

The welfare of transgenic animals - an AEC lay member's perspective

Lay members or Category D members on Animal Ethics Committees (AECs), as I was told in 1996 when I was approached as a possible new member, are chosen on the general rule of thumb that they enjoy listening to *The Science Show* on the radio or watching *Quantum* or *Catalyst* on television. Lay members therefore do not have the unifying characteristics of Categories A and B members in veterinary science or medicine, or Category C members in animal welfare. Category D members are as varied as the proverbial person in the street whom in fact they represent.

My background is in the arts, as an administrator rather than as an arts practitioner, but my years of experience in this field have shown me that there could be

similarities between science and the arts in attempts to bring along the members of the general public to understand what is going on and also to dispel misconceptions, or apathy, which may be worse.

I have been and am still somewhat complacent about my ignorance of complex scientific data, but complacent only because I am confident in the knowledge and high ethical standing of my Committee colleagues in Categories A, B, and C. I know that they will answer any questions I could pose or explain in terms I can understand. It has been my experience that all the science-based and animal welfare-based people on the Committee seem to be good teachers and also have the capacity to be inclusive in discussions on protocols. They are faced

with the layperson on the Committee as an obligatory given. It's not a matter of choice for them, but it seems to me that apart from the benefit to everyone on the Committee in having the protocols explained in language the layperson can understand, maybe the presence of the Category D members is a constant reminder of the majority of the population out there who need to be 'brought along,' so to speak, in an everyday knowledge of contemporary science.

Category D is described in the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* as "an independent person who does not currently and has not previously conducted scientific or teaching activities using animals". It made me wonder, not why, because I think it is laudatory and necessary for there to be a 'person of the people representative' in the loop when matters of ethics are involved, but how the good sense of those who proposed this inclusion originally prevailed. From the viewpoint of the arts I think that if it were obligatory to have a science person, with no knowledge of arts practice, as a member on the various grants and other arts committees the reaction would be that it was a waste of a committee place. The layperson on Church committees is an age old and accepted practice. Maybe science and the Church have that in common.

I am typical of those in the general public motivated to interrogate sources readily available to them on radio, TV, the Internet and newspapers to research a range of subjects. In this case it was transgenic animals. It made me think that perhaps the problem of scientists is not how to get information out, because there is something written every day on biotechnology, but how to control what gets out, in the sense that a little knowledge can be a dangerous thing.

I was surprised to find that the term transgenic animal has been around since the late 1960s or early 1970s, but only since 1981 has DNA microinjection in mammals been applied to mice. That is only a relatively short time for the knowledge about transgenic animal technology to become known beyond the scientific community, much less for the non-scientific community to have an opinion on the ethics of such science. It might be useful for me to explain what basic facts on transgenic animals my reading has delivered to me. I can guarantee that it is more information than a straw poll of 20 of my alert and enquiring friends can muster.

* Transgenic animals are created by DNA microinjection, by embryonic stem cell-mediated gene transfer and by retrovirus-mediated gene transfer;

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- * embryonic stem cell mediated gene transfer is the method of choice for gene inactivation and hence the so-called "knock-out" mice;
- * success rate in terms of live birth of animals containing the transgene in retro virus gene transfer is low and it is common practice to freeze and store embryos containing the transgene - I ask myself is this where the interestingly named mortal and immortal cells arise?
- * the creation of transgenic animals is allowing a shift in the use of higher order animal species to lower order species and is allowing for change in numbers of animals - which is good news;
- * apart from wide ranging medical research usage, transgenic animal creation is of great interest in the pharmaceutical industry, to test products and produce drugs. To the layperson this can sound alarms that commercial controls may be not always in the public interest;
- * experience in the laboratory is a requirement in industry standards for keeping transgenic animals - that signals to the layperson that there are special rules relating to student researchers and others who enter any laboratory holding transgenic animals;
- * there are guidelines which scientists must follow which cover justification of the rationale for creation of the particular transgenic animal and welfare issues in the creation process; and
- * biosafety for the animal care staff and for the animals is paramount and includes special cages and special protective clothing.

My main sources for the above information are my downloading of the Guidelines from the websites of Canadian Council on Animal Care <http://www.ccac.ca/index.htm>

and the Monash University Animal Welfare Committee <http://www.monash.edu.au/registration/animal-ethics/index/htm>

The NSW *Animal Research Act 1985* No 123 and Regulations, and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*, sixth edition, 1997 are among the documentation which all members of the University of NSW AEC receive on appointment. These spell out the responsibility of the AEC in research involving genetic manipulation and the role of the National Health and Medical Research Council Animal Welfare Committee and the Genetic Manipulation Advisory Committee (since reconstituted) in Canberra from whom registrations and licences must be obtained.

All of the above I found reassuring when I began to consider some of the issues which spring to mind when thinking about transgenic animals from a layperson's perspective.

Some of the questions were:

- (i) was the language of science necessarily arcane?
- (ii) the Guidelines on Transgenic Animals set down by the Canadian Council on Animal Care seem to have achieved the high ground on the internet. Has Australia posted similar Guidelines which I missed? How frequently do working scientists refresh their memories on the relevant parts of the Animal Research Act relating to experimental manipulation of animals' genetic material in order to pass this information on to any students in their responsibility? How much and when do graduate and undergraduate student scientists learn about animal research licences and the Code of Practice?
- (iii) what is being done at University level, in CSIRO, or in other science bodies, specifically to

inform and maybe educate the general public on issues arising from genetic engineering in animals and if the discussion and debate became general, would this impede scientific progress in an inordinate manner?

- (iv) who owns the research if Universities become too reliant on the corporate sector to fund them? What about the question of patents? How is the law weighted?
- (v) where, apart from the AEC, are lay people brought within the scope of discussion on ethics and animal research?

These are a sample of the myriad of questions that can confront a layperson who thinks about the subject of transgenic animals. They reflect my realisation, albeit late in my term as Category D member of the AEC, that I have assumed, and I am sure correctly, that there must be sufficient checks and balances in the system to assure the non-professional observer that nothing untoward should occur in animal research in Australia. Other wider questions relating to genetic manipulation that arise for those of us who view it from afar relate to where it is all leading.

Over the last couple of weeks there has been a flurry of information arising from latest research results in animal and plant gene manipulation, and newspapers have been full of discussion on the cloning of the human embryo. The distinction between creation of transgenic mice and the cloning of human embryos may be a mile apart for scientists but it is a distinction that only those in the know can make. It is perhaps the ever changing end point of genetic research that is cutting the layperson off from a reasonable comfort zone, and that should be a warning sign for scientists.

I list here are some of the pieces in the Sydney Morning Herald and on ABC Radio National that in the last month I have read or

heard which will give you a taste of how prevalent the subject of transgenic animals is becoming in the general media. It made me wonder whether there is any monitoring of this in the scientific community and whether the prevalence of material is after all part of a master plan to inform and educate the general public.

I read an article in the *Sydney Morning Herald* on 16 October, 2001 which confirmed that a British couple had sidestepped British regulations and sought help in the USA in order that they could give birth to a baby with an immune system which matches that of their four year old son who suffers from leukaemia. The 'designer baby' is due by the end of this year.

I heard Lord Robert Winston during a recent Press Club address decrying what he called the "over-hyping" of genome technology which he said was like talking of the invention of the axle rather than the wheel. But as a lay person, although I find Robert Winston is enormously reassuring and straightforward, is he adequately addressing public perceptions when he plays down concerns in this area?

On 22 November, 2001 the Editorial of the *Sydney Morning Herald* stated: "The achievements of genetic research constitute one of the great successes of modern science. Some of the benefits offered by the new technology, however, challenge long-established codes of behaviour. They also present legal and ethical dilemmas involving the improper use of genetic information as it affects employment, insurance, commercial gain and government services. Clearly a balance is needed between encouraging the advances of genetic science and technology and protecting Australians from loss of privacy and unfair genetic discrimination".

The ABC Background Briefing program of 11

November was an address delivered in the UK in October this year by Professor George Monboit on Global Democracy. George Monboit is a young professor in philosophy, environmental science and politics, and a columnist for *The Guardian* newspaper. He convincingly argues that democratic governments such as Britain, the US, France and Germany are increasingly being held ransom by corporate lawyers and non-elected bureaucrats whose strings are really being pulled by corporations. And so we get, according to George Monboit's research, genetically engineered growth hormones injected into US beef which is able to be sold according to trade regulations of the World Trade Organisation into Europe, and those countries refusing to accept it are hit with trade sanctions.

On 19 November the ABC had a lead news item from the University of California on the transfer of genes from the bacterium *E.coli* to the ovarian cells of a Chinese hamster. The report was followed by a CSIRO spokesperson explaining what a breakthrough this is and emphasising that the delivery of genes into target cells has been a major challenge. My reaction as a lay person was *Why a Chinese hamster?*

The ABC *Encounter* program on 25 November dealt with the International Meeting on Biotechnology in Salzburg in October when 60 scientists, philosophers, lawyers and medical specialists from all over the world came together to think about the ethical and legal implications of the explosion of knowledge in animal and plant genetics. As a member of the general public I found this most reassuring and also it told me about the International Bioethics Committee of UNESCO, which in January 1999 drafted the Universal Declaration on the Human Genome and Human Rights. I learned also that the Australian Health Ethics Committee and the Australian Law Reform

Commission have issued a recent paper on protection of human genetic information and that there was a Gene Technology Act promulgated in Australia in 2000, and that cloning of genetic material is prohibited by law in some Australian States. These are all significant occurrences protecting the highest standards of practice and ethics in Australian science and it surprised me as a member of the general public to find out about them as a supplementary piece of information from an International Conference in Salzburg.

I want to underline the vigilance which I can see as a layperson is required of scientists to be aware of and to counter where necessary the wide ranging opinion and comment which is out there on what scientists are doing in the area of genetic engineering and how the *genie out of the bottle* is impossible to control.

I can't resist the chance to return to the question of language for a moment. I wonder if science achieves the highest rate of acronym use of all language exchange. My guess is that if acronyms were not widely used, scientists would have to live longer than the general population to communicate! DNA is now so widely used in everyday parlance and seems to be the key to all mysteries but I'm sure if you stopped 20 people in the street and asked what the initials DNA stood for, very few would be able to say de-oxyribose nucleic acid, and I until a week or so ago I was one of the 20 and I love crime novels dealing with forensic medicine!

I am not advocating any change in language usage by scientists except maybe an appeal for clarity of meaning, but as in cricket, or wine making, or the arts, it can't be denied that terms can develop which can sound somewhat quaint and unusual to the uninitiated. With a wry smile I draw your attention to the scientific use of the terms 'mortal' and 'immortal' cells.

A lay person might think that there was fodder here for assuming that scientists sometimes play God. By the same token the term 'knock-out method' to describe gene inactivation in embryonic stem cell mediated transfer is down to earth and self-explanatory.

In summary, here are some matters I would like scientific researchers to consider from a layperson's perspective :

- * what is the role of the lay member on the AEC and your attitude to their inclusion. How comfortable would you feel if, for example, an investigative journalist (with impeccable ethical credibility as a given) was appointed as a Category D member on your AEC?
- * consider the channels through which members of the general public inform themselves on the areas of research scientists carrying out and how easy it is for misinformation to arise if scientists do not become aware of the level of ignorance which prevails in the general community;
- * consider ways of involving general public discussion as a means of information and education and whether you think this would impede or enhance your work; and
- * in our best interests, develop fool-proof ways of dealing with big business interests and scientific research, and assure us that patents and products are less important than human rights and ethical probity. Remember that the general public must rely entirely on the scientific community in all these matters, and the delegation of this responsibility should constantly register with you.

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Notes from workshops on transgenic animal welfare

ANZCCART held workshops on this topic in Sydney and Melbourne in late November.

Notes from these workshops are currently being compiled and will be collated and published on ANZCCART's website early in the New Year. Copies of the notes will be sent to all those who attended the workshops.

The preceding paper by Ms. Jane Burns was given at the Sydney workshop.

Legal and ethical aspects of working with wildlife, with particular reference to Africa

Introduction

We are a husband and wife team, a veterinary pathologist and a lawyer respectively. We are based in the United Kingdom (UK) but have extensive overseas experience, including living in East and Central Africa for several years.

Our shared interests in wildlife, conservation and human and animal welfare mean that we bring an interdisciplinary, perhaps rather different, approach to studies on animals. In this paper we discuss the legal and ethical aspects of working with wildlife, and argue that these are important components of planning and executing scientific research on such species.

In an earlier visit to Australasia, during a seminar organised by the Department of Conservation in New Zealand, we discussed ethical considerations in wildlife health and some of the relevant background can be found in those Proceedings (Cooper, 2000).

Definitions

In this paper the term "animal" is used in its broadest sense, meaning all vertebrate and invertebrate animals.

Nearly 90% of living animals are invertebrates and possibly many millions of such species remain undescribed. In previous papers (Cooper, 1992; 1999) concern was expressed that scant attention had been paid to the welfare of invertebrates or, indeed to that of so-called "lower vertebrates" (reptiles, amphibians and fish), although it is noteworthy that a number of organisations, including ANZC-CART, have begun to rectify the situation in recent years.

The emphasis in this paper will be on vertebrates but many of the points raised are applicable to invertebrate animals.

The law can be defined as "The body of rules, whether formally enacted or customary, which a state or community recognises as binding on its members or subjects" - Shorter Oxford English Dictionary (1990). In many countries there is legislation relating to the health, welfare and conservation of animals but this differs in scope and often in the extent to which it is enforced. Some laws are national, some regional and some international.

Ethics can be defined as "a social, religious, or civil code of behaviour considered correct, especially that of a particular group, profession, or individual" - Collins Dictionary of the English Language (1981). Perhaps a better definition, since it encompasses legal considerations as well, is "The science of human duty in its widest extent, including besides ethics proper, the science of law whether civil, political, or international" - Shorter Oxford English Dictionary (1990).

An ethical approach to work with wild animals is not new (Botzier and Armstrong-Buck, 1985). It was concerns over welfare and the obligations of humans towards sentient beings that led to the great debates of the eighteenth and nineteenth centuries in Europe and to the legislation designed to protect animals that ensued in Britain and certain other countries. More recently, the need for biologists to make ethical judgement has been stressed by authors from a wide range of backgrounds (O'Riordan, 1995).

In our view, there is a

need for all those who work with wildlife, whether their activities are invasive, minimally-invasive or non-invasive (see later), to adhere to codes of practice, quite apart from any legal constraints on their research. Such codes of practice can be based on existing guidelines - for example, those drawn up by scientific societies or professional bodies.

The dilemma

The difficulty facing those who work with free-living wildlife is how to balance the welfare of the individual animal against the survival of the population. Traditionally, those who are concerned with conservation tend to think in terms of protection of groups of animals or of maintenance of the species. In contrast, welfarists and veterinarians are usually trained to assess individual animals, and veterinarians in particular are expected as part of their professional calling to do all possible to prevent, alleviate or control pain and suffering. This dilemma has been discussed by Kirkwood and Sainsbury (1996), amongst others.

An example from our own work in Africa illustrates how the two approaches can sometimes be combined. In Lake Mburo National Park, Uganda, there are large numbers of free-living ungulates, amongst them impala (*Aepyceros melampus*). These animals are an important part of that ecosystem and viewing them is the main *raison d'être* for most tourists who visit the Park. Many visitors to Lake Mburo are expatriates, but some are Ugandans, including groups of school children who, for financial reasons, usually have to tour the Park in the back of a lorry. The school children enjoy not only seeing the free-living antelope but also the opportunity to

come close to, sometimes to touch, the habituated impala that live around the campsite. The latter are mainly orphaned animals which have been "rescued" and hand-reared. They are of no importance in terms of the conservation of the species but, nevertheless, serve a very important education role. Exposure to these captive impala, as well as to the extensive herds of animals in the field, helps to imbue young Ugandans with a concern for individual creatures and a sense of wonder for their native fauna.

The second example concerns the rare mountain gorillas (*Gorilla beringei*) which live in the Congo, Rwanda and Uganda. The total population of mountain gorillas is in the region of 600 to 650 animals and for many years international funding has been used to conserve them. The philosophy behind such work is to protect the species from threats to their health or survival. The basic rule is that, since the mountain gorillas are wild animals, intervention should be minimal - in other words, here the species takes priority over the individual. When, however, a mountain gorilla is found to have a health problem that is human - induced, for instance, an injury caused by a snare, action is taken. The animal is physically restrained (if it is young or weak) or immobilised (if it is mature) so that the snare can be removed. The rationale for intervention is that, although the survival of the population is usually paramount, there is an obligation under these circumstances to take action because an individual animal has become incapacitated as a result of human activities. Such interventions certainly help to save the lives of individual gorillas but they also provide an opportunity to carry out morphometrics and other

studies, to collect samples and to assemble data that may be of value in future conservation efforts. Treatment of an injured animal also generates good publicity for the gorilla projects and for those people working on them. In this case, concern for the population and concern for the individual prove compatible.

Competition and conflicts

One of the increasingly important factors that influence studies on wildlife, especially in Africa, is the competition between wild animals, domestic animals and humans (Conover, 2001). Such competition very often revolves around access to land. In many parts of Africa local farmers face a regular threat from wild animals such as baboons (*Papio* spp) which steal their crops, and elephants (*Loxodonta africana*) that may trample and damage their property. Action often needs to be taken over such animals. Sometimes it is necessary to kill them; often it is possible to deter them or even to capture and to translocate them elsewhere. Each case has to be judged on its merits and appropriate action taken.

Competition for land may be more subtle; in Lake Mburo National Park, for example, wild animals may compete with domestic stock for grazing.

Competition can also take other forms – for example, the use of poisonous substances to control “pest” species can result in disease and death of non-target wild animals. This is a particular problem in poorer countries where arthropods and other invertebrates transmit a range of diseases, usually necessitating effective ways of killing them.

Interventions

There appears to be an increasing need for humans to intervene in issues and circumstances regarding wildlife. Some practical interventions are relatively

minor – for example, the translocation of amphibians from a wet area that is threatened by drainage to another swamp or pond where they can live and breed. This is a commonplace activity in Britain and other westernised countries. In the poorer parts of Africa, however, such ventures may not be so straightforward.

The reception, treatment and care of wild animal casualties is another example of intervention and is discussed later in this paper. Views about the treatment of wild animal casualties vary; in richer countries such work is generally very popular and often adequately funded. In Africa, however, care and rehabilitation of wildlife generally has a low priority because there are so many other pressing human and domestic animal needs.

The official policy in some African countries regarding sick and injured wildlife may be strictly non-interventional, certainly in national parks. As a result, a buffalo (*Syncerus caffer*), for example, that is seen to be injured may be left to its fate and no action permitted in terms of either treating or killing it. This in turn can create difficulties, not only for members of the public (especially visitors from countries where action over the buffalo would be expected on welfare grounds), but also sometimes for national and expatriate veterinarians. This illustrates once more the dilemma of how to reconcile species’ protection with individual welfare.

Research

Research on wild animals very often constitutes a form of intervention. Interventions can in theory be described as non-invasive, minimally-invasive or invasive, but the distinctions are often blurred. Some research projects may appear to be non-invasive – for example, observation of animals from a distance using binoculars – but even these may have a subtle, but significant, effect

on the animals in question.

Other forms of intervention are very clearly invasive – for instance, the capture of wild animals in order to apply radiotelemetry equipment, to take blood samples or even to give treatment or vaccination.

Certain types of research on wildlife attract adverse criticism – mainly those that are clearly invasive, where the animal may be pursued, captured, restrained and subjected to procedures that are at least stressful and at worst cause pain or compromise survival (Mellor and Monamy, 1999).

The role of stressors on wildlife cannot be overestimated. While all wild animals are exposed to a range of stressors, a healthy animal should be able to respond to these satisfactorily. However, if there are too many stressors, or if the effect of the stressors is excessive, the animal may not be able to react adequately (the “general adaptation syndrome” cannot cope) and it will become stressed. A stressed wild animal may show non-specific signs and is also likely to exhibit an increased susceptibility to disease. It may even die (Tribe and Spielman, 1996).

The effect of stressors on wild animals as a result of interventions has been studied by a number of authors. In the African context the scenario that has attracted particular interest and controversy concerns the African wild dogs (*Lycaon pictus*) which disappeared from the Serengeti National Park in Tanzania a decade ago. It has been postulated (Burrows *et al*, 1994, 1995) that this local extinction might have been a result of various interventions that were carried out, including the vaccination of the dogs against rabies. This hypothesis continues to be debated, but there is little doubt that repeated interventions in wild animal populations can be deleterious and should be avoided whenever possible.

A paradox of working in poorer countries, including many in Africa, is that procedures that would require licensing and regular external assessment in the UK, elsewhere in Europe, North America, or in Australia or New Zealand, can often be performed with relatively little control and formality. Often it is necessary to have a research permit for work on wildlife but frequently there is little or no scrutiny of what is proposed in terms of its effect on the welfare of the animals. There are exceptions; for instance, in Kenya the Institute of Primate Research has produced and follows guidelines for research, but this is exceptional. It is therefore important that those carrying out research on wildlife in different parts of the world should not only familiarise themselves with the local law (regardless of whether or not this is enforced) but also ensure that they have drawn up and are adhering to a code of practice that will minimise any adverse effects on animals.

An important way of promoting the welfare of wildlife is to ensure that as many research procedures as possible are minimally-invasive.

Minimally-invasive methods of study

Much useful information can be gained about wild animals by careful methodical observation, which should precede physical or chemical restraint. The lead in such work in Africa was taken by those concerned with health monitoring, in particular studies on the health of primates such as the mountain gorilla (*Gorilla beringei*), mentioned earlier. From the earliest days of study on this species, protocols were based on minimal intervention. This was partly because of concern about the species’ status and the effect that the demise of even one animal might have – not so much on the population but on public opinion. The result is that a large volume of information about the mountain gorilla

has been accumulated as a consequence of observation, coupled with the collection and examination of samples such as faeces, urine and hair. It has proved possible to build up a remarkably comprehensive portfolio of data about the health of *Gorilla beringei* even though very few have ever been handled.

Similar minimally invasive methods of health monitoring have been advocated for other species of wild animal (Cooper, 1998). The basic tenets are properly planned and documented observation, collection of samples for laboratory investigation, and (only if the results of the above tenets indicate that this it is necessary), capture and examination. One example of an area of work in which the use of such minimally-invasive health monitoring has been practised to advantage concerns vultures. The decline in numbers of Old World vultures, particularly *Gyps* species, in Asia in recent years has prompted concerns that there might be an infectious disease affecting these birds and that this might spread to Africa (Virani *et al.*, 2000). As a result, a Vulture Workshop was held in Uganda in 2001 at which a key feature was the training of veterinarians and biologists in methods of monitoring the health of these birds without needing to capture and restrain them (Cooper, 2002).

Movement

The movement of animals, whether from one locality to another within a country or across international boundaries, gives rise to legal and ethical issues in addition to the practical and logistical aspects (Cooper, 1989). In so far as the law is concerned, there are two important aspects to the international movement of animals: legislation relating to animal health, usually administered by the Ministry or Department of Agriculture of the particular country, and conservation legislation, usu-

ally under the jurisdiction of the Department concerned with the environment.

The first of these, concerning animal health, requires that animals are subjected to veterinary examination and certification together with, in some cases, quarantine. However, it is easy to forget that the legislation covers samples such as faeces and blood as well as live animals and carcasses, particularly when they concern pathogenic organisms. This applies mainly to species that are liable to carry diseases which are a risk to farm animals.

It is important that those involved in such work should check beforehand the legal requirement, (for example, if the species is classified as endangered) both within the country where they are working and at the destination to which animals or parts thereof might need to be sent. Non-compliance may make it difficult to publish research based on material that has been illegally moved. Some guidance on this has been provided in a number of papers – see, for example, Cooper, M.E. (1989).

Rehabilitation

The rehabilitation of wild animals can be divided into three phases: rescue, rehabilitation and release. Each stage calls for distinctive skills and decisions, which also have to be effected in compliance with the relevant wildlife, welfare and other legislation.

The care of sick and injured wild animals is of great interest to many people, especially in western countries. It is a complex subject which involves not only the animals, but also the humans concerned, many of whom are very committed but do not necessarily have an understanding of population dynamics and the role of disease and death in the wild. Nevertheless, rehabilitation can be important when indi-

viduals of a small threatened population are concerned. It can also be valuable in terms of education, and of collecting scientific data.

The problems presented by wildlife casualties were outlined in an earlier paper on rehabilitation in East Africa (Cooper, 1995). Shortage of funding and often unavailability of equipment and expertise means that the care of sick and injured wildlife cannot always be undertaken satisfactorily. Some projects, especially involving large charismatic species such as elephants, attract substantial sums of money and, as a result, a considerable amount of work can be done. Nevertheless, it is often argued that the funds that are spent on such work in order to save, and possibly in some cases to return to the wild, only a small number of animals, might be better used in broader-based conservation exercises, either relating to a range of species or to improving the well-being of local people who work with or live adjacent to them.

Increasingly, questions being asked about the welfare considerations in rehabilitation. In Britain, for example, the question of treatment of injured bats, all species of which are protected by the law, is controversial because these animals cannot readily be returned to the wild and the quality of their life if they are retained in captivity is debatable. Similar arguments apply to other species in many parts of the world. In most countries there is no legislation that relates specifically to wildlife rehabilitation; however, it is usually covered in part by laws relating to welfare and species' protection. The authors of this paper advocate that all rehabilitation projects either adhere to existing guidelines or those of comparable organisations elsewhere. Alternatively they can compile their own codes of practice.

A dilemma is posed in the

care of the great apes. This particularly concerns chimpanzees (*Pan troglodytes*) of Africa and the orang-utans (*Pongo pygmaeus*) of South-East Asia. There may be successful rescue and rehabilitation but the animals often cannot be released, for a variety of reasons. For example, the chimpanzees that have been confiscated or otherwise taken into captivity are often not suitable psychologically for return to the wild, while the shortage of habitat restricts the release of orang-utans. An added difficulty at this level is the prevailing philosophy that certain species are entitled to their full life-span and that alternative provision for them must therefore be found. Suitable accommodation for apes is very difficult and expensive to provide on a long-term basis that is sustainable in a poor or unstable country.

Conclusions

In this paper we have drawn attention to the dilemmas that can arise in work with wildlife, with particular reference to our experiences while residing and working in Africa. The pressure on free-living animals, largely as a result of the increase in the human population and the conflicts that this engenders, means that care has to be taken not to impose unnecessary and deleterious extra pressures on these wild creatures.

The question of how best to promote the conservation of the species while still being attentive to the welfare of the individual animal, will continue to tax minds. The most important rule is that such difficulties should be addressed at an early stage and an attempt made to come up with an acceptable formula.

The authors recommend the following approach:

- * appropriate protection should be given to all animals, both vertebrate and invertebrate;

- * such protection should comprise both legal controls and ethical judgements;
- * discussion – and, wherever possible, consensus – should guide where to draw the line in terms of balancing benefits to science with the welfare of the animal; and
- * in all our dealings with wildlife we should show consideration of the animal, both as an individual and as a member of a group or species.

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Editor's note

Professor and Mrs Cooper visited New Zealand and Australia in May, 2001. They gave a number of seminars and workshops in New Zealand, in conjunction with the Auckland Unitec, Auckland SPCA and Massey University.

In Australia they gave seminars on behalf of ANZCCART at Taronga Zoo, Sydney (in conjunction with the Australian Association of Veterinary Conservation Biologists) and at Monash University, Melbourne.

New Information on ANZCCART's website

A NZCCART's
Australian website

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

has been upgraded by the addition of a substantial section on the three Rs of Replacement, Refinement and Reduction, and the inclusion of a modified Australian version of the section entitled *Using Animals in Science*, prepared by Professor David Mellor for the Board of ANZCCART New Zealand. It can be reached under the heading of *Why animals?*

The Three Rs information comprises background notes, including references from Russell and Burch's classic 1959 publication *The Principles of Humane Experimental Technique* and a list of international databases on the Three Rs.

The section *Using Animals in Science* is intended for use by primary and secondary school students. This is a very important area of need and these notes will be very useful in providing objective information to students.

Non-destructive and non-invasive sampling of volatile compounds produced by live animals

A major limitation in the field of chemical ecology is the inability to analyse semiochemicals and related compounds in their 'natural context'. Typically samples, whether they are tissue samples, excretions or secretions, or whole organisms are brought back to the laboratory for analysis. Often the methods used to investigate these samples are destructive to the chemical and/or organism under study. This is of particular concern where the sample is a living organism. Because of this attempts have been undertaken to develop non-invasive and non-destructive sampling techniques for field applications.

One technique which shows promise is the sampling and preconcentration technique of Solid Phase Microextraction (SPME) (Pawliszyn, 1997). This recently developed technique involves trapping volatiles on sorbent-coated fibers. In essence the fiber acts like a 'chemical sponge' soaking up and retaining volatile compounds. By using SPME we were able to effectively study the release of volatiles by the Brown Tree-Frog (*Litoria ewingi*), when challenged by a 'model' predator (it is believed the release of these compounds is a defensive mechanism). Frogs were stressed either by gentle prodding with blunt forceps or by the presentation of a Common Tree-Snake, (*Dendrelaphis punctatus*). Following the stress event the immediate atmosphere around the frog was sampled by suspending a sorbent fiber 1 cm above the back of the animal. Figure 1 shows a representative chromatogram obtained using this technique.

Typically defensive secretions have been obtained via extractions of excised skin. In some species more than 1000 specimens have been sacri-

ficed to obtain sufficient quantities for compound for identification (Roseghini *et al.*, 1976). Aside from its destructive nature, solvent extraction is limited in that it only reveals those compounds present in the sample at the time of death and cannot be used to examine the changes in the chemical signature of individuals over extended periods (Turillazzi *et al.*, 1998). It is also well established that the profile of volatiles obtained from isolated glands or tissue samples is often not representative of the blend released by the intact living organism (Takeoka *et al.*, 1998; Teranishi *et al.* 1993; Heath and Manukian 1992; Golub and Weatherston 1984; Lorbeer *et al.*, 1984). Enzymes released by tissue maceration can rapidly change the chemical profile. For example, Tollsten and Bergström (1998) showed that intact plants of a number of *Brassica* species released a different blend of volatile chemicals compared to macerated plant material.

Besides the analytical limitations, consideration must be taken of the ethical constraints associated with animal experimentation. With a worldwide decline in many frog species (Tyler, 1991), it is important non-invasive extraction techniques are developed. By using SPME we were able to sample the secretion without harming the animal and then conduct repeated sampling events following exposure to the 'predator'. The ability to sample the same animal at various stages of the procedure greatly enhanced the amount of information we could obtain from the experiment and provided information about the lifetime of the compounds in the frog's skin.

SPME has a number of other advantages for sampling frog volatiles. Frog glandular secretions are complex mixtures of volatile and non-volatile components. By

using SPME we were able to limit our attention to those compounds volatile enough to interact with other organisms or the organism's physical environment. Excluding non-volatile components reduced the number of misleading compounds in the chemical profile. The presence of extraneous compounds in an extract can lead to unwanted reactions (Tollsten and Bergström 1998; Blight 1990; Bostock and Stermer 1989), altering the volatile profile of the organism and in some cases masking the presence and/or activity of target chemicals.

The ability to concentrate samples on the fiber is another advantage. The high efficiency of the fiber in extracting low concentration samples enabled the analysis of individual animals. Whereas we could sample volatiles from a single animal using SPME, on average two skins were required for solvent extraction; and even then not all components were obtained. Due to their volatility many compounds were lost during the extraction process. Malosse *et al.*, (1995) also showed this when he demonstrated the quantity of volatiles isolated from a single pheromone gland using

SPME equalled the amount isolated from 50 glands using solvent extraction. The ability to sample individual animals decreases the number of subjects needed for a test and allows individual variation to be assessed. The ability to work with low sample numbers or amounts is also an advantage if the sample is in limited supply, threatened or difficult to obtain.

A further advantage of SPME is the rapid rate with which a sample can be collected (less than one minute). Due to the nature of frog skin, and its role as a respiratory surface, it is important the animal be kept moist to minimise desiccation. Standard techniques of volatile trapping usually employ dynamic systems in which air is drawn across the sample over time. Desiccation stress as a result of such methods may alter the chemical profile of the animal. If humidified air is used, traps to remove the moisture could provide sites for analyte loss.

To date, studies such as these have been undertaken principally in the laboratory. These studies point to the usefulness of the technique for field applications. In practice there is no need to

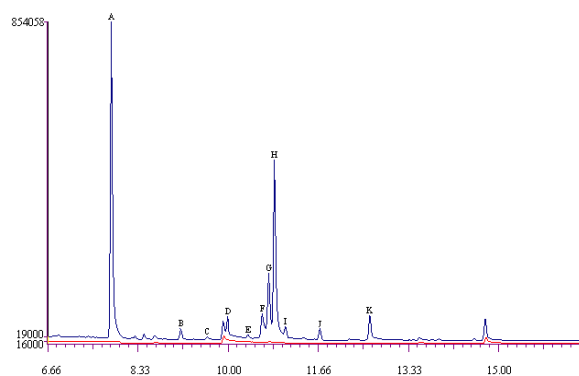


Figure 1 The volatile profile of a stressed frog measured during a 'predator' encounter using SPME.

collect a defined sample prior to analyses as the fiber can be exposed directly to the ambient air, water or plant. Thus an organism can be observed in its natural environment without the need for disruption. This is of particular advantage when we consider the difficulties associated with maintaining live organisms in the laboratory. Artificial containment may alter the chemistry of the system under study. Stone *et al.* (1992) highlight the influence containment can have on frog skin secretions. They showed plasticisers adsorbed from the moistened plastic bags in which frogs were placed for transport accumulated in the skin secretion, making subsequent analysis more difficult.

Currently work is being undertaken to design appropriate field devices for SPME. An important feature of a field device is the ability to preserve extracted analytes in the coating. The simplest practical way to accomplish this is to seal the end of the needle with a piece of teflon. Additionally, cooling extends the storage time. To be useful in the field, however, a device needs to be rugged. One device being investigated is based on a leaf's structure (Pawliszyn, 1997). This device functions by encasing the fiber in a metal sheath of minimal air volume to minimise desorption from the fiber. At this stage the device is a prototype and further testing is required. Other work which is being conducted is on a system of storage chambers for individual fibers. These chambers can be cooled and pressurised to maximize storage time on the fiber.

It is clear SPME is a valuable and attractive tool for biologists. The ease with which the technique can be applied to a number of situations without considerable changes in methodology, coupled with its simplicity and rapid time of analysis are all factors in favour of SPME. For example, SPME devices can be used to probe for substances emitted by a single flower bulb during its life

span or the use of sub-micrometer diameter fibers permits the investigation of single cells. The ability to sample volatiles from widely differing sources, using identical sampling conditions, provides a major advantage when investigating the chemical association between different species, individuals within a species and an individual and its environment.

The primary advantage, however, lies in its application to sampling live organisms. Conventional methods can be destructive to both the chemical and organism under study. SPME is highly suited to sampling living systems. Since the SPME coated fiber does not extract analytes exhaustively either in equilibrium or short exposure modes, its presence in a living system should not result in significant disturbance. In addition, the technique facilitates speciation in natural systems, since the presence of a minute fiber, which removes small amounts of an analyte, is unlikely to disrupt chemical equilibria in the system.

Finally, in the interest of our environment and concern for life it is imperative non-destructive techniques of extraction be developed. SPME conveniently fits this niche and provides a valuable tool for studying the role volatile chemicals play in nature.

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Independent review of animal ethics committees

Throughout the previous trimester, the NHMRC Animal Welfare Committee combined a number of its regular meetings with site visits to institutions around Australia to learn more about the issues faced by AECs in complying with the Code of Practice.

The findings of the AWC in terms of functioning of AECs and institutional animal facilities were generally positive. However, visits also revealed that some problems existed. The AWC concluded that while the self-regulation of AECs was largely effective, there was scope for improvement.

At about the same time, *Animals Australia* put the research community on notice that they were not satisfied with some aspects of the AEC process. Among their requested changes was that some form of independent audit of AECs be introduced.

Earlier this year, the Code Liaison Group distributed a Letter of Recommendation regarding the independent review of AECs.

Its aims were to:

- * assist institutions in ensuring that AECs are regularly reviewed in accordance with the Code;
- * set principles of operation for such reviews; and
- * encourage the public release of the reviews and their outcomes.

The letter of recommendation suggested a number of principles for the review process.

- 1. Timing.** A broad, independent review to be held every three years;
- 2. Membership.** An independent chair with a knowledge of animal welfare issues; a person with a demonstrated commit-

ment to animal welfare; a person with experience in the administration of animal welfare and animal ethics appropriate to the institution;

- 3. Reporting.** A report from the review committee to the operational head of the institution should address any problems with the operation of the AEC or with application of the Code. Where possible, the complete report, or a summary, should be released in an annual report or a Web site; and

- 4. Content of the Review.** Samples of paperwork to allow tracking of particular applications, interviews with past and present AEC members and the Chair of the AEC, invited submissions from staff of the institute and relevant members of the public, inspection of animal facilities and the attendance at an AEC meeting of a member of the review committee.

Anyone who is interested in seeing a copy of the *Letter of Recommendation* should contact Dr. Alana Mitchell or NHMRC.

Email:
alanam@netspace.net.au

Review of the Australian Code Of Practice for the Care and Use of Animals for Scientific Purposes

In August 2001, the Code Liaison Group (CLG) met in Melbourne to consider revision of the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*. The current sixth edition of the Code was published in 1997.

The Code has been revised at regular intervals since its inception in 1969, in recognition of both shifts in community attitudes and advances in biological science over time.

The CLG identified a number of areas of the Code that were in need of revision, including some items of additional information. The CLG recognises that the list of issues, although extensive, may not be comprehensive.

At this stage, the CLG and the NHMRC Animal Welfare Committee invite all interested parties to consider the list of issues and contact NHMRC either via the office or the Animal Welfare Liaison Officer, Dr. Alana Mitchell, regarding any additional items for consideration.

A brief summary of the code review process is:

- * The CLG meets. It includes representatives from NHMRC, CSIRO, Agriculture and Resource Management Council of Australia and New Zealand, Australian Research Council, Australian Vice-Chancellors' Committee, State and Territory Governments, RSPCA, Animals Australia and the general public.
- * Items in need of review, or inclusion in the Code are identified.
- * The CLG is divided into working parties, each of which discusses a subset of the issues.
- * Input is invited from all interested parties to draw attention to any issues that have been overlooked by the CLG.
- * A draft document is prepared and an advertisement placed in the *Weekend Australian* seeking submissions on the draft document.
- * Each submission is considered and the draft Code is annotated at the relevant text.
- * A writing group produces the final version of the Code.

Information about the review of the Code of Practice is now available from the Animal Welfare Committee page of the NHMRC website, at:

<http://www.nhmrc.gov.au/issues/animalethics.htm>

It includes background about the review, the process to be followed, contact details, and a description of the issues currently being considered by the Code Liaison Group, which is conducting the review. There will be a formal public consultation process in 2002.

For further information, contact:

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MAWA (Medical Advances Without Animals) Trust Grant-in-Aid

The Australian Association for Humane Research Inc. is pleased to announce the award of a second Grant-in-Aid by its medical research trust fund, the MAWA (Medical Advances Without Animals) Trust.

The 2002 recipient, Dr Eileen Gallery of the Renal Research Group at the Royal North Shore Hospital in Sydney, has been awarded a grant of \$22,120 for her project *Interactions of human monocytes/macrophages and decidual endothelial cells in the development of vascular disease in diabetic pregnancy*.

ANZCCART's Financial Position

A Special General Meeting of ANZCCART's Council in Sydney on 15 November was held to consider the implications of the withdrawal of core funding by the NHMRC and the reduction in funding from the Royal Society of New Zealand.

Strong support for ANZCCART was provided by all who attended, in addition to written expressions of support from other representatives

A subsequent Board teleconference, held on 19 December, agreed to continue ANZCCART's operations in 2002, but to contain costs by publishing the quarterly newsletter electronically. It also considered the need to replace the Director, whose resignation had recently been received (see below).

ANZCCART News to be published electronically only in 2002

Due to the withdrawal of core funding by the NHMRC and the reduction in funding from the Royal Society of New Zealand, it is not possible for ANZCCART News to be published in hard copy next year.

The ANZCCART Board has therefore decided that the four issues of ANZCCART News for 2002 will only be published electronically, via ANZCCART's website and through its email list. While this should not greatly inconvenience those with ready access to a computer, some readers will unfortunately not have access to it.

For this reason, Chairpersons and Secretaries of Animal Ethics Committees are requested to print hard copies of each

issue and distribute these to AEC members.

The ANZCCART Chairman, Professor Roger Holmes, will write to all universities and major scientific institutions explaining this decision, seeking their co-operation in printing copies for their staff and for AEC members.

This decision will be reviewed at the end of 2002, when ANZCCART's longer-term funding position is known.

New Chairman of ANZCCART Australia

Professor Mike Rickard, the CSIRO's representative on the Board of ANZCCART since 1995, has been appointed Chairman of the Board of ANZCCART Australia, from 7 January 2001. He succeeds Professor Roger Holmes, Vice-Chancellor of the University of Newcastle, who is the AV-CC representative on the Board. Professor Holmes will continue to represent the AV-CC on the Board, and will serve as Deputy Chairman.

Professor Rickard, who has previously chaired ANZCCART, has recently retired as Director of the Australian Animal Health Laboratory at Geelong, Victoria and will continue half-time with CSIRO next year as its Animal Welfare Advisor. He also chairs the Animal Welfare Committee of PISC, the Primary Industries Standing Committee and represents Animal Welfare Committee on NCCAW, the National Consultative Committee on Animal Welfare.

Resignation of ANZCCART's Director

The Director of ANZCCART, Dr Robert Baker, is to leave his position in February, 2002 and will join the South Australian Farmers Federation as its Chief Executive Officer.

Dr Baker joined ACCART (as it was then known) in February, 1992 when the office moved from CSIRO in Canberra to the Waite Campus of the University of Adelaide. The arrangement between ANZCCART and the University of Adelaide has worked very well and has been mutually beneficial.

He has overseen its growth to include the ARC and the Royal Society of New Zealand and has managed six major conferences and numerous workshops, as well as publishing conference proceedings, monographs and 40 issues of ANZCCART News, including 24 Facts Sheets.

The Board of ANZCCART is currently considering how to fill the vacancy.

New publication by ANZCCART

The second edition of ANZCCART's 1993 monograph *Euthanasia of animals used for scientific purposes* has been published and is available from ANZCCART's Adelaide office for \$33.00, including GST and postage (within Australia and New Zealand).

It has been substantially revised and updated and an order form has been inserted in this issue.

Coming up

**RSPCA Australia
Scientific Seminar
Equine welfare - balancing
tradition and science
Canberra, 26 February,
2002**

Details:
Tel: 02 6282 8300
Fax: 02 6282 8311
email:
scisem@rspca.org.au

**Australian Veterinary
Association
Annual Conference
Adelaide
6-10 May, 2002**

Includes two day program
by AVERT on animal ethics
issues.

For further information,
contact:
avacos@ava.com.au
Tel: 02-6273-8855
Fax: 02-6273-8899

**International course on
laboratory animal
science
27 May - 7 June 2001
Utrecht, Netherlands**

Details from:
Professor L.F.M. van
Zutphen
Faculty of Veterinary
Medicine
University of Utrecht
PO Box 80.166,
3508 TD Utrecht
Netherlands
Fax: 31 30 153 7997
email: pdk@las.vet.uu.nl

**Australian Society for
Animal Production
Conference
Finding the balance -
profitability with
responsibility
Adelaide
7-11 July, 2002**

Contact: Thomas Banhazi
Tel: 08 8303 7781
Fax: 08 8303 7975
email:
Banhazi.Thomas@saugov.
sa.gov.au

**Fourth World Congress
on alternatives and
animal use in the life
sciences
New Orleans, USA
11-15 August, 2002**

email: dpease@hsus.org
website: www.world
congress.net/

News

Andrew's Report on human cloning

The Australian House of Representatives Standing Committee on Legal and Constitutional Affairs has recently released the Andrew's Report *Human cloning: scientific, ethical and regulatory aspects of human cloning and stem cell research*. It can be found at

www.aph.gov.au/house/committee/laca/index.htm

It is 282 pages in length but it does include a nine page executive summary with a list of recommendations. The summary is p.22 of the section Report-front/table of contents.

ILAR's home page

<http://www.national-academies.org/ilar>

ILAR's website features two searchable databases:

The International Laboratory Code Registry contains a complete listing of laboratory codes that can be accessed through the ILAR home page

(<http://www4.national-academies.org/cls/ilarhome.nsf>).

A laboratory code is a one - to four - letter symbol that uniquely identifies an investigator, a laboratory, or an institution that breeds rodents or rabbits. ILAR assigns laboratory codes and maintains the registry on behalf of the International Committee on Standardized Nomenclature for Mice (<http://www.informatics.jax.org/support/nomencl/inc.shtml>) and the International Rat Genetic Nomenclature Committee

(<http://ratmap.gen.gu.se/ratmap/wwwNomen/RGNC.html>).

It is also possible to request a laboratory code online or to correct a current code.

The Animal Models and Genetic Stocks (AMGS) Information Program responds to thousands of queries each year from the scientific community on the availability of various animal models, stocks, and strains.

This website includes additional information about ILAR's program, new publications, databases, ILAR Journal, student information, and links to other home pages.

For more information contact ILAR at - 2101 Constitution Avenue NW, Washington, DC 20418, USA.

Email: ilar@nas.edu.

US Department of Agriculture animal use statistics - Rats, mice and birds rule delayed additional year

A provision that effectively prohibits the USDA from issuing a final rule on coverage of rats, mice and birds under Animal Welfare Act regulations for another year was included in the final House-Senate conference report on the Agriculture Appropriations Bill approved in November.

The full House and Senate are expected to adopt the conference report.

New alternatives website launched by InterNICHE

A new website was launched in November by InterNICHE, the International Network for Humane Education.

The new site is:

www.interniche.org and provides news and comprehensive information on alternatives to animal experiments. It is aimed at teachers and students of biological science, veterinary and human medicine. It is also highly relevant to university ethics committees, legislators, civil rights and animal protection groups.

For further information contact Nick Jukes by email on: lynx@gn.apc.org

ANZCCART's work-plan for 2002

The Board of ANZCCART Australia is currently planning ANZCCART's activities for 2002.

These will include a workshop, to be held in conjunction with the Animal Research Review Panel of NSW Agriculture. Its theme will be the monitoring of animal well-being, of researchers by AECs and the effectiveness of monitoring systems in ensuring animal welfare. It is to be held in March, probably in Sydney.

A second workshop is planned for May, 2002, to involve ANZCCART's client groups, in particular biomedical societies, in a discussion of future ANZCCART activities and the requirements for these by its client groups. The venue has not yet been decided.

No decision has been made on whether a conference will be held in Australia next year. This will be discussed by the Board early in the new year and an announcement made in the March issue of *ANZCCART News*.

ANZCCART News will again be published quarterly, but will only be available electronically on our website or via email (see details on p.11).

ANZCCART News is published quarterly by the Australian and New Zealand Council for the Care of Animals in Research and Teaching Limited.

It is a publication for researchers and teachers; members of animal ethics committees; staff of organisations concerned with research, teaching and funding; and parliamentarians and members of the public with interests in the conduct of animal-based research and teaching and the welfare of animals so used.

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

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