

Committees and conflict resolution

The term conflict resolution refers to a set of practices, and a range of values, that are conducive to the solving of problems between people. While some of the values are idealistic, they are firmly attached to real experience. The values and practices of conflict resolution are relevant to each one of us, for we all encounter conflict situations, no matter what our profession or our status. What each one of us must answer, therefore, is not whether this subject interests us, but how well we are responding to the conflict situations in which we find ourselves.

Conflict resolution and complexity

Our need to become better managers of conflict emerges from the age in which we live. The spread of democracy, for instance, is one significant fac-

tor. Consider the difference between a society based on hierarchical values and authoritarian power structures, and a society based on a more egalitarian voicing of opinions. In a hierarchical society, the people in less powerful positions are not permitted to voice their problems: conflicts that are aired are 'solved' by the decisions of those at the top.

Dissatisfaction with the results of such practice has contributed to the changes now underway. With the spread of education has come the ability of the majority of the population not only to perceive what is troubling them, but the ability and the means to say so. There are more voices now, and more perspectives are being expressed. The complexity of modern societies means that several different perspectives may be valid at the same time.

It is not a matter of simply deciding who is right (for there may be no single right answer), but finding ways to ensure that everyone affected by a problem can share in a satisfactory solution. The alternative dispute resolution movement is growing within the legal community and alongside it, as a response both to the perceived limitations of the formal legal system, and in recognition of the fact that not all disputes require adjudication.

The essential findings about conflict resolution are these:

- conflict is inevitable but not inherently good or bad;
- when faced with conflict one can choose whether to ignore it or address it, but in each case there will be consequences;
- whereas some conflicts concern disputes readily resolved through appropriate dialogue, other disputes are in fact deep-rooted conflicts based on more complex issues of identity;
- there is no single best approach to conflict resolution, but any approach chosen must include good listening skills, empathy for the situations of others, assertive rather than aggressive speech and behaviour, and a willingness to resolve.

Some definitions

Disputes and conflict

(1993) has explained that disputes involve negotiable interests, while conflicts are concerned with issues that are not negotiable, that relate to ontological human needs that cannot be compromised. This helps to explain why some disputes cannot be resolved even when taken to the highest courts in the land. A number of years ago a significant article by Felstiner and others (1980) explained how disputes result from the transformation of an unperceived injurious experience into one that is felt (a perceived injurious experience) and acted upon.

In order for disputes to emerge and remedial action to be taken, an unperceived injurious experience must be transformed into a perceived injurious experience. The next step is the transformation of a perceived injurious experience into a grievance. The third transformation occurs when someone with a grievance voices it to the person or entity believed to be responsible and asks for some remedy. (Felstiner et al, 1980)

This helps to explain why some individuals or groups begin to place blame long after the particular incident or

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series of incidents transpired. At first they had not felt injured by their experience, but over a period of time their injury became apparent to them, and they attributed it to a particular cause.

The conflict resolution continuum

I suggested above that when faced with conflict one can choose whether to ignore it or address it, but that both responses have their consequences. A continuum of responses to conflict begins with avoidance, and moves through processes of conversation and negotiation toward mediation and eventually judgment in a court of law. The continuum has been described as starting from the informal, private processes of avoidance and of negotiation not involving a third party to the most public and formal processes of arbitration and adjudication. (Astor and Chinkin, 1981) Each approach has implications for determining who controls the process, the content, the outcome, and the issues resolved.

In avoiding a conflict the parties control the process, but none of the issues get resolved. If the issue is small it may fade away. But if it is important, and remains unaddressed, it may explode later. Negotiation of a conflict may be either public or private, but still allows the parties to control the process and the content under discussion, and remain in the negotiations voluntarily.

Formal committee work may involve negotiations between parties having different viewpoints, or seeking competing objectives. In mediation of a conflict, the parties give control over the process to a third party but remain in the process voluntarily. They are still responsible for finding a solution. If a matter moves to arbitration, however, both the process and the content are controlled by a third party, who also provides a decision. When disputes go before courts for a decision, the parties give up all control over the process and the outcomes, since a

judge controls the proceedings, participation in which is compulsory.

Mediation

The term mediation is used in a number of public and private dispute resolution contexts to mean a number of different things. Most broadly defined, it can mean any kind of assisted negotiation. It is in this sense that the word is being used in areas of contemporary dispute resolution discourse, by lawyers, courts and government, in a way which may subvert the traditional meaning of mediation as a facilitative process.

The meaning of mediation is being redefined very broadly as any kind of settlement out of court, which may be little more than an alternative way of litigating rather than a primary facilitative dispute resolution process alternative to the adversarial system (Ardagh and Cumes, 1997).

Conflict resolution skills

We do not need to become mediators or judges in order to apply conflict resolution strategies, since the initial focus is everyday conversation. A conflict-resolver will never use a provocative manner, and will be alert to signs of discomfort or misunderstanding in his/her conversations with others. The goal here is to raise issues clearly as soon as they appear, rather than allowing them to simmer, or ferment. One simple formula for ensuring that professional relationships are preserved and strengthened is to decide to never speak behind the back of a colleague in a manner that is divisive. This simple rule of personal conversation will help to eliminate any context of suspicion and rumour from committee consultations.

Listening

The basic skill of a conflict resolver is active listening. This requires a person not only to refrain from talking during the listening process but to refrain from formulating a response while listening.

To listen actively means to ask questions about the content of a message, to clarify any ambiguities in what is being said, and also to probe the feelings that are attached to the spoken words. In conflict resolution, feelings count. Thus if a committee member says he or she is happy with a course of action, but his/her actions and tone do not support this, a conflict resolving approach would find a way to clarify that person's deeper views.

Empathizing

While we are often led to believe that professional life, and professional decisions, are somehow devoid of emotion, we know at a more fundamental level that each decision that we make as a committee will have an impact on our own activities or on those of colleagues. Feelings inevitably enter into our decision-making, and decisions are best made when these are taken into account. Incredibly, the feeling that one has been heard makes a difference to one's acceptance of any decision reached by the committee. To know that one's views have been heard and valued contributes to a feeling of acceptance.

Assertiveness

Assertive speech and action contribute to conflict resolution and should be distinguished always from behaviour that is aggressive. An assertive approach is to state what one needs, and why. It is not a demand but a statement of one's situation which is so clear as to be understood by others. This assertive approach, moreover, does not consist of telling others what to do, or how to behave. Conflict resolution workshops include practice in making "I" statements. To make an "I" statement is to make clear what I need without making demands of the behaviour of others. Thus to seek a quieter room one would say "I want to let you know how plans are progressing and what I need is a few minutes of silence in the room." This is preferable to the command "OK everyone,

stop talking." The latter instruction may work with a small or unified group, but even then it has not informed the group as to why you are in need of silence.

Timeliness

The timeliness of discussion can be a factor contributing to the resolution of conflict. I have already mentioned that clarifications of perceived miscommunication or discomfort should come earlier rather than later.

Mapping

To map a conflict is to ensure that all the parties to the dispute are identified, and that all their needs and fears are understood. Finding out exactly who is involved in a conflict is an important part of finding a solution, since it is often the case that there are more than two people, or parties, involved. It is also often the case that a person's deeper concerns are not the first to be voiced when they are speaking about a conflict, and it is the task of all who are seeking to resolve a conflict to allow the time required to define them and to create an atmosphere of understanding that will make this possible.

A strategy for solving a conflict in a committee

I will conclude this brief article with a summary of steps that can be taken when it becomes apparent during a committee meeting that a situation of conflict has emerged. A committee facing an ongoing conflict has several options. The first is to ignore it, in the hope that it will fade away: it may – but on the other hand it may intensify. A pro-active committee would not take this chance, and would identify a process for handling the dispute. All committee members may be involved, or a delegated team.

If a process for dialogue can be identified in advance, the parties to the dispute (presuming they are willing to resolve the issue by talking it through) can have foreknowledge of what awaits them along the way.

A common path for discussion involves the following steps:

- pre-discussion preparation;
- opening statements;
- summaries of these statements;
- agenda setting;
- exploration;
- separate sessions if required finding agreement; and the making of closing statements.

I must stress that it is the principles rather than formal procedures that count most: the procedures of articulating the problem in full, of listening to the views of others actively, and of searching for maximum solutions jointly. The process was summarised by Burton (1993) in this way:

The procedures can be readily deduced. First there must be a careful analysis of parties and issues. Second it is necessary to bring those two parties whose relationships are most affected into a facilitated interactive situation in which relationships are analyzed in depth. Other parties and issues are dealt with in due course in the same way. At this stage no proposals are entertained, nor is there any bargaining or negotiation. When there is an agreed definition of the problem, and a full assessment of the costs of existing policies based on a knowledge of responses to the denial of human needs, there can be exploration of positive options.

Pre-discussion preparation

Each person is invited to make a statement outlining their perspective on the conflict. Each person should be encouraged to prepare this statement, so that he/she comes to the discussion with all the relevant information at hand, and prepared to air his/her concerns in a clear manner.

Opening statements

Each person is given the

opportunity to state his/her case free of interruptions, and free of censure. An opening statement will often include, in addition to the facts, expressions of frustration, or even anger, reflective of the person's current emotional state. The other persons are counselled to listen carefully, as it can be the case that they have not previously heard the concerns of the other person explained in full. This phase can lead to understanding of the positions of others.

Summaries of these statements

By asking one party to the conflict to summarise the position that has just been put by the other party, the committee is ensuring that those involved in the conflict have an accurate understanding of the viewpoint of the other party. If they do not reflect the argument fully or accurately, this can be remedied immediately. This reflection of the arguments will rarely happen in the course of informal conversation or in heated discussion of a dispute, so the committee's use of this strategy may break a cycle of misunderstanding.

Agenda setting

Having listened to the viewpoints of the parties, the committee can assist in preparing an agenda for discussion. This is important for two reasons. First, there will inevitably be a range of issues on the table rather than just one. By creating an agenda the committee can ensure that they are considered individually. Second, some issues will be easier to solve than others, and if they are ranged from easiest to hardest, progress can be made on the easier issues before the harder ones are tackled. This strategy is commonly used in negotiations between parties in serious conflict situations. It allows for consensus building on smaller issues and the generation of confidence between the parties that the larger issues can similarly be solved.

Exploration

In the exploration phase parties are encouraged to propose solutions to the problem.

Creative thinking is required. When entering a dispute each party may know what they want, but the dispute exists because neither party knows how they can get it. One of the reasons this phase is called exploration is that the parties are encouraged to work together to find a novel solution that allows them to both get what they want. If this is simply not possible, exploration can seek a compromise position in which both parties get as much of what they want as possible.

Separate sessions

If this phase is built into the process, it allows the parties to once more speak in confidence to the committee. There might be concerns, for instance, that they are just not willing to share with the other parties to the dispute. Of course, such a conversation can only proceed in circumstances where the parties have complete confidence in the confidentiality of the process. If a committee is regularly processing conflict situations, it will want to take pride in the confidentiality of its proceedings.

Finding agreement

An agreement must be clearly understood by all, and it must be liveable. In other words, the committee must be satisfied that the parties have agreed to a solution that will work in the long term.

Closing statements

Allowing parties to make closing statements provides for a sense of closure to the discussion. The parties may want to express satisfaction with what they have experienced. On the other hand, they may want to say that while not fully satisfied, they are prepared to work with the level of agreement reached. No two cases will ever be the same.

Conclusion

The values and procedures for conflict resolution, I have suggested in this article, can

be incorporated in one's own repertoire of skills for committee services and professional relationships. They can be incorporated, too, into the practice of committees that find themselves in need of a dispute resolution process. The committee as a whole, or individual members of it, may consider undertaking a professional development course in conflict resolution or negotiation.

Courses are offered by the International Conflict Resolution Centre at the University of Melbourne. Homepage: <http://www.psych.unimelb.edu.au/icrc> tel 61-3 9344 7035; email: icrc@psych.unimelb.edu.au

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Ducks as a model for studies of human hepatitis

The long-term objectives of our research are to design therapeutic strategies and to improve vaccines for human hepatitis B virus (HBV) infection. Our research is performed through study of duck hepatitis B virus (DHBV) infection of Pekin ducks. DHBV and HBV are members of the hepadnavirus family that also includes viruses specific to woodchucks, ground squirrels, arctic squirrels, woolly monkeys and herons (Table 1). DHBV infection is also present in two species of Australian wild ducks, the grey teal and maned duck (Robert Dixon, University of Sydney, personal communication). DHBV infection of Pekin ducks is the only model currently available in Australia for experimental studies of hepadnavirus infection.

Characteristics of Hepadnavirus infection

Specificity of infection

Hepadnavirus infection is generally species specific although the human HBV can also infect higher primates and the heron hepatitis B virus is able to infect ducks. It is assumed that the species and cell specificity of hepadnavirus infection are determined by the presence of a specific receptor used by each virus to enter the cells of the host. The main cell type infected by Hepadnaviruses is the hepatocyte but the specific receptors for Hepadnavirus binding and entry have not yet been identified.

Ducks in Australia infected with DHBV do not show clinical signs of the disease.

Features of viral particles and viral replication

Hepadnavirus particles have many common structural features. They all have an

envelope, a nucleocapsid, a small circular DNA genome and carry a viral polymerase. The viral envelope is composed of a protein referred to as surface antigen and the nucleocapsid is composed of a protein referred to as core antigen. Both of these proteins are highly immunogenic. Hepadnavirus genomes are circular DNA molecules ranging in size from approximately 3020 - 3300 base pairs. An unusual feature of hepadnavirus replication is production of the circular DNA genome from an RNA template using the process of reverse transcription. The only other virus family that uses reverse transcription is the Retrovirus family that includes the human immunodeficiency virus (HIV; the AIDS virus).

Transmission of infection

Due to the large numbers of viral particles circulating in the bloodstream of infected hosts, Hepadnaviruses are readily transmitted by intravenous or parenteral inoculation of infected blood and by sexual or personal contact. In DHBV-infected ducks the natural route of viral transmission is from the bloodstream to the egg. Viral replication then occurs in the yolk sac and developing liver of the embryo and results in congenital infection. Congenitally DHBV-infected ducks remain persistently infected throughout their lifetime. Similarly, experimental inoculation of newly hatched ducks with DHBV results in persistent DHBV infection. We have demonstrated that

dose. In humans, persistent HBV infection develops in most individuals infected with HBV at or around the time of birth, but only in 5-10% of HBV-infected adults. Similar age-related outcomes are seen in DHBV, woodchuck and ground squirrel hepatitis virus infections. As stated above, persistent DHBV infection occurs following either congenital transmission or experimental transmission of DHBV to newly hatched ducklings. In recent studies using a standard low dose of DHBV we have demonstrated a sharp age-related transition from persistent and transient DHBV infection. Virus dose also affected the outcome of infection. A 25-fold increase in dose, given at the same age, caused a shift in outcome from transient to persistent infection. Even very high doses (up to 2×10^{11} viral particles) normally cause only transient infection in adult ducks (Jilbert *et al.*, 1998).

Aims of our current research

These are:

- to determine the mechanism(s) of resolution of transient infection;
- to study the regulation of persistent infection (chronic carrier state); and
- to study the efficacy of DHBV DNA vaccines against DHBV infection.

The underlying clinical goals of our research are:

- greater understanding of what initiates and maintains persistent infection;
- improved vaccination strategies; and
- therapies for persistent infection.

Mechanism(s) of resolution of DHBV infection

We aim to determine the factors that allow the host to clear viral infection and to

Hepadnaviridae (Hepatitis B Viruses)

Mammalian	Avian
Hepatitis B Virus (HBV)	Duck Hepatitis B Virus (DHBV)
Woodchuck Hepatitis Virus (WHV)	Heron Hepatitis B Virus (HHBV)
Ground Squirrel Hepatitis (GSHV)	
Arctic Squirrel Hepatitis (ASHV)	
Characteristic virion structure & genome organisation	
DNA replication via reverse transcription	
Hepatotropic - infect liver & other organs	
Age-related outcomes of infection	



Table 1

Nature of infection

In those ducks that become infected, viral replication occurs mainly in the liver, with high levels of DHBV replication and antigen expression in the cytoplasm of most, if not all hepatocytes. High numbers of DHBV and "empty" surface antigen containing particles are released into the bloodstream (Figure 1). Titres in the bloodstream may reach 1×10^{10} DHBV particles and 1×10^{13} surface antigen particles per ml of serum.

one viral DNA containing particle is sufficient to initiate infection in a newly hatched duck and have used the DHBV model to study the kinetics and tissue specificity of DHBV infection (Jilbert *et al.*, 1988, 1996).

Age-related outcomes of Hepadnavirus infection

Hepadnaviruses have the ability to cause either persistent or transient infections. The outcome of infection is strongly age-dependent and is also related to the viral

develop immunity to re-infection. To do this we have developed ELISA assays to detect antibody responses to infection and are characterising cellular immune responses using *in vitro* antigen proliferation assays and analysis of cytokine gene expression. Understanding of the age-related effects and the mechanisms of resolution of infection, would provide a framework for addressing the clinically important issue of why some patients, but not others, remain persistently infected. This is also of fundamental importance for designing and testing approaches for immunotherapy of patients with persistent HBV infection.

Regulation of persistent infection

We are developing a number of approaches to investigate the rate(s), site(s) and mechanism(s) of virus removal that operate in both uninfected and persistently DHBV-infected ducks. In each case inoculated virus can be distinguished from virus already present in the duck by radioactive or genetic labelling. Radiolabelled virus is prepared by purification of viral particles from serum and iodination using lactoperoxidase. Genetically labelled virus is available as different geographical strains of DHBV that have been isolated from ducks in USA, France, Germany, China, Japan and Australia. The genome of the Australian wild type strain of DHBV (AusDHBV) has been cloned and sequenced in our labora-

tory. AusDHBV shares 89.7% nucleotide homology with the USA strain of DHBV and 95.8% nucleotide sequence homology with the Chinese Shanghai strain of DHBV. Current work includes inoculation of the USA strain into ducks congenitally infected with AusDHBV to monitor competition of the 2 strains *in vivo* and to determine if superinfection is possible. Experiments to monitor competition of the two strains using primary duck hepatocytes are also planned.

Permission has been obtained from the Australian Quarantine and Inspection Service (AQIS) to infect Australian ducks with the USA strain of DHBV under strict quarantine. Infection of ducks with the USA strain is achieved by intrahepatic and intravenous inoculation of newly hatched ducks with plasmid DNA containing a head-to-tail dimer of the genome of USA DHBV. This method of establishing infection using cloned virus DNA has the advantage of ensuring that the inoculum contains no other pathogens.

Knowledge of the rate of turnover of DHBV in the bloodstream and of the ability of newly inoculated strains to replicate in the presence of pre-existing infection, is required to design and evaluate the effectiveness of antiviral treatment of persistent infection.

The protective efficacy of DNA vaccines against DHBV infection

Vaccination against HBV

infection with recombinant HBV surface antigen produced in yeast has been highly successful in reducing the incidence of HBV infections among persons at risk. However, some individuals fail to produce antibodies to HBV and presumably are not protected. More effective vaccines are therefore needed. Accordingly, DNA vaccines encoding the DHBV envelope, core and e antigens are being evaluated for their ability to protect ducks against DHBV infection.

DNA vaccines encoding the DHBV surface antigens have been shown to induce antibodies that are highly effective in neutralising viral infectivity *in vivo* and *in vitro* (Triyatni *et al.*, 1998). In newly hatched ducks DNA vaccination did not prevent primary infection of the liver, but prevented widespread infection of the liver and the development of persistent viraemia. DNA vaccines encoding the core and e antigens have been constructed and their immunogenicity is being assessed prior determining their ability to protect ducks against DHBV infection.

DHBV DNA vaccines as therapy for persistent DHBV infection

Experiments are also in progress to assess the potential of DNA vaccines in therapeutic treatment of persistent DHBV infection. DNA vaccines encoding the DHBV surface antigens have been used in preliminary experiments to vaccinate ducks to alter the outcome of DHBV

ANZCCART STUDENT AWARD

The Board of ANZCCART Australia is again offering its ANZCCART Student Award, in conjunction with the 1999 Conference in Dubbo on 26 and 27 May, whose theme is 'The Use of Wildlife for Research'.

The purpose is to encourage attendance and involvement at the Conference by honours and postgraduate students.

The award is open to all disciplines and is worth \$1000 inclusive of travel costs.

Students are required to submit an abstract on an animal welfare theme relevant to the conference and be prepared to give a 10 minute talk at the conference.

Applications should be submitted by 27 April to:

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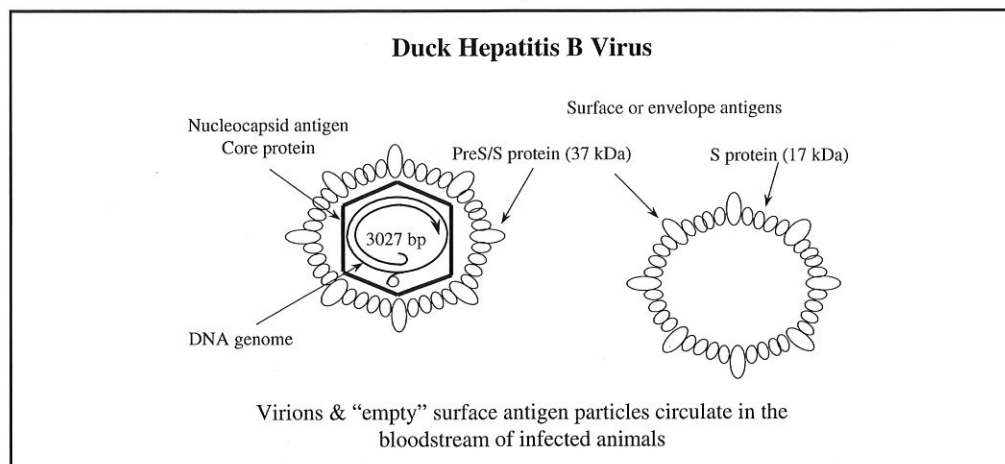


Figure 1

infection. In these experiments ducks were simultaneously infected with DHBV and vaccinated, or infected and then vaccinated seven days later. Congenitally infected ducks were also vaccinated on the day of hatching and several times subsequently.

Ducks received a total of five doses of vaccine over a 13-week period and were autopsied at 24 weeks of age. All vaccinated and control (unvaccinated) ducks developed persistent DHBV infection although, at later time points (weeks 16-24) vaccinated ducks had lower serum levels of surface antigen and DHBV DNA. Autopsy liver tissues from the vaccinated ducks also had lower levels of DHBsAg staining in hepatocytes although there was no reduction in the percentage of cells infected with DHBV.

As a result, we plan to assess the effectiveness of DNA vaccines in conjunction with anti-viral drugs as therapy for persistent DHBV infection. Initial experiments are planned with the Bristol Myers Squibb compound, BMS-200475, to lower the viral load before administration of DNA vaccines. In addition to the DHBV surface antigen vaccines, vaccines encoding the core and e antigens and duck cytokine genes (initially IFN-alpha, IFN-gamma and others as they become available) will be used.

Ethical implications

The Australian strain of DHBV is endemic in some commercial duck flocks in Australia without causing any known disease or economic consequences. The same is true for the USA strain in America. Animals are handled in accordance with the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes and the SA Prevention of Cruelty to Animals Act, 1985. Approval for all animal experimentation is obtained from the Animal ethics committees of the Institute of Medical and

Veterinary Science and the University of Adelaide. Experimental procedures (inoculations, biopsies) cause minimum discomfort and distress to the ducks. Surgical liver biopsies are performed using fluorothane anaesthetic administered via an endotracheal tube.

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Careful How You Hold Me - a CD-ROM Training Package for Bio-medical Institutions in Australia and overseas.

This new multi media CD-ROM Training Program has been developed for investigators, honours and postgraduate students, animal technicians, teachers and others new to the field of laboratory animal science and animal welfare. A resource for collective use of self-paced learning it would also be of value to veterinarians and members of Animal Ethics Committees. Emphasis is on animal welfare, standards of practice recommended, and core information required to operate effectively as an animal based scientist.

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The Use of Wildlife for Research

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Frogs and Toads as Experimental Animals

ANZCCART Facts Sheet

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Introduction

Frogs and toads were used extensively for experimental purposes for several decades, but their current use is more as subjects for dissection in secondary and tertiary teaching institutions, than for investigations in the fields of physiology and pharmacology. Given recent concerns about the decline or total disappearance of some species of frogs, it is likely that research will focus more upon use of the introduced toad: the Cane Toad *Bufo marinus* and the introduced African Clawed Frog *Xenopus laevis*.

Historically, Australian amphibians were perhaps first used extensively as the subjects for the study of helminth parasites by T. Harvey Johnston and his colleagues at the University of Adelaide. Following the demonstration by Bhaduri and Bardhan (1949) that a simple diagnostic test for human pregnancy involved the injection of a sample of the patient's urine into a South American frog, *Bufo marinus* was found to behave similarly, and its use in Australia for this purpose rapidly ran into many thousands each year. Of 16,000 imported into South Australia in 1966, the majority were for pregnancy testing purposes. In university and other institutional research, the isolated sciatic - gastrocnemius muscle preparation, and the isolated rectus abdominis muscle were used routinely in tertiary teaching for demonstration of nerve-muscle transmission, and for acetylcholine assays respectively. In recent years *Bufo marinus* has found a new role as a subject for toxicological studies of environmental pollutants. It follows that there remains a need to consider the available information on the housing, care and maintenance of frogs and toads in captivity.

Sources

The collection and interstate movement of native frogs in most States and the Territories is subject to various legislative laws and regulations. Information needs to be obtained from the National Parks and Wildlife Service or its equivalent. Similarly, the ambit of animal ethics committees includes experimental procedures on frogs and toads, and appropriate research permits are required.

To my knowledge there is only one commercial source of native species: the Amphibian Research Centre in Melbourne. A few native species can be purchased from pet shops, but their availability is often uncertain and, unless they can be guaranteed to have been obtained legally, these sources of supply should not be used. Cane Toads can be obtained from

various suppliers in Queensland. Because of the pest status of this species, importation from suppliers is regulated, and a permit is required from the vertebrate pest authority in the State to which they are being imported. Colonies of the African Clawed Frog are maintained in a number of institutions. Like the Cane Toad, this species has the potential to become established in the wild if released. Accordingly, it is subject to maintenance and transfer controls, and is a prohibited species in Western Australia.

Housing

Because of the assumption that few native species are likely to be used as experimental animals (other than perhaps as a source of eggs), I will confine my observations to one common and widespread native species, the Marbled Frog, *Limnodynastes tasmaniensis* and the two exotic species mentioned above. In the event that none of these is suitable for a particular purpose, advice on other species should be sought from amphibian experts at major zoos or museums.

(a) *Limnodynastes tasmaniensis*

This species has a snout-vent length of up to 50 mm, and a group of up to 12 individuals can be maintained in a glass aquarium with a floor area of 50 cm x 30 cm and a height of 30 cm. The species lives around the edges of pools, lakes and streams and shelters at the base of dense vegetation or beneath rocks or debris during the day. It follows that the aquarium should provide land, water and cover.

The substrate most favoured in our laboratory is bricks of compressed, chopped and dehydrated coconut fibre. When placed in a bucket of water it expands to form a soft, moist material. Occasionally *L. tasmaniensis* will attempt to climb or jump out, and an aquarium lid is essential. We use a custom-made wooden lid that slips over the glass and rests upon the upper rim. The frame is covered with a fine, strong, open weave cotton material similar to that used for mosquito nets.

A larger and more elaborate fibreglass tank, featuring a flowing stream, was developed at the University of Adelaide, and is described by Chapman (1987).

(b) *Xenopus laevis*

This species is totally aquatic. Because there are two books providing all data relevant to its care and maintenance it is sufficient to refer to them (Deuchar, 1975; Tinsley and Kobel, 1996). The only way to obtain this species is from a laboratory maintaining a colony and, hence, information about housing

can be obtained from the supplier prior to establishing a new colony.

(c) *Bufo marinus*

There was a time when Cane Toads were housed in large zinc chambers within animal houses. No food was provided and the only shelter was in the form of wet sacks thrown upon the floor. Happily it is now appreciated that, despite their pest status, they require food and warmth if they are to maintain optimal conditions, and the standard of care must satisfy modern ethical criteria.

There are two uses for which Cane Toads are likely to be obtained: as a source of tissues or for other purposes that require that the animal be sacrificed, or as a source of fertile eggs. Holding tanks of glass or fibreglass are ideal. Access to water is essential - heavy china dog drinking bowls are particularly suitable because they cannot be overturned. The housing of Cane Toads intended to be used for breeding purposes is described below.

Environmental conditions

Light quality

If the room in which the animals are to be housed lacks direct light, it is imperative that the fluorescent lighting be of 'daylight' quality. The health of the animals (and the rearing of healthy, normal tadpoles) requires exposure to low levels of ultraviolet light.

Air quality

In an animal house, the only major concern is to ensure that any air-conditioning is separate from that used for rats, mice, rabbits and other mammals, because amphibians are extremely sensitive to ammonia and will not survive exposure to it.

Temperature

As a convenient rule, frogs and toads from northern Australia should be maintained at 30°C, and those from southern Australia at 20°C. In northern Australia tadpoles and eggs commonly are found in water with temperatures above 40°C and on one occasion at 45°C (Tyler, 1994). Nevertheless, the attributes to survive at such temperatures are species-specific and care should be taken regarding their exposure to such temperatures even for short periods.

Food

The larvae of the beetle *Tenebrio molitor* (better known as mealworms) are by far the best staple diet for frogs. Toads are equally partial, but their extreme dietary intake can make this food an expensive maintenance item. Mealworms can be purchased in amounts as little as 100g from pet shops, for they are also fed to lizards, turtles and insect-feeding birds and marsupials. The mealworms are usually supplied in plastic containers of dry bran to absorb moisture. The development of larvae can be halted by storing them in a refrigerator at 4°C. If the quantity of mealworms required places financial stress upon the research budget, a mealworm breeding colony can be established. Details can be obtained from pet clubs or caged bird fanciers and are described in Tyler (1997).

Anaesthesia

There are relatively few instances in which there is a need to anaesthetise frogs, and relatively few options to achieve that state. By far the best documented general anaesthetic is the cocaine isomer MS-222 (tricaine methanesulfonate (TMS) ethyl 14 - aminobenzoate), rejected for human use (as a local anaesthetic) because of its low solubility in water. It is now available from Ruth Consolidated Industries of Annandale, NSW. One of the major attributes of MS-222 is the simple and non-invasive method of delivery. All that is required is to place the amphibian in a 2% aqueous solution, no more than 5 mm deep. The anaesthetic is absorbed directly through the skin of the ventral surface of the body and limbs. It is preferable to make up a fresh solution for each use, because there is significant loss of activity after a few days.

The depth of anaesthesia can be determined in precisely the same manner as for small mammals: by compression at an inter-phalangeal joint. The duration of induction will vary with the size, body mass and skin thickness of the species, combined with body temperature and hence, metabolic activity. Elimination of the anaesthetic is brought about by exposing the animal to a stream of cold water beneath a tap. Fingerling trout have been anaesthetised for up to eight hours, but shorter periods are recommended.

Fluothane (ICI) has been used as a general anaesthetic for Cane Toads (Taylor *et al.*, 1985). A few millilitres are poured upon a wad of cotton wool in a sealed, five litre capacity glass jar beside the toad. Loss of consciousness is rapid, and anaesthesia is maintained for three to five minutes following removal from the container. The depth of anaesthesia is sufficient for minor surgical activities.

Anholt *et al.*, (1998) described the use of a 0.02% solution of MS-222 to anaesthetise tadpoles. Immobility was achieved within four minutes, with recovery after thirty minutes.

Euthanasia

The prospect of using decapitation as a means of euthanasing frogs is a deterrent to those contemplating experimental biology. Despite its speed and efficacy it is considered barbaric by many researchers, and by those opposed to the use of animals for experimental purposes.

A humane euthanasing agent is a 3% aqueous solution of chloral hydrate. As with the use of MS-222 as a general anaesthetic, the frog is placed in a container with the solution covering its floor to a depth of no more than 5 mm. Even with a tree frog, which may climb out of the solution, death follows within a few minutes and the animal is in a relaxed state.

Deep-freezing is used by many to kill cane toads. It is effective, but whether there is no suffering is difficult to establish.

Pithing (decerebration followed by spinalisation) is more readily demonstrated than described. The diameter and length of the pithing rod and the shape of the tip are crucially important if the procedure is to be undertaken humanely.

I am dubious that the necessary skill and confidence to undertake pithing can be derived other than by video or personal demonstration. The accompanying notes are included simply because this facts sheet would be incomplete without reference to the procedure.

The pithing rod needs to be of stainless steel or any non-ferrous metal of similar rigidity. Kirschner wires of vanadium are ideal. The diameter must be narrower than the diameter of the neural arches through which it must eventually pass. A diameter of 2 mm is my preference.

Decerebration is made possible by the simple form of the first cervical vertebra. The animal needs to be held firmly in the left hand, and the head ventrified gently with the forefinger. By this means a non-bony gap is created between the first vertebra and the occipital region of the cranium.

The pithing rod needs to be held near the end of the shaft and inserted forcefully into the brain by rotating it over the forefinger.

Very slowly the pithing rod should be withdrawn to the position at which it rests upon the superior border of the neural arch, and therefore is in a position in which it can be rotated posteriorly and pushed posteriorly (spinalisation) through the neural arch. As soon as the pithing rod has entered the posterior portion of the spinal canal the operator should turn his or her head to one side, because there can be a massive sympathetic stimulation of the parotoid glands, discharging the toxic contents in a fine spray for a distance of one metre or more. Contact of the secretions with the eyes will cause excruciating pain. Protective glasses are recommended.

Breeding induction

Traditionally, breeding has been induced by the subcutaneous injection of a suspension of crushed pituitary glands. It is far simpler to use luteinising hormone releasing hormone (LHRH) produced by Sigma. Because of a recent increase in handling charges in Australia the price for 1 mg has increased greatly. Fortunately, a synthetic form of LHRH ('Lucrine') is used in fertility clinics. Inject 0.05 ml, which equates to 125 µg subcutaneously (s/c) into the male and female, beneath the dorsal skin. Because the skin is so tough in *Bufo marinus*, a 21 gauge needle is needed. The onset of amplexus is rapid. It is commonly one hour after administration but on one occasion the male clasped the female in less than five minutes.

Tadpole care

The chlorine levels in tap water are high enough to kill tadpoles. To eliminate the chlorine it should be allowed to stand in a bucket for 24 hours or passed through a carbon filter. Chloraminated water requires chemical treatment.

Aeration is essential to permit high numbers of tadpoles to survive. The tadpoles should be removed and transferred to a separate aquarium with shallow water and stones when the front legs emerge in readiness for their change in diet and habitat.

I favour boiled lettuce leaves for food, but it is essential to obtain them from an 'organic' source to ensure that they have not been exposed to pesticides. They should be boiled in a stainless steel vessel to eliminate heavy metal take-up. I purchase 50 lettuces at a time from the grower, boil the leaves and then deep-freeze them to provide a constant source.

Blood collection

The only reliable method of blood collection is by cardiac puncture. In *Bufo marinus* the ventricle is located near the xiphisternum. I am uncertain whether the position varies to any significant degree in other species. Accordingly, dissection of a freshly sacrificed individual to familiarise the operator with the anatomy should be undertaken prior to the use of this procedure.

Marking

Because frogs shed (and usually eat) their entire skin approximately once each week, there is no simple method of marking individuals. I have a personal aversion of toe clipping - removing one or more phalanges to identify individuals. Tattooing or hotwire branding is more humane.

Drug administration

Amphibians have a unique lymphatic system consisting of a series of s/c sacs which drain into pulsatile lymph hearts. The number of sacs and the position of the septa bounding them varies from species to species (Carter, 1979). The dorsal sac extends from the base of the cranium to the end of the body. A drug injected s/c reaches the blood stream within seconds of administration. Apparently unique to *Bufo* is the presence of numerous adhesions of the dorsal skin to the underlying musculature.

Intraperitoneal injection is unreliable because of the often vast size of the bladder (and hence the risk of injecting into it), and the presence of nephrostomes on the surface of the kidney which take up fluid from the body cavity and excrete it, so eliminating at least part of any drug administered by that route.

I am unaware of the intramuscular route being used, probably because of the ease of s/c injection.

Diseases

More has been written about amphibian pathology than about disease treatment. This year the first volume on husbandry, medicine and surgery of amphibians (Wright and Whitaker, in press) will be published, whilst an overview of husbandry and medicine is also to be published shortly (Wright and Tyler, in press).

Rather than repeat data which will soon be available in greater detail, the focus here is upon major problems that have only

recently been noticed. By far the most important is the report of chytridiomycosis in frogs from North America, Central America and Australia (Berger *et al.* 1998; Berger and Speare, 1998).

In Australia there are now confirmed cases from Western Australia, South Australia, Victoria, New South Wales and Queensland. The fungus invades the epidermis and initially causes an overall hypertrophy, so increasing the number of layers of this tissue.

Parasites

Frogs have the capacity to carry extremely high parasite loads without any evident deleterious effects. As a resource for parasitological studies, there have been a number of significant papers and reviews of parasite groups over the past two decades. The majority of these publications have concentrated on the identification of the parasites and providing primary and secondary host lists. For example, Edmonds (1989) reviewed the Acanthocephala for all vertebrate hosts, whilst Barton (1994) provided a check list of all helminth parasites of Australian frogs.

Greater detail of the parasites is provided in the studies of protozoans (Delvinquier, 1986; 1989), trypanosomes (Delvinquier and Freeland, 1989) and opalinids (Delvinquier, 1987).

Myxidium immersum has been linked to hepatitis in *Litoria caerulea* by Hill *et al.*, (1997), but experimental infection has to date proved unsuccessful.

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Assessing and enriching the cage environment of laboratory rats

The following is a summary of the findings of PhD studies recently completed at Victoria University of Wellington, in the School of Psychology (Patterson-Kane, 1999). The thesis investigated the New Zealand caging standard for laboratory rats. Caging practices were determined by anonymously surveying 18 universities and research institutes. The typical rat cage had a plastic base and a wire mesh lid or top section. It measured approximately 40x20x20 cms, contained wood shavings and housed two adult rats. The purpose of the research was twofold, first to determine whether the standard rat cage was acceptable in terms of the rats' welfare, and second, to assess different ways of enhancing the welfare of caged rats. The following four methodologies were employed to carry out these goals.

Standardised tests of fearfulness and problem solving ability.

The behaviours of rats housed in enriched, standard and deprived conditions were assessed using standardised tests of fear and problem-solving abilities. The other housing conditions were included in order to determine whether New Zealand standard conditions resulted in behaviour more similar to enriched or deprived rats. The deprived rats were housed singly in 20x20x20cm aluminium cages. The enriched rats were housed in groups of 12 in a large glass aquarium with a range of objects and fixtures that were changed regularly. Exposure to these conditions was from 30 to 60 days of age.

The assessment procedures used were the emergence box, open field and

Hebb Williams maze, an open field maze consisting of 12 barrier-based problems, where entering a dead-end is scored as an error. The behaviour of rats housed in standard New Zealand conditions was intermediate between the enriched and deprived rats on all three measures, but more closely resembled that of the deprived rats (Patterson-Kane, *et al.*, 1999).

The deprived rats were more fearful, and more cognitively impaired than the enriched rats and that the standard rats shared these deficits to some extent and suggest that the welfare of caged rats kept under standard conditions in New Zealand is compromised.

Tests of specific cognitive abilities

The deprived rats displayed no general cognitive deficits on procedures other than the Hebb Williams maze, causing the validity of the maze in this context to be questioned. Deprived rats were tested for deficits of memory, learning and persistence. They showed no clear deficit on any of these tasks. Some of the results could be interpreted as indicating that the deprived rats have a specific cognitive deficit relating to attention at the time of encoding, and a tendency to respond on an unproductive response option in a discrimination reversal task. However this impaired reversal learning did not occur when intermittent reinforcement was used, suggesting that it is not caused by an inability to solve reversal problems. The deprived rats showed an advantage over enriched rats in some learning tasks which could be attributed to their greater sensitivity to reinforcement.

The conclusion was that deprived rats do not suffer from a general cognitive deficit. They may have a specific disadvantage in terms of attending to stimuli, and

making 'frustration' responses under conditions of extinction, as well as an advantage in some learning situations, as they are more sensitive to reinforcement. I concluded that the Hebb Williams maze is not a valid cognitive test, probably because it is confounded by different fear levels (as displayed by activity levels). Thus, the maze findings are disregarded and New Zealand standard conditions are considered to have only small and ambiguous effects on cognitive abilities.

Preference

The thesis then moved from looking for behavioural damage to examining what conditions rats would prefer. The rats showed significant preferences for only a small number of cage modifications (of the 20 tested). They clearly preferred nesting boxes and shredded paper, and showed some preference for a larger group size of rats.

Economic demand

The demand experiments demonstrated that the rats worked hardest for access to moderately sized environments with a group size of six. However, the demand procedure is not well suited to use with environmental reinforcers (such as extra space and enrichment items). This limited the amount of data that were generated and there was marked variability, especially between subjects.

Conclusions

The main conclusion was that the current caging conditions are not obviously damaging to welfare. However, deprived and standard rats were more fearful than enriched rats. This could be ameliorated through interventions such as regular human handling (Spence and Mayer, 1962). Cages can be improved by the provision of nest boxes and paper, but many other enrichment

options (e.g., PVC tubes or sticks) are contra-indicated. Arbitrary enrichment items should be avoided as most were not preferred by rats and some were avoided. Provision should be made in the future for using cages suitable for groups of around six, although more data would be helpful regarding the optimal group size.

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Book Reviews

Animal Welfare

by Appleby, M.C. and Hughes, B.O., eds,
CAB International, Wallingford, Oxon., U.K. 1997,
316 pp, paperback
AUD \$65.50
ISBN 0 85199 1807

Academic books establish their stature by their relevance, coverage, style, authority, insight, or some other related attribute. This book appealed to me because of its blended display of all the attributes named, though not for any one more than others. As a multi-authored book, its potential was always likely to be limited, because the benefits of having specialist contributors usually end up being partly traded off for the cohesion given by a single author. As a collection of independent contributions on a complex topic, this book ranks very highly.

Is a book of edited contributions the best way to offer new or collected thoughts on animal welfare? The subject is one where the literature is expanding like DNA in a thermocycler. As a measure of the problem, I suspect that I am now aware of barely a tenth of the literature relevant to animal welfare, and maybe read only a hundredth of it. More and more frequently, discrete topics are carved as monographs from the growing body of knowledge so as to make them manageable and accessible. The type of sweeping coverage of Animal Welfare in this book is rare, so this collection will be treasured by those of us struggling to keep abreast of proliferating publications.

The intellectual standard in the works is of top rank. The editors, themselves worthy contributors, have organised 32 prominent colleagues to write 17 chapters under

five broad headings. The first addresses "Issues", of ethics and of understanding welfare. Then five chapters examine "Problems" of how best to provide the Freedoms which concerned people commonly argue should be given to animals. A section on "Assessment" discusses techniques for quantifying welfare, four chapters offer possible "Solutions" to defined problems, and finally the process of "Implementation" links the ideas to the social constructs of economics and legislation. The spread is well focussed and balanced.

At numerous points, in fact beginning with Chapter One on Ethics by Sandoe, Crisp and Holtug, my interest was held by a particularly original approach. These authors, for example, have charted a new path through the much trodden field of animal ethics, and end with a very helpful analysis of "What is the point of engaging in ethical thinking?" Another chapter to give me great pleasure was that on "Preference and Motivation Testing" by Fraser and Matthews. Their structured mix of anecdote, research data and analysis was as enjoyable as it was helpful. Not all chapters were quite so gripping or well presented, but the editors put back on track the occasional drifting approach through their guidance in the Introduction and final Discussion.

The layout of the text is clear, logical, and mostly helpful. Each chapter begins with an Abstract of half a page which foreshadows the key ideas, and ends with a set of dot-pointed Conclusions. A minor irritation, at least to me, was the great number of quotations from papers by other writers, a feature which the editors had encouraged to show "how the ideas have developed". These excerpts

(unfortunately also set in smaller font) sometimes were so frequent as to confuse my following of the argument, in one chapter actually making it difficult to identify the authors' own ideas.

The book's few shortcomings arise from its structure rather than its contents. Partitioning the text into sections called Issues, Problems, etc, has a logic which was not always helpful in practice. For example, it was difficult to guess where certain topics might be discussed. On checking my interests in consciousness and euthanasia, the quite brief index gave me some limited leads, but even there the targeted topics were not discussed in the context I wanted. It will always be difficult to logically dissect such a mega-topic, stretching from the humanities through the social and biological sciences to clinical practice. To improve this as a text, the editors could have offered advice, especially for science students, about the many worrying conflicts one encounters in a study of animal welfare. For instance, how can rises in plasma cortisol be both normal or abnormal, how can indoor animal husbandry be regarded as either good or bad, why does alarm cause animals to freeze or flee? Students are easily unsettled by apparently inconsistent data, even leading them to conclude that study of this very demanding discipline is futile - some advice from experts might help.

This book will undoubtedly emerge as a key and authoritative reference for animal welfare practitioners as well as students. Some readers will be frustrated by the logic of presentation or the conflicting views, others will find them challenging. Regardless, the book is a major text. By nature, its push through the rapidly changing pool of ideas will lead to it being out of date within a few years, especially with the mass of problems now emerging from the machinations of biotechnology.

I hope that in five years, a new edition will be compiled that is as successful as this in documenting current developments in this ever demanding field.

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Minds of their own

by Lesley Rogers. Allen and Unwin, St Leonards, NSW.
1997. 212 pages
ISBN 1 86448 504 3
AUD\$17.95

In this interesting book, Professor Lesley Rogers from the University of New England has provided a concise but wide-ranging coverage of the perennially interesting question of animal consciousness.

This is a subject which should interest people from all cultures and occupations, whether they live in the city or the country and whether or not they keep animals. The author asks:

Do animals have ideas and do they think about objects that they cannot see or about situations that have occurred in the past? Do they consciously make plans for the future or do they simply react unthinkingly to objects as they appear and situations as they arise? Are animals aware of themselves and of others or is this an ability unique to humans? All of these questions have bearing on whether animals have consciousness or not.

These are difficult and complex questions, which humans have attempted to address in many ways over the years. In the introductory chapter *Not simply machines*, the author reviews the history of this debate, from Aristotle to Descartes to Darwin, including the Judaeo-Christian story of creation.

Until recently, it has been decidedly suspect for good scientists to discuss whether animals have thoughts or feelings. Rather, it has been considered preferable for non-human animal behaviour to be described in simple stimulus - response terms, without reference to thoughts or emotions.

Lesley Rogers systematically discusses the evidence for consciousness, mental images, memory, intelligence and use of tools and of language, drawn from her own work and extensive knowledge of the published literature.

This includes fascinating studies on awareness of self and of others, using birds and non-human primates. She points out repeatedly in the book the difficulties inherent in such studies - in particular, the need to ask the right questions (or to ask questions in the way most suitable to the species, and the individuals being examined). This is a very important point. For example, results from studies on small groups of chimpanzees, macaques or birds have often been taken to be typical of the whole of the particular species, without allowance being made for the source of the animals (wild-caught or captive-bred), or their age, sex or other variables. Lesley Rogers points out that data from small groups of such animals cannot be said to represent the whole species any more than data on a small group of humans from one particular social or economic background cannot be said to represent *Homo sapiens* as a species.

Lesley Rogers devotes a considerable part of her book to examining evidence for awareness of self in animals as well as their awareness of others. This includes communication vocally and by display, as well as one animal teaching another member of its species (e.g., a mother chimpanzee teaching its young to crack open nuts). Other related issues covered

are intentionality (planning ahead or anticipating the future), deception; suffering with others and reading another's mind-state.

The further I read, the more interested I became in this fascinating book. While many readers will have some familiarity with studies of learning in mammals; for example, the use of tools by orang-utans to obtain food, as well as conditioned learning (rats pressing a bar for food), what is really interesting is the work on learning in birds - pigeons, parrots and chickens. This is Lesley Rogers' own research interest and she reviews the evidence for concept-formation and cognitive abilities in birds. This includes Irene Pepperberg's famous African grey parrot Alex, which has been trained to use English words to name objects and feelings. He can use a vocabulary like that of a chimpanzee with sign language and can identify, request or refuse more than 100 objects of various colours, shapes and textures.

Following the extensive discussion of "intelligent" behaviour by birds and mammals, Rogers examines the evolution of the brain in vertebrates and how this relates to overall cognitive capacity, or "intelligence". She emphasises the need for scientists working in this field to be well versed in the fields of brain anatomy and function and of animal behaviour (comparative psychology).

The relationship between brain structure and animal behaviour (e.g., bipedal walking) is of great interest and is treated in detail. Lesley Rogers summarises her chapter on brain structure by saying:

We know of no single structure in the brain that is unique to humans ... we are, it seems, always seeking to find something about the brain that might make us different from, and superior to, other species. Perhaps it is just more of everything that singles us out.

The book concludes with chapters on future research on animal minds and on thinking, feeling and animal rights. Rogers reiterates the importance of taking into account individual differences between animals of a species when studying complex behaviour, in particular, behaviours that reflect consciousness -

...We need to live in close contact and communication with animals if we are going to be able to detect their subtle behaviours and if we are going to understand them in any way.

The final points discussed relate to the importance of cognition and consciousness in animals and to the way in which we treat them - i.e., to their welfare. This includes the need to accept that at least some species of animals (e.g., vertebrates) can experience pain. Although it is unquestionable that animals with consciousness will experience pain, failure to find evidence of consciousness in a species should not be used as a reason to conclude the species does not feel pain.

Reference is made to the need to consider welfare of housed laboratory and zoo animals, e.g., of sheep in metabolism cages. Stress can result from inability to move around, as well as from insufficient mental stimulation.

Professor Rogers, in closing, briefly refers to the Great Ape Project, which calls for special legal rights to be conferred on the great apes because of their very close relationship to humans. She asks, if this were granted, would it make some animals more equal than others?

The challenge to scientists of explaining consciousness still remains.

Robert Baker

For more on animal consciousness

See the following contributions by Professor Rogers to ANZCCART's publications.

Rogers, L. (1994) What do animals think and feel? *ANZCCART News* 7(4), 1-3.

Rogers, L. (1995) Do animals think? In: *Animals and science in the twenty-first century: new technologies and challenges*. (R.M. Baker, R. Einstein, D.J. Mellor and M.A. Rose eds.) ANZCCART, Adelaide.

Letter

Alternatives to harmful animal usage in tertiary education

On 11 November 1998 Murdoch University took the groundbreaking step of formally allowing conscientious objection by students to animal experimentation or other areas of their coursework. Murdoch is, to my knowledge, the first Australian university to formally take this step, and its decision will have ramifications for other Australian universities. Additionally, the University has agreed to review the humane alternatives available in all 45 teaching units that currently use animals. These units are found within Murdoch's veterinary, biomedical and biological science courses.

These results followed a year-long struggle by myself as a Murdoch veterinary student for humane alternatives to animal usage to be made available in the veterinary course. I entered the veterinary course because I hoped one day to become a healer of animals and was surprised and disappointed to discover that my participation was required in several teaching laboratories in which animals were seriously harmed or killed, and for which humane alternatives existed. When I and a classmate voiced our concerns and requested alternative assessments and education experiences, these were granted in some units, for example in biochemistry, but denied in others, most notably in physiology.

The academics in charge were unmoved when I presented them with details of humane alternatives, of courses around the world where they are successfully pursued, and of the many scientific studies that demonstrate that "alternative" students are at least as compe-

tent. Consequently we lost marks for refusing to participate in several physiology laboratory classes which used animals. As a last resort I formally complained to the WA Equal Opportunity Commission, with the result that my marks were restored to me. These events became the catalyst for the university reviews of conscientious objection and the use of animals in teaching which culminated in the decision of November 1998.

In the last decade, the number of veterinary medical colleges in the USA offering alternative programs for students who request them has increased to 20 out of 31. Just over 50% of the 126 US medical schools have completely eliminated animal usage and all but one of the remainder offer alternative programs. Harmful animal usage has been eliminated in all six of the UK Veterinary Colleges for some years. Many of these changes have occurred after students have taken legal action as a last resort.

What are the alternatives?

The field of humane alternatives to harmful animal usage in teaching is a rapidly growing one and databases listing thousands of alternatives now exist. They include computer simulations, videos, plasticised specimens, ethically-sourced cadavers, models, diagrams, self-experimentation and clinical experiences. In medical and veterinary courses, alternatives at the preclinical level are mainly focused upon imparting knowledge, whilst those at the clinical level impart skills as well.

Alternative veterinary surgical sources comprise a number of stages. In the beginning students learn basic psychomotor skills such as suturing and instrument handling using knot typing boards, simulated organs, and other models. They then progress to simulated surgery on ethically-sourced cadavers obtained from animals that have died naturally or in accidents or been euthanased for

medical reasons. Finally students observe, assist with, and then perform necessary surgery under close supervision on real patients that actually benefit from the surgery, as distinct from healthy animals that are later killed.

An important part of alternative veterinary surgical courses worldwide is the highly popular animal shelter sterilisation programs, in which homeless animals are sterilised by students under close supervision and returned to the shelters. The popularity of these programs stems in part from the fact that all parties gain from them. The animals have their adoption rates consistently increased by these programs, the students gain invaluable experience at the most common procedures they will later perform in practice, and the veterinary school has its image enhanced by providing a useful community service.

Why use alternatives?

The many reasons to use humane alternatives include ethical considerations, Code of Practice and legislative requirements, and economic pressures. Claims that animal experiments provide essential tissue-handling skills or an essential introduction to surgical procedures are refuted by the numerous courses worldwide where alternatives are extensively and successfully used. Such alternatives can be used to demonstrate both the variability of data encountered in real experiments and how experimental data and principles were originally derived. Their teaching efficacy is demonstrated by the numerous published studies showing that alternative students are at least as competent as their conventionally-trained counterparts (see attached references).

Students' rights to conscientious objection to harmful animal usage are enshrined in international human rights legislation and the national laws of several countries, including Australia. Univer-

sities whose uncompromising attitudes have resulted in lawsuits by students have found themselves dogged by controversy and adverse publicity and have in some cases been forced to pay out considerable sums in damages.

On the other hand, universities which seize the opportunity to make progressive changes are able to portray themselves as ethical, responsible and capable of providing the latest in educational technology. By becoming, to my knowledge, Australia's first university to formally allow conscientious objection, Murdoch has demonstrated its commitment to equity and cemented its reputation as one of Australia's most progressive institutions. By agreeing to review the humane alternatives in all teaching units that use animals, Murdoch now has the opportunity to become an Australian leader in this area and to build on its reputation for providing excellence in its teaching.

The increase in the number of students worldwide insisting on humane alternatives to harmful animal usage in their education is exceeded only by the growth in the numbers of alternatives themselves. In considering their responses to the issues of humane alternatives and student concerns, universities are faced with two major choices today. They can seek to hold back the tide by clinging to an increasingly outdated tradition of harmful animal usage, or they can embrace the exciting possibilities which the rapidly expanding field of alternatives represents. They can, in fact, choose to help shape the future or to be shaped by it.

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References

Fawver, A.L., Branch, C.E., Trentham, L., Robertson, B.T. and Beckett, S.D. (1990) A comparison of interactive videodisc instruction with live animal laboratories. *American Journal of Physiology* **259** (Advances in Physiology Education 4): S11-S14.

Greenfield, C.L., Johnson, A.L. Schaeffer, D.J. and Hungerford, L.L. (1995). Comparison of surgical skills of students trained with models or live animals. *Journal of the American Veterinary Medical Association* **206**: 1840-1845.

Pavletic, M.M., Schwartz, A., Berg, J. and Knapp, D. (1994) An assessment of the outcome of the alternative medical and surgical laboratory program at Tufts University. *Journal of the American Veterinary Medical Association* **205**: 97-100.

Editor's Note

Andrew Knight's letter was adapted from his original 3,550 word article. For the complete paper and further references contact Andrew. Further information about animal use for primary, secondary and tertiary teaching can be found in the following ANZCCART articles or publications.

Brennan, A. and Einstein, R. (eds.) (1997) *Animals in education: value, responsibilities and questions*. ANZCCART, Adelaide.

Einstein, R. (1994) Can I teach biology without using animals?. In *Animals and science in the twenty-first century: new technologies and challenges* (eds. Baker, R.M., Einstein, R., Mellor, D.J. and Rose, M.A.) ANZCCART, Adelaide.

Loiacono, R. (1998) Animal replacement and reduction: multimedia teaching aids in behavioural pharmacology. *ANZCCART News* **11**(2): 4-5, June, 1998.

The University of Adelaide's policy on the use of animals for undergraduate teaching

The Animal Ethics Committee (AEC) of the University of Adelaide has developed and implemented a policy to reduce and replace the use of animals for undergraduate teaching, as required by the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* and by State and Territory animal welfare legislation.

Approval for use of animals in undergraduate teaching cannot be expected where practicable alternatives to animals could be used effectively. All applications for use of animals in undergraduate teaching are to include references to available alternatives.

Departments using animals in undergraduate teaching are expected to either trial alternative teaching methods which do not involve the use of animals, or, to demonstrate why the use of animals is sufficiently superior to warrant exemption from this requirement. Departments are to discuss proposed trials with the AEC at the time of submitting teaching applications.

Approval for undergraduate teaching programs may be granted for a period of up to three years (rather than annually as at present) provided that in those Departments where alternatives exist the programs include suitable plans for the trial of these alternative methods. Applications for undergraduate teaching involving use of animals must be made in good time to allow dialogue with the AEC to be completed well before teaching is to commence.

Honours projects are not subject to this policy.

Further details are available from the University of Adelaide website: www.adelaide.edu.au/secretariat/ethics

Information available from NSW Animal Research Review Panel on *Animals and alternatives in education - towards best practice*

The NSW ARRP held two workshops on this topic in September 1996 in Armidale and Newcastle, NSW, and it has published a set of notes. These are in the form of a discussion paper and include a summary of key issues, followed by three presented papers and a background paper.

Copies of the notes are available free of charge from:

Lynette Chave
Senior Veterinary Officer
Animal Welfare Unit
NSW Agriculture
Locked Bag A5000
Sydney South NSW 1232

Tel: 02 9264 9544
Fax: 02 9264 9632

email: lynette.chave@agric.nsw.gov.au

Workshop on Reduction

The second of the three workshops on the Three Rs will be held in Brisbane at the University of Queensland on Monday, 10 May, 1999.

It is co-sponsored by ANZCCART and the Queensland Department of Primary Industries.

For details of the program and registration, contact:

Dr Julie Reilly
Animal Welfare Office
University of Queensland

Tel: 07 3365 2713
Fax: 07 3365 4455

email: j.reilly@research.uq.edu.au

Coming up

Australian Veterinary Association Conference
16-21 May 1999, Hobart

Contact: Ms Doreen Culliver
AVACOS, 7 Phipps Place
Deakin, ACT 2600
Tel: 02 6285 3600
Fax: 02 6285 3913

Email: avacos@ava.com.au

The Use of Wildlife for Research

26-27 May 1999
ANZCCART's 1999
Australian Conference
Western Plains Zoo,
Dubbo, NSW

Contact: ANZCCART's
Adelaide office for information

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

29 August - 2 September
1999 Bologna, Italy

Contact: JRC Public
Relations and
Publications Unit
Tel: 39 33 278 9889
Fax: 39 33 278 2435

Email: prp@jrc.it
<http://www.ei.jrc.it/cevam/bologna/testbol.html>

Innovation, Ethics and Animal Welfare: Public Confidence in Science and Agriculture

18-19 November 1999
ANZCCART/AWAC
Conference Wellington,
New Zealand

Contact: Mrs Gill
Sutherland PO Box 598
Wellington NZ
Tel: 64 4 472 7421
Fax: 64 4 473 1841

Email: sutherland.g@rsnz.govt.nz

News

Animal Welfare - special issue on genetics

The November 1999 issue of *Animal Welfare* will be published as a special issue, devoted to the topical subject of *Genetics and Animal Welfare*. This journal, published by the Universities Federation for Animal Welfare (UFAW), has established itself as an objective, international forum for quarterly publication of peer-reviewed papers on all aspects of farm, laboratory, zoo, wild and companion animal welfare science from practical husbandry to ethical debates.

The special issue will cover issues ranging from the welfare implications of extreme breed types in farm and companion animals, to the use of transgenic animals in veterinary bioassay. The ethical implications of advances in genetic technologies are also well discussed in a range of authoritative and thought-provoking submissions.

Further details of the journal can found on the UFAW website at: <http://www.ufaw3.dircon.co.uk>, or by contacting Helen O'Leary, UFAW Publications Officer on : journal@ufaw.org.uk.

News from UFAW

Dr Gillian Sales was elected Chairman at the 1998 AGM, to succeed Professor Peter Holmes who retired after his two year term, and Professor Ronald Anderson was elected Vice-Chairman to succeed Dr Sales. Dr Marcia Edwards and Dr Miranda Stevenson retired by rotation and Dr Stevenson was re-elected.

Three new members joined the Council: Dr Richard Bennett (University of Reading), Dr Barry Hughes (Roslin Institute, Edinburgh) and Mr Michael Radford (University of East Anglia).

New Chair of UK Farm Animal Welfare Council

Dr Judy MacArthur Clark has been appointed to Chair the FAWC, following the retirement of Professor Sir Colin Spedding. The FAWC plays a key role in promoting the welfare of farm animals in the UK.

Dr MacArthur Clark has previously worked with UFAW. She is widely experienced in laboratory animal science and is a Past President of the Royal College of Veterinary Surgeons.

New Executive Director for CCAC

The Canadian Council on Animal Care (CCAC) has appointed Dr Clement Gauthier as Executive Director, from 1 February 1999. Dr Gauthier succeeds Dr Donald Boisvert, who resigned late last year.

Dr Gauthier is a physiologist who has taught at the University of Ottawa and more recently was Executive Director of the Coalition for Biomedical and Health Research. He has extensive experience in policy matters, working with government and with research funding mechanisms.

Monoclonal antibodies

1. NHMRC draft guidelines

Following the workshop held by ANZCCART in Melbourne in March 1998, on the *in vitro* production of monoclonal antibodies, the Animal Welfare Committee of the NHMRC undertook to prepare guidelines in monoclonal antibody production to assist institutional animal ethics committees in the evaluation of monoclonal antibody production. The document is now available for comment. It further emphasises the principles of replacement and refinement, as required by the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Copies of the document can be obtained from:

Mrs Jenny Gordon-Douglas
Secretary to the AWC
Mail Drop Point 33
NHMRC
GPO Box 9848
Canberra ACT 2601

Comments must be received by 7 May 1999.

2. NSW Animal Research Review Panel (ARRP) guidelines

The ARRP has produced *Guidelines for the production of monoclonal antibodies* which are designed to assist animal ethics committees which consider applications for the production of monoclonal antibodies, as well as to assist producers of monoclonal antibodies.

The guidelines have been developed from information available in the published literature as well as information on common practices obtained during a survey on monoclonal antibody production conducted by the ARRP.

The guidelines can be obtained from:

Animal Welfare Unit
NSW Agriculture
Locked Bag 21
Orange NSW 2800
Tel: (02) 6391 3682
Fax: (02) 6391 3570
email:
Animal.Welfare.orange@agric.nsw.gov.au

They can also be downloaded from the NSW Agriculture home page (*Animal Welfare Unit index*).
<http://www.agric.nsw.gov.au/AW/index.html>

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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PO Box 19, Glen Osmond, SA, 5064.

Tel. 61-8- 8303 7393: Fax. 61-8- 8303 7113
E-mail address: anzccart@waite.adelaide.edu.au

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

or

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PO Box 598, Wellington, New Zealand

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