sign language and other symbol systems at the level of a young child. They are self-aware (i.e. can recognise themselves in photos and mirrors) and this develops in both humans and chimpanzees at around 15-25 months of age. Suitable intelligence tests for young children (those not requiring a verbal response, for example) show a similar early rate of mental development in humans, chimpanzees and gorillas. Intelligence tests designed for humans can be answered equally well by young apes and young children, which is an amazing result.

Chimpanzees also show theory-of-mind; the ability to imagine others’ thoughts and to act on them. This usually develops in human children around the age of four (greatly improving their ability to deceive others)! They also understand seriation (arranging things in order); conservation of matter (retention of volume irrespective of shape); basic arithmetic (counting and ranking numbers up to nine); and representational art (attempting to depict actual objects).

Furthermore, the great apes exhibit individual personalities, clear cultural differences between populations in the wild and a human-like range of emotions. They display empathy (working out the feelings of another, and acting sympathetically) and other pro-social behaviour similar to the rudimentary moral awareness of 3-6 year old humans. Neuroanatomy studies are similar. In language regions of the brain, chimpanzees have been found to have the same asymmetries that were once thought unique to humans.

None of this should be surprising given what we know of their biological kinship to us. The great apes are in our family, the *Hominidae*, and over the last two years several proposals have included chimpanzees, bonobos and gorillas within our genus, *Homo*. Chimpanzees differ from us in less than one percent of their functional DNA and in barely 1.4 percent of their total DNA. This is similar to the genetic distance between sibling species of other mammals in the same genus.

Putting science into practice

It appears that New Zealand’s new Animal Welfare Act will be the first statute in the world to ban invasive experiments on great apes (chimpanzees, bonobos, gorillas and orangutans). The United Kingdom introduced a similar regulation two years ago banning experiments on great apes as “a matter of morality.” The key difference is that our ban will be cemented in law. It will not prohibit all experiments - just those that are not in the apes’ best interests. In this respect, it comes very close to the protocols used in experiments with human children.

Professor David Penny

This is an historic shift. It acknowledges the special nature of the great apes and also takes the first step toward something that many researchers around the world are calling for — a fundamental change in the legal status of great apes. When great apes are compared to young human children, the differences in mental abilities are smaller and are far outweighed by the similarities. Taken together, the evidence suggests that many of the traits we thought of as “human” are actually “hominid”. We do not see them as “clever critters”, but we need to acknowledge them as special members of our own evolutionary family with appropriate legal status, similar to children.

At present, only humans have legal standing and basic legal rights. The great apes can be — and are — killed with impunity and have no standing in a court of law. They are routinely ill-treated by the entertainment industry, and in invasive biomedical experiments which they and their human advocates are legally powerless to resist. They are also served up as “bushmeat” in European restaurants specialising in African cuisine.

Xenotransplantation

However, a world movement of scientists, philosophers and lawyers under the umbrella of the Great Ape Project is now calling for fundamental change with three categories — human, hominid and other animals. New Zealand's forthcoming ban on great ape experiments is a commendable first step, along with the UK ban and recent US laws for the humane retirement of laboratory chimpanzees. Just like children, great apes would not be subject to the Crimes Act, and so could not be charged with crimes. Clearly, the move to hominid status and rights will be a gradual one, but worldwide it is progressing quite rapidly.

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Hominid Rights Submission:
Professor David Penny *et al.*,
http://www.massey.ac.nz/~imbs/Research/Mo1Evol/Great_Apes.htm

Hominid Rights Submission:
Professor Roger Fouts
<http://www.cwu.edu/~cwuchci/nztext.html>

Britain bans great ape experiments
<http://www.enviroweb.org/gap/news-letters/BtG2extra.html>

Hot topics at the Chimpanzee-Human Communication Institute
<http://www.cwu.edu/~cwuchci/quando.html>

The Great Ape Project International
<http://www.enviroweb.org/gap/gapintroduction.html>

The Bushmeat Project
<http://goldray.com/bushmeat/pan.htm>

It is quite clear that the transplantation of organs and tissue material, in many cases, is a very effective and indeed lifesaving clinical procedure. As the efficiency of transplantation increases, it is becoming apparent that the growing demand for human donors is already inadequate. The alternatives to using human tissues and organs include the development of mechanical substitutes for organs or the use of organs or tissues from species other than man i.e., xenotransplantation.

The scientific and policy issues surrounding xenotransplantation have been discussed widely in the scientific literature but the level of informed public debate in no way matches the complexity of the potential problems. It is worth therefore, summarising these discussion points before dealing in a little more specific detail with the implications of using animals as the source of donor material in human transplantation.

What are the special practical problems in xenotransplantation?

As the situation is now perceived, the acceptance of xenografts requires avoiding the hyperacute rejection mechanisms, a swift complement-dependent phenomenon. This is in addition to the control of immunological rejection that is met by allografts usually by means of the immunosuppression of the recipients. Immunosuppressive strategies when recipients may be exposed to novel pathogens may also be increasing such hazards.

A number of strategies for controlling hyperacute rejection mechanisms are being developed with varying success. They may be summarised as follows.

- Modification of donor tissue. Crucial antigens on donor cells are blocked/masked with appropriate antibodies. Alternatively, tissues are from transgenic animals in which the transgene codes for a molecule that inhibits immune rejection by, for example, inhibiting complement action or by modifying unique target sugars on the surface of the graft. For example, by inserting the gene for the appropriate enzyme, the terminal galactose of a crucial sugar can become a fructose. In this way, the xenoreactive antibodies of the recipient would no longer bind to the cell surface of the graft.
- Modification of the host. Most of the strategies are likely to be based on those used with allografts but they are not readily adaptable to xenografting. There are good reasons why the extensive immunosuppression of xenografts would not be advisable. It has been suggested by Sachs(1997) that a state of tolerance towards crucial xenoantigens might be inducible.
- Physical isolation of grafts. In the transplantation of cells or small aggregates of specific tissue, the main function of which is to release active molecules, e.g., insulin from pancreatic islet cells, it has been found that they can be encapsulated in an inert but permeable coat. The pores of the capsule can be designed such that immune cells and antibodies are excluded but are large enough to allow the release of active molecules, such as insulin, from the surviving islet cells.

Risks to public health following xenotransplantation

It now seems likely that non-human primates will not be used as tissue or organ donors in New Zealand. The advantages of using tissue that is as closely related to humans as possible is seriously outweighed by the additional risks of transmitting simian pathogens. Not only are we faced with the spectre of an HIV-type epidemic, but there are severe practical and ethical reasons why a relatively slow reproducing animal that is close to being an endangered species should not be used as a tissue donor. Pigs are generally regarded as acceptable xenograft donors and encapsulated porcine pancreatic islets have been used in New Zealand in the treatment of type II diabetic patients.

The general risks of xenotransplantation to public health have been discussed widely and the WHO has provided criteria that could be used in developing an exclusion list of infectious agents (WHO, 1998). Such a list would be easy to generate but attention has been drawn to a number of additional factors.

- A number of agents, mainly viruses, may be presumed to be non-transmissible but under the unusual conditions of xenotransplants, they may become adapted to the new human environment;
- Some viruses tend to be highly mutable (e.g., retroviruses and influenza). The milieu of the transplant may present an environment with novel selection pressures or provide a "mixing vessel" for the recombination of viruses.

- Latent non-pathogenic retroviruses may separate and reinsertion into the recipient genome may lead to an increase in virulence that is unique to the new environment.
- One way of increasing the virulence of a pathogen is to passage it through an unusual host. Accordingly, the emergence of a new strain of microorganism with altered characteristics is a factor to which an appropriate risk estimate could be allotted.

It seems clear that the risks of emerging new zoonoses are not zero but how much greater has yet to be established. The screening of patients for animal-derived pathogens is a challenge, particularly as such protocols may have to detect pathogens that may occur with very low frequency and for which tests are not readily available. The United States FDA guidelines may be a standard on which others can be based in the near future. It seems reasonable to link the informed consent of potential xenotransplant recipients with a commitment to a lifetime of screening. Such monitoring of patients may involve the collection and storage of blood samples and graft samples together with the ground rules for involving near relatives and carrying such procedures beyond the duration of research programs.

How much should xenotransplantation be regulated?

According to New Zealand animal welfare legislation, the use of animal tissues must be according to a protocol that has been approved by an appropriate Animal Ethics Committee. Similarly, clinical research or novel procedures require a protocol that has been approved by an accredited Human Subjects Ethics Committee. Such committees are not set up with the expertise that would cover the specialist knowledge required. Also, the terms of reference of these committees do not necessarily lead

to mandatory communication between them.

If any body is charged with protecting the health of the nation, it is the Ministry of Health. Xenotransplantation presents society with complex regulatory, administrative, financial, scientific, ethical and public health issues. These will require the input from a similar range of experts, amongst whom will be animal researchers, veterinarians, clinicians and microbiologists. Such a panel could advise the body that will balance the applications to transplant with the range of advice that may emerge. In the UK, an Interim Regulatory Authority has been devised and a committee will be set up by the FDA in the USA that would have such a function. It is likely that NZ will have a Gene Technology Advisory Committee that will have a similar function.

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Editor's note

See the article "It's a pigs life". *New Scientist*, 4 September 1999, p.18-19.

ANZCCART's Australian Conference 1999

One of the major activities each year of ANZCCART is to hold a scientific conference and to publish the conference proceedings. This year's Australian conference was held on the 26-27 May at the Western Plains Zoo, Dubbo, NSW on the theme *The Use of Wildlife for Research*. This topic was chosen because of the increasing interest in this field and the particular issues which arise. The latest edition of the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* includes a new section on wildlife.

The conference was attended by 125 persons, including scientists, veterinarians, animal welfare officers from universities and State and Territory governments, representatives of animal welfare and animal rights organisations and members of animal ethics committees

The keynote speakers in the opening session were Professor Angus Martin, from the University of Melbourne, on *The view from the far side: attitudes to animals*, Dr Vaughan Monamy, from the University of NSW, on *The ethics of zoology: wildlife research as a case study* and Professor Gordon Grigg from the University of Queensland who discussed how and why wildlife research is conducted, drawing on his own experience. The second session examined wildlife research in the field and in the laboratory and the role of the public in caring for injured or orphaned native animals. It included reference to the section on wildlife in the 1997 edition of the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Session 3 went to the zoo, with Dr Rupert Woods of the Western Plains Zoo, discussing zoo-based re-search in Australia, followed by a paper on zoos as education resources. The session concluded with a tour of the Zoo, which is now well established and a fascinating place to visit. Four case studies were presented in session 4. These examined problems with over-population of koalas, the conservation program for the kakapo, wildlife as reservoirs of human and animal disease and marine mammal disease.

The ethical and scientific issues associated with vertebrate pest management in Australia and New Zealand were addressed by two speakers in session 5, together with a paper from Animals Australia on the importance of reducing animal suffering in vertebrate pest control. The final session was in the style of point-counterpoint, with philosopher Dr Glen Albrecht (University of Newcastle) and a scientist, Mr Dan Lunney, from the NSW National Parks and Wildlife Service, giving their views on the question *Ethics versus science in experimentation on native animals*.

The Conference was of a high quality and has received wide praise. It provided an excellent overview of the subject from speakers expert in their various fields.

The Proceedings will be of particular interest to anyone interested in endemic and introduced wildlife. They will be available in November from ANZ-CCART's Adelaide office for \$20, including postage within Australia, or \$28 outside Australia.

Ethical and welfare implications associated with transgenic animals

Introduction

Transgenic animals are organisms containing integrated sequences of cloned DNA (transgenes), transferred using techniques of genetic engineering (including those of gene transfer and gene substitution). These techniques include pronuclear microinjection, embryonic stem cell manipulation, Cre-lox technique (gene knock-out), use of viral vectors (e.g., retroviruses), cytoplasmic injection, primordial germ cells, nuclear transfer, and spermatogonial manipulation (Mempham *et al.*, 1998). The main methodologies currently in use include microinjection of embryos and targeted mutation (knock-out) of a specific gene. The most common transgenic animal species is the mouse. However, there are also transgenic strains of farm animals such as chickens, pigs, sheep, goats and cattle.

Ethical concerns

The interaction of the transgenic animal with its environment may produce unexpected outcomes. This is of particular concern when the animal is part of the food chain (e.g., transgenic pigs containing additional growth hormone genes), or if it is to be released into the general environment.

Where no naturally occurring animal models exist, creation of a transgenic animal model of a human disease may enable study of disease processes to progress. The creation of mutant animals with increased morbidity or mortality, or reduced breeding ability or lifespan, is problematic, both ethically and in an animal production sense.

Many animals are required in order to construct and analyse

the characteristics (phenotype) of a new transgenic animal strain. The foundation transgenic animals are created using genetic engineering techniques, and further animals are produced by conventional breeding methods for use in subsequent experiments. During conventional breeding, animals which do not possess the required genotype are also produced. Commonly, these animals are unsuitable for use in other projects or other purposes, and unlike the common non-transgenic animal strains, they are less likely to be of general use to other investigators. They are killed, resulting in increased animal wastage.

Opportunities for reduction of animal use

Transgenic animals which are better models for the study of a gene, a biological process or a human disease may replace a previous animal model. This may enable statistically analysable data to be collected using fewer animals.

The creation of a better animal model may also enable substitution of a species such as a mouse for a non-human primate in some situations (e.g., polio vaccine testing, Alzheimer's Disease research) (Gordon, 1997).

Creation of unexpected phenotypes

The effects of genetic manipulation are incompletely understood; therefore the impact of the genetic manipulation on the physiology and well-being of the individual is unknown.

The characteristics of the transgenic animal are frequently found to differ from those anticipated. This arises due to limitations in control of the insertion

of the DNA which are inherent in some techniques (e.g., microinjection). In other situations it is attributed to the unexpected interaction of the introduced DNA with other genes. These interactions vary with the genetic background, as has frequently been observed with mice (Gordon, 1997).

Pathological effects

Uncontrolled expression of inserted genes may result in an increase in morbidity and mortality. This is a problem encountered using microinjection of multiple copies of a gene and resultant overexpression or overproduction of the gene product e.g., growth hormone in mice, cattle and pigs (Mempham *et al.*, 1998).

Replacement or disruption of functional genes with non-functional counterparts (targeted mutagenesis/knockouts) results in failure to produce a functional gene product. This has been performed in mice to create models of human and animal diseases. In situations where disease is created, it is likely that animals suffer to some degree (Mempham *et al.*, 1998).

Monitoring and evaluation of transgenic animal welfare

Some authors avoid the issue of defining and measuring well-being, and concentrate instead on comparing the transgenic animals with non-transgenic animals of the same species. Poole (1995) suggested that transgenic animals should enjoy a quality of life equivalent to ordinary members of their own species. Mempham *et al.*, (1998) recommended comparison of transgenic and non-transgenic offspring using a broad selection of biological responses (physiological, pathological and

behavioural observations), combined with measurement of transgene products and RNA in various body tissues in order to evaluate the transgene for deleterious effects. Transgenic animals should be monitored closely for their entire lifespan, and for two full generations following (Mempham *et al.*, 1998).

Van der Meer *et al.*, (1997) recommended selection of parameters that would be sensitive, non-invasive and easy to determine on a routine basis. Observations recommended were: survival rate, growth; developmental measures (age of onset of incisor eruption, eyes open, hair growth); clinical observations (body posture, coat condition, ocular/nasal discharges); anatomical-pathological observations (organ weights, post-mortem and histopathological findings); and neurobehavioural tests (performed on offspring from birth to weaning, and from weaning to 26 weeks of age).

Dennis (1998) suggested a phenotyping protocol which would be required to be submitted to Animal Ethics Committees for each transgenic mouse line where continued breeding was requested. The data to be supplied included measures of morbidity and mortality, fertility, development, clinical parameters, simple behavioural parameters, necropsy and relevant specialised testing.

Morton (1997) has suggested a scheme for recognising and assessing adverse effects in animals. The score sheet method is applicable to many experimental situations, and would be useful as the basis of a system for monitoring transgenic animals.

The guidelines on transgenic

animals issued by the Canadian Council on Animal Care (1997) recommend *a frequent, reliable, thorough, and documented monitoring system is in place to detect behavioural, anatomical and physiological abnormalities indicative of animals' distress*. These guidelines also suggest provisional or 12 month approval whilst animals are created and phenotyped. Investigators are required to report to the Animal Care Committee on the morbidity and mortality associated with the phenotype. After receiving the report from the investigator, the Committee may approve a further period of scientific use, or may require a modification of the protocol in order to minimise pain or distress. In some cases, perpetuation of the transgenic strain may not be justified.

Requirements of the Australian Code of Practice

The *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* (1997) includes requirements for animal monitoring, both as a general consideration (Section 3.3) and in the specific case of animals where their genetic material has been manipulated experimentally (Sections 3.3.56 and 3.3.57). Although there are many spontaneous or naturally occurring mutant animals which require special ethical or welfare consideration, additional issues apply to those animals which are generated using genetic engineering.

Sections 3 and 4 of the Code specify the responsibilities and requirements associated with uses of transgenic animals. In the case of transgenic farm animals or wildlife, or where transgenic animals are used in teaching, the relevant additional sections of the Code apply. The Code acknowledges that there is potential for any investigation, including genetic manipulation, to impact negatively on animal welfare. Accordingly, the Code specifies the responsibilities to be met by investigators. The

following requirements are drawn principally from section 3:

- to anticipate and monitor for adverse effects, and report them to the AEC;
- to be familiar with species-specific signs of pain or distress;
- to limit pain and distress;
- to justify the creation of animal disease states; and
- to minimise the duration of animal use.

In the case of transgenic mice, animal breeding and holding may form part of a scientific project, or may be performed for the purpose of producing sufficient numbers of animals for use in a subsequent project. Frequently, breeding of transgenic mice for both of these purposes occurs in the same facility, and is performed under the supervision of the investigator. Regardless of the situation under which transgenic animals are being held, the requirements of section 4 of the Code relating to animal care, monitoring and record keeping are to be met by investigators (and animal care staff, if applicable), the institution, and the AEC.

Other requirements of the Code include:

- to provide suitable facilities and environment;
- to monitor for adverse effects, pain and distress, and disease;
- to limit pain and distress;
- to maintain animal acquisition, breeding, health and production records.

Conclusion

Advances in biological science and technology have enabled creation of large numbers of new animal strains, the characteristics of which cannot be fully known in advance of their generation. Ethical and animal welfare concerns have sparked considerable discussion and debate, and requirements for additional moni-

toring and reporting for animals arising as a result of genetic manipulation have increased as a response. Although the details of the monitoring and reporting protocols are ideally tailored to each individual situation, the general principles that relate to all animal use for scientific purposes apply.

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Continued Page 8 -

Transgenic rodents

For a detailed discussion of the practical issues associated with the use of transgenic rodents, see the paper on this subject given by Dr Patrick Hardy, of Charles River - Iffa Credo, France at ANZCCART's Workshop in Melbourne on 21 September, 1998.

It is available free of charge as part of the notes from that workshop and will also soon be available from ANZCCART's website.

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Letter

Ethics and wildlife surveys in State Forests of NSW

In *ANZCCART News*, June 1999, Patrick Prevet from the University of Ballarat encouraged other institutions to publicise their training courses in wildlife research and the ethical use and handling of wild native animals. I am an ecologist with State Forests of NSW (SFNSW) and would like to outline courses dealing with ethics and wildlife research run by this organisation. SFNSW undertakes a very large number of fauna surveys and considerable research every year. In fact, it almost certainly undertakes more wildlife survey and research than any other government body in Australia. Almost every compartment of trees that is to be logged or is designated for logging is intensively surveyed for scheduled fauna and flora species prior to permission being given for logging to go ahead. This is a legal requirement under the Threatened Species Conservation Act in NSW. The survey effort involves working for at least three days in the compartment, undertaking spotlighting, call playbacks, trapping, hair-tubing and bat surveys. All of this is then written up as a detailed report that is placed in the harvesting plan for approval by the NSW National Parks and Wildlife Service.

The need to undertake such surveys first arose in 1992. It was immediately recognised that such a volume of work required a large number of trained SFNSW fieldworkers, as hiring consultants to perform the surveys would be too expensive. To meet this need, SFNSW implemented a program of training courses that have provided staff with the opportunity to develop and upgrade their skills in wildlife surveys and management.

SFNSW runs a basic course over two or three days that covers surveys of vertebrates and

plants. In this introductory course, the various basic survey techniques are first discussed. There are also demonstrations of relevant equipment to show how it works and how to handle it. Lectures and discussions are followed by sessions in the field to provide practical demonstrations and hands-on experience in and with the use of the equipment and how to perform an effective survey. At all times special attention is paid to the potential impacts of surveys on fauna and the effective methods available to reduce these impacts. This includes field demonstrations of how to protect traps from the extremes of weather, how not to lose traps, how to handle captive animals, when and where animals can be released and how animals should be housed if they cannot be released immediately.

The more advanced courses targeting particular groups of wildlife are designed to provide more detailed information and greater field experience on the animals in question. This has included frog and bat survey and identification, feral animal management and nocturnal and diurnal bird surveys. People who are to undertake specific or more difficult types of surveys (eg., trapping for bats or call playbacks for some rare birds) are required to attend and pass the relevant course before they can commence.

Each course is taught by demonstrators who are experts in the relevant fauna group and who have extensive experience in the particular methods discussed. Wherever possible, experts who are external to SFNSW are invited to provide a broad range of perspectives on techniques and to introduce new ideas to people.

To assist the staff being trained, SFNSW has developed a set of protocols detailing the acceptable means of undertaking all the available types of survey techniques

Each technique includes a section on ethical considerations to maximise survey efficiency and to reduce to acceptable levels the stress under which ani-

mals are placed. The protocols have been reviewed by experts from other institutions. Licenses to undertake surveys are eventually issued to staff on the condition that they will follow these protocols. Variations to the listed methods can be made, but only with the approval of the SFNSW Animal Ethics Committee.

It is recommended that staff undertake a refresher course at least every three years or whenever they transfer to a region where the wildlife and survey requirements are likely to be substantially different. This ensures that workers are informed of refinements to techniques and gain experience with new techniques as they come to hand.

It is stressed throughout each of these courses that there is no substitute for experience. Attending and passing a course does not make someone an expert, but provides them with a good starting point on which to base their work. Only time will provide real expertise in the chosen area of survey and we encourage all staff to talk to and accompany recognised experts as often as possible, to continue to develop their skills and gain additional experience under expert guidance.

To my knowledge, there are no other similar courses available within NSW and a growing number of people from other government agencies and educational institutions has attended one of these courses. I hope that this or a similar series of courses will eventually be recognised as a standard minimum level of qualification that wildlife surveyors in NSW need to achieve in order to be allowed to perform wildlife surveys.

Frank Lemckert
Forest Research and Development Division
State Forests of NSW, Sydney

Note Anyone interested in attending one of these courses can contact Mr Lemckert on 02 9872-0159 or E-mail him at frankl@sf.nsw.gov.au

Book review

Ethics into Action: Henry Spira and the Animal Rights Move- ment

by Peter Singer

Melbourne University Press

ISBN 0522 848745

\$29.95 (soft cover)

The quotation from Henry Spira at the beginning of the book, *If you see something that's wrong, you've got to do something about it*, summarises his attitude precisely and is a testament to his long and very effective campaigning as an animal activist in the USA.

This well-written and very readable account of the life of Henry Spira by Professor Peter Singer (late of Monash University and now at Princeton University), was completed a year before Spira's death and reflects a long friendship between the author and his subject. This began in 1973 with the publication of Singer's article *Animal Liberation* in the *New York Review of Books*, which stimulated Spira's interest in improving the welfare of animals used for research and testing.

Henry Spira was born in Antwerp in 1927 in a Jewish family, which arrived in the USA in 1940 from Europe via Panama. Spira became involved with left-wing politics, trade unions and the civil rights movement. He worked as a journalist and then as a teacher, from which he took early retirement in 1982 to focus on helping animals.

Prior to this, he had attended a continuing education course titled *Animal Liberation* given by Peter Singer at New York University. These lectures became the basis for Singer's 1975 book *Animal Liberation*. This course confirmed Spira's view *that animals are at the bottom of the heap, as far as oppression and exploitation are concerned,*

and that they therefore most need our help! This led to a meeting in Spira's apartment, to see what could be done to put the ideas of animal liberation into practice.

The group decided to start with the issue of experiments on animals and realised that the US animal movement, although active for many years, had not had notable successes. The group decided, as their first project, to tackle a sex research study using cats at the American Museum of Natural History. The campaign included demonstrations for over a year and gradually gained media interest. A full-page paid advertisement was run in the *New York Times*. Funding for the study was eventually withdrawn and the project ceased.

The project for which Henry Spira is probably best known is the campaign to stop cosmetic companies testing products on rabbits using the Draize eye test. This test had been widely used across the USA for many years by corporations. Revlon was chosen as the target for the campaign, due to its high profile and its image of beauty. After initial approaches seeking Revlon's support for a research project to develop an alternative test that did not use animals were unsuccessful, a full-page advertisement was run in the *New York Times* under the heading *How many rabbits does Revlon blind for beauty's sake?* The end result was a decision by Revlon to provide substantial funding to support research into non-animal safety tests.

Henry Spira's approach, while dramatic and confrontational, also recognised the need to congratulate Revlon in deciding to work towards ending the suffering of animals for safety testing, rather than continuing to level criticism at it.

Other companies were then targeted and an industry fund was established. This led to the creation of the Center for Alternatives to Animal Testing

(CAAT), with Dr Alan Goldberg as Director, at Johns Hopkins University in Baltimore. CAAT is now well-established, with an international reputation as a leader in this field.

The next target for Spira was the LD50 test, which in the early 1980s was being performed on four to five million animals a year in the USA — many more than were used for the Draize test. Discussions with the pharmaceutical company Smith Kline Beckman led to recognition by the Pharmaceutical Manufacturers Association that the test lacked justification. This was followed by similar statements from other organisations, including the National Society for Medical Research. The issue became public and was discussed on television and a newspaper advertisement was used.

The ethical dilemma for animal activists was that, while the number of animals used by the LD50 test was greatly reduced as a result of the campaign, some animals were still used (and still are used). The development of alternatives to this test was taken up by the multinational chemical and pharmaceutical company Procter and Gamble from 1983. During the years that followed, the fields of alternatives and *in vitro* toxicology blossomed, and the numbers of animals used by various major companies in product testing was greatly reduced.

Singer covers the emergence of new animal-rights groups, such as People for the Ethical Treatment of Animals (PETA) and suggestions by some of Spira's more headstrong colleagues that *he had spent too much time hobnobbing with the enemy*.

The title of chapter 5 is *The Forgotten Animal Issue* and refers to the conditions under which chickens were kept on intensive farms. Spira took up this issue in 1987 and tackled one of the major chicken meat producers in the USA, once again via a full page advertisement in the *New York Times*. This campaign was strongly opposed by the owner of the com-

pany and did not produce a positive outcome, other than raising public awareness of the issue.

While Henry Spira did not advocate violence, other organisations, such as the Animal Liberation Front (ALF) were involved in a spate of militant actions in the USA and in the UK. This approach was publicly opposed by Spira and Singer, who advocated following the principles of non-violence employed by Gandhi and Martin Luther King.

Spira's concern for farm animals was further expressed through campaigns against shackling and hoisting of steers prior to slaughter and against the practice of face branding cattle. Both campaigns were successful. His next campaign was to ask McDonalds restaurants to fund a research centre dedicated to improving the welfare of intensively farmed animals. McDonalds, after some pressure was applied, sent a letter to all of its suppliers endorsing the humane treatment of farm animals.

In 1997, a coalition of animal welfare organisations was formed to work to improve farm animal welfare and discussions at the time of the writing of this book (1998) were continuing with McDonalds.

Singer concludes this interesting biography with a chapter reviewing Henry Spira's life and his success in reducing the suffering of millions of animals. He compares Henry Spira's life to two widely held assumptions — that the individual is powerless to change the world and that life is essentially meaningless. He argues that Henry Spira disproved each of these.

Singer concludes by detailing the 10 eminently sensible ways Spira employed to make a difference and to bring about change and quotes Spira on what he would like for his epitaph *He pushed the peanut forward.*

Robert Baker
ANZCCART

Newly published

Monoclonal antibody production

The journal *Lab Animal* has published a special issue (Autumn, 1999) which focuses on small-scale monoclonal antibody (mab) production. The aim is to aid those in search of appropriate *in vitro* technologies, to help minimise or abolish pain and distress in mice. The editorial of this issue discusses the responsibility in the USA of members of Institutional Animal Care and Use Committees (IACUCS) to direct investigators to employ *in vitro* methods of mab production (where available) or to purchase their antibodies from an outside source (unless the ascites method of mabs is scientifically justified).

The issue includes four papers on mab production and a selected list of companies and institutes providing new technologies in mab production.

The four papers are:

- *In vitro antibodies and good-faith efforts: An overview of the NRC report on monoclonal antibody production* by Norman Peterson. The author discusses the conclusions of the National Research Council's committee on methods of producing mabs.
- *Perspective on in vitro production of monoclonal antibodies* by Simon Saxby. The author discusses European and US regulation of mab production, the NRC report, and the IACUC's responsibility in protocol review.
- *An IACUC guide to reviewing protocols calling for monoclonal antibody production by mouse ascites* by Joanne Smith and Louis DeTolla. Ascites production of mabs has become increasingly controversial as *in vitro* methods are developed and refined. One of the challenges that IACUC members face is

evaluating protocols that include the mouse ascites method. The authors discuss applicable concepts and guidelines appropriate for protocol review.

- *Small-scale monoclonal antibody production in vitro: Methods and resources* by Lynn Jackson, Laura Trudel and Neil Lipman. When critically reviewing protocols involving production of monoclonal antibodies, IACUCs must be able to evaluate scientific justification of the use or non-use of *in vitro* alternatives. The authors present a review of *in vitro* production of monoclonal antibodies, as well as critical considerations in selecting the appropriate technique.

For further information, or to find out how to obtain a copy, contact www.labanimal.com/

Editor's note — NHMRC-Guidelines on *in vitro* mab production

The NHMRC is considering responses to its call for submissions on the draft guidelines. These will be incorporated into a new draft, which will be sent to the original respondents and readvertised for further public comment.

Laboratory animal web sites

The *Journal of Applied Animal Welfare Science* 1(4): 383-7 (1998) has published a very useful article on laboratory animal websites. The authors (David Anderson and Michael Kreger) are both experienced in this field and provide a list of 17 web sites which address the welfare of animals which are used in laboratories for regulatory requirements and in animal care.

The paper includes notes on the function of each organisation listed and the scope of its website.

Many of these websites are in turn linked to others.

Editor's note

Another new website of interest to ANZCCART readers is www.IACUC.ORG, established as a resource for Institutional Animal Care and Use Committee members and for research and technical staff.

Guidelines for the care and housing of dogs in scientific institutions

The Animal Research Review Panel of NSW Agriculture has published its Guidelines Number 14 (March, 1999) for the Care and Housing of Dogs in Scientific Institutions. The 26 page document covers the following topics:

- responsibilities of the investigator;
- aspects of dog behaviour relative to housing and husbandry;
- housing design, including isolation areas and exercise pens;
- enclosure construction;
- husbandry;
- signs of pain and distress; and
- fate of animals used.

It includes a bibliography and a resource list. For further information contact:

Animal Welfare Unit
NSW Agriculture
Locked Bag 21,
Orange, NSW 2800

Tel: 02-6391-3682
Fax: 02-6391-3570

Notes from ANZCCART's 1999 workshops now available

ANZCCART has held two workshops in Australia this year, in addition to co-sponsoring the three workshops on the Three Rs held by the University of Queensland.

Notes from the first two workshops are available free of charge from ANZC-CART's Adelaide office.

Their titles are:

- *Workshop for Category C members of Animal Ethics Committees* (held in Melbourne on 23 April, 1999); and
- *Analgesia of laboratory animals*, by Professor Paul Flecknell (held in Adelaide on 21 July and in Melbourne on 22 July, 1999).

These notes will be available soon from ANZ-CCART's website: www.adelaide.edu.au/ANZCCART/

The notes from the Three Rs workshops will be available in December.

The mouse knockout and mutation database

This new database lists all mouse knockouts and mutations. Edited by Ian Jackson, it is available for \$US200. The database scans journal articles and lists abstracts.

For further information:
www.biomednet.com

NEAMS Trust grant

Applications are invited from the New Education Aids in Medicine and Science (NEAMS) Trust for a grant of up to \$A10,000 to further the aims of the Trust. These are to develop educational aids (such as new computer simulations or interactive video presentations), which will substantially reduce or abolish the use of animals for teaching purposes.

Application forms, which must be received by 15 January 2000, are available from :

The NEAMS Trust
PO Box 516
Darlinghurst, NSW, 1300

Tel: 02-9360-7114
Fax: 02-9361-6448
email: info@neams.asn.au

Electronic media: animal care- 2000

This conference, to be held at Disney World, Orlando, Florida from 9 to 11 February 2000, will focus on the use of electronic media in laboratory animal science. It is sponsored by the American Association for Laboratory Animal Science, the Laboratory Animal Management Association, the Laboratory Animal Welfare Training Exchange, the National Institutes of Health's Office for Protection from Research Risks, the University of Florida in Gainesville, the University of Central Florida in Orlando, the Florida Agricultural and Mechanical University in Tallahassee, and the University of Miami.

The conference is open to institutional administrators, members of Institutional Animal Care and Use Committees, laboratory veterinarians, investigators, researchers, regulatory personnel, and other personnel who are responsible for institutional animal care and use programs.

The objectives of the conference are to:

- provide a forum for discussion among laboratory animal professionals from

academia, government and industry of future directions of electronic media in laboratory animal science;

- examine recent advances in biomedical research and education through the use of electronic media;
- discuss electronic media technology and its applications in laboratory animal medicine settings;
- explore alternatives to animal experimentation through the use of electronic media; and
- harness the explosive growth of the Internet and expand its use in the field of laboratory animal science.

For details, contact the website:
www.emac2000.org

Revised conditions for importation of laboratory rodents to Australia

The Australian Quarantine and Inspection Service (AQIS) has recently published *Revised import conditions for importation of laboratory rats and mice*.

These should be read in conjunction with the information provided on this subject in the ANZCCART facts sheet by Dr Kevin Doyle published in the June, 1999 issue of *ANZCCART News*. Copies of the revised AQIS guidelines are available from:

Mr Pat Boland, AQIS
GPO Box 858
Canberra, ACT 2601

Tel: 02-6272-4859
Fax: 02-6272-3399
email:
pat.boland@aqis.gov.au

Coming up

Principles for primates conference

11 November, 1999
Sydney

Contact: Lynette Shanley
PO Box 60, Portland,
NSW 2847

Tel/Fax: 02-6355-4026
email: ippl@lisp.com.au

ANZCCART/AWAC (NZ) conference

18-19 November, 1999
Wellington

Innovation, ethics and animal welfare: public confidence in science and agriculture

Contact: Mrs Gill Sutherland
ANZCCART (NZ)
PO Box 598
Wellington, New Zealand

Tel: 64-4-472-7421
Fax: 64-4-473-1841
email:
sutherland.g@rsnz.govt.nz

4th Australasian Clinical Toxicology conference

3-4 December, 1999
Sydney

Contact: DC Conferences
PO Box 571
Crows Nest, NSW 1585

Tel: 02-9439-6744
Fax: 02-9439-2504
email: dcon@tmx.com.au

Australasian Society for Clinical and Experimental Pharmacology and Toxicology

33rd Annual Scientific Meeting

5-8 December, 1999
Sydney

Contact: Conference Organisers
PO Box 772
Darlinghurst, NSW 2010

Tel: 02-9360-9177
Fax: 02-9360-9289
email:
Events@syd.occ.com.au

Electronic media: animal care - 2000
9-11 February, 2000
Orlando, Florida, USA

website:
www.emac2000.org
(see notes this page)

Consciousness, cognition and animal welfare UFAW symposium

11-12 May, 2000
London

Contact: Dr Stephen Wickens, UFAW

Tel: 44-01582-831818
Fax: 44-01582-831414
email: wickens@ufaw.org.uk
(see notes on page 12)

Australian Veterinary Association conference

25-30 June, 2000
Perth

Contact: Ms Doreen Culliver,
AVACOS
7 Phipps Place, Deakin,
ACT 2600

Tel: 02-6285-2600
Fax: 02-6285-3600
email: avacos@ava.com.au

International Conference on Animal Science and Veterinary Medicine towards the 21st century

(ICA SVM 2000)
12-15 August, 2000
Beijing, China

Contact: Ms Xu Jinhua
Fax: 86-10-6289-5351
email:
xmskyczy@public3.bta.net.cn

XXI World Buiatrics Congress

4-8 December, 2000
Punta del Este, Uruguay

Contact: Gabriela Rohr
Congresos and Reuniones
Cerrito 307
Montevideo 11.000
Uruguay

Consciousness, cognition and animal welfare: The UFAW Symposium 11-12 May 2000, Lon- don

Concern for animal welfare rests largely on the premise that some animals have the capacity, as do humans, for pleasant and unpleasant subjective experiences or awareness states. That is, on the assumption that they have at least a basic level of consciousness. Views on the validity of this belief and on the taxonomic range of animals that are likely to have this capacity vary within and between cultures and nations, and this underlies corresponding marked differences in opinion about appropriate levels of resourcing for animal care in farming and other animal use. Although a commitment has recently been made by the European Heads of State to make provision in the Treaty of Rome to ensure improved protection and respect for welfare of animals as sentient beings, the fact remains that deciding which species are sentient (i.e. which have the capacity for subjective experiences), and determining the range of phenomena they can be sentient of (and which can affect their welfare), remain serious problems.

Gaining insight into the capacities of other animals for subjective mental experiences is notoriously difficult. However, a number of new experimental techniques and approaches have led recently to significant advances in understanding aspects of the neuroanatomy, neurophysiology and the functioning of neural systems which underpin subjective experiences in humans. In addition, there is considerable current research interest in animal cognition, which may provide greater insight into the range of phenomena that animals may be aware (have consciousness) of, and which may, therefore, be relevant to their welfare. This meeting will consider this new research and how

the insights it provides may be able to contribute to understanding of conscious aware states in animals and thus to the science that underpins the development of animal welfare.

The provisional program is:

- Introduction — consciousness, feelings and animal welfare.
- The function and evolution of consciousness. What happens when it fails?
- Recent advances in understanding the neural basis of consciousness. What kind of brain is needed to support aware states?
- Welfare and interspecies variation in capacities for perception and cognition.
- Distribution of capacities for pleasure and suffering in the animal kingdom.
- Possible approaches to the study of states of awareness in animals.

For further information, contact Dr Stephen Wickens, UFAW.

Fax: 44-01582-831414
email: wickens@ufaw.org.uk

International course on laboratory animal sci- ence - Utrecht The Netherlands

15-26 May, 2000

A two week intensive course on laboratory animal science will be held at the Department of Laboratory Animal Science, University of Utrecht, The Netherlands in May 2000. This course has been held each year since 1993.

The objective of this course is to present basic facts and principles that are essential for the

humane use of animals and for quality of research.

The contents of the course are in line with recommendations of the Federation of European Laboratory Animal Science Associations (FELASA) regarding the training of young scientists whose research involves the use of vertebrate animals.

The course may also be of interest for those who intend to set up a similar course at their location. For this purpose, during the course the acquisition of teaching materials can be discussed with the course committee.

For information and application forms please contact:
Prof. LFM van Zutphen, or
Mr Stephan van Meulebrouck
Department of Laboratory Animal Science
Faculty of Veterinary medicine

PO Box 80.166
3508 TD Utrecht
The Netherlands
Tel: 31-30-253-2033
Fax: 31-30-253-7997
email: pdk@las.vet.uu.nl

FELASA working group report on health monitoring of dogs, cats and pigs

These recommendations for the health monitoring of breeding colonies and experimental units of cats, dogs and pigs were published in the journal *Laboratory Animals* (1998) **32**: 1-17 and are available as an offprint (Report No. 5). ANZCCART has a number of copies available free of charge.

ANZCCART also has a number of reprints available of the Second Report of the BVA/WF/FRAME/RSPCA/UFAW Joint Working Group, on refinements in rabbit husbandry (reprinted from *Laboratory Animals* (1993) **27**: 301-329).

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Contributions to ANZCCART-News are welcomed and should be sent to:

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E-mail address: anzccart@waite.adelaide.edu.au

<http://www.adelaide.edu.au/ANZCCART/>

or

Mrs G. Sutherland, ANZCCART New Zealand
PO-Box 598, Wellington, New Zealand

Tel. 64-4-472 7421; Fax. 64-4-473 1841
E-mail address: anzccart@rsnz.govt.nz

<http://anzccart.rsnz.govt.nz>

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