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"AEC – Best Practice"

Tuesday 28th to Thursday 30th July

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2009 ANZCCART Conference

Conference Programme

Tuesday 28th July

11.00am	Welcome & General Administrative Announcements	
11.05am	Conference Opening	
11.20am	Erich von Dietze	"Supporting External AEC Members – A Murdoch University and Perth Zoo Initiative"
11.50am	Dave Swain	"Virtual Fencing – Ethical advantages and disadvantages"
12.30pm	Dave Morgan	"Best practice monitoring options for AECs"
2.00 – 3.00pm	Break out group discussions (Based on AEC Category)	
3.00 – 3.30pm	Report back to conference from break out groups	
4.00pm	Short presentations on the expected and unexpected	
	Erich von Deitze	"Researching with Birds: a welfare approach for captive wild birds"
	David Rounsevell	"Griffith University AEC implementing the Code"
	Mark Oliver	"Physiological sheep studies: metabolic crate versus pen"
5.30 pm	Session ends	

Wednesday 29th July

9.00am	Este Kotze	"The welfare status of experimental animals in South Africa: Past, Present and Future"
9.30am	Gail Tulloch	"Nussbaum's Capabilities as Criteria of Good Practice"
10.00am	Sandra Boulter	"Euthanasing invading "captured from the wild" cane toads with carbon dioxide"
10.30am	Janine Barrett	"Unexpected adverse events - What are they and what do I do about them?"
11.30am	Gordon McGurk	"Feedback from the NHMRC on AEC Survey"
12.00 noon	David Pemberton	"AEC – Best Practice: A perspective from a Category B Member"
12.30pm	Dr Simon Bain	"The Enabling Role of Animal Ethics Committees"
2.00pm	Discussion Session	
	Revising the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes – What do we need to change?	
3.30pm	Group Discussions by Pseudo – AEC groups	
	Key issues arising out of discussions on the Code Revision	
4.15pm	Feedback from pseudo – AEC discussion groups	
5.00 pm	Session ends	

Thursday 30th July

9.30am	Stephen Balcombe	"Reducing stress in fish using a "non-acceptable euthanasia method: refinement works with a progressive animal ethics committee"
10.00am	Stephanie Sinclair	"Pain Recognition & Relief During the Dehorning of Cattle"
11.00am	John Schofield	"AEC military manoeuvres on the field of battle – an alternative model of the best and worst of collateral damage control"
11.45am	Janine Barrett	"Out-of-session approvals - the good the bad and the very ugly!"
12.15pm	Geoff Dandie	"ANZCCART Conference 2010 Update"
1.30pm	Peter Maley	"Arbitration – Independent Dispute Resolution"
2.00pm	Lex Turner	"Documenting AEC activities and site inspections"
2.30pm	Geoff Dandie	"ANZCCART's Publication Strategy: - Maintain, Update and Expand"
3.00pm	Conference Ends	

Supporting External AEC Members: A Murdoch University & Perth Zoo Initiative

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Abstract

External (C & D) Animal Ethics Committee (AEC) members are diverse and there are only a small number on any AEC. Providing this group with support and professional development relevant to the work of an AEC can be complex and time consuming. Conference attendance is one option, but only meets the needs of some individuals and can be expensive. In addition, C & D members are volunteers and are often busy in their wider lives, which can make it difficult for them to allocate sufficient time for travel and conference attendance. Generally, most C and D members do not have a scientific background and some have indicated that they feel isolated or unsure whether the questions they have regarding research proposals are similar to those of other C & D members. The confidentiality of AECs and the diversity of issues different committees address can add to this sense of isolation. This can leave C & D members uncertain about the value of attending training, conferences and the like. In recognition of their reported sense of isolation, Murdoch University Ethics Office allocated some resources and joined together with Perth Zoo to offer targeted support and development for C & D members in an integrated approach. We invited all C & D members in Perth to attend sessions focused on their needs and requirements, where they were not only given input but also had the ability to set the agenda both for the day and for future sessions. This presentation will describe what we initiated and evaluate its impact based on feedback from attendees.

The idea

Animal Ethics Committees (AECs) are aware of the need to support and provide training for their members. This includes category C & D members[1]. At the same time, there is

[1] The ***Australian code of practice for the care and use of animals for scientific purposes*** **(**7th edition 2004), section 2.2.2 defines the C&D categories as follows:

Category C a person with demonstrable commitment to, and established experience in, furthering the welfare of animals, who is not employed by or otherwise associated with the institution, and who is not involved in the care and use of animals for scientific purposes. Veterinarians with specific animal welfare interest and experience may meet the requirements of this Category. While not representing an animal welfare organisation, the person should, where possible, be selected on the basis of active membership of, and nomination by, such an organisation;

Category D a person who is both independent of the institution and who has never been involved in the use of animals in scientific or teaching activities, either in their employment or beyond their under-graduate education. Category D members should be viewed by the wider community as bringing a completely independent view to the AEC, and must not fit the requirements of any other Category.

often a tension - expressed as wanting to retain the integrity of the C & D voice by not professionalising it through over-training. Traditionally, our AEC has endeavoured to fund at least one C or D member to attend each ANZCCART conference. In recent times this has become increasingly difficult to achieve. Feedback suggests that members are sometimes reluctant or unable to travel due to their wider personal commitments, at other times members that have not previously attended an ANZCCART conference have been unsure of the value of a conference. However, members agreed that training and development are important elements of their contribution to an AEC.

Conference attendance is typically an expensive mechanism for providing training and the outcomes are not always wholly focused on the needs of C & D members. Yet, conference attendance provides many benefits, including the ability to mix with similar members from a wide variety of AECs, to share stories and learn from each other's experiences.

Our issue was providing training that at least emulated the benefits of a conference without the demands of time and travel on members. Discussion among several local ethics offices had identified this as a common issue.

Based on feedback and suggestions from our AEC members, in 2007 we decided to host a focused C & D member training event. The initial idea was to emulate some of the networking and input that can be attained through a good conference without the necessity for travel and in a compact format. To achieve this we decided to provide an event that would be open to all C & D members in Perth. This would also have the impact of achieving sufficient numbers to make the event worthwhile and to ensure strong networking. We were aware from the outset that, if successful, this event could commit us to running future similar events. One reflection from the program which developed is that our intention of providing training was not entirely what the members were seeking; their vision seemed to be more in the direction of a mechanism which facilitated support and networking.

To date this event has run in 2007 and again in 2008. We hope that it will continue to run at least once each year.

Budget

Total outlay for each event was relatively minimal. We spent less than one registration, travel & accommodation package for an ANZCCART conference, not including the value of the staff time for the preparatory work. We were able to keep the budget low due to the generosity of the institutions involved who donated in-house services, room hire and the like.

Planning

From the outset it was important that this be seen as a community member driven event. We needed to learn more precisely what their agendas were and then find ways of focusing the session around those ideas. Foremost we intended to provide opportunity for them to interact with each other.

C & D members were approached through their committee secretariats and asked to identify whether they

would value an opportunity to meet together and if so when and how they would like an event to run and what format they would like[2]. All those who responded to the invitation indicated that they would prefer a combined event for C and D members, rather than separate sessions. Their suggested topics and preferences for time and day were collated and the events were run based on this feedback.

The decision to host the session collaboratively with another institution was made to spread the organisational work load, to ensure a minimum level of participation, to convey a wider perspective for and recognition of the event and to reaffirm the importance external members hold for every institution's AEC.

What better venue is there than Perth Zoo? Landscaped gardens, ample parking, easily accessible and of course, close proximity to animals that most of us (even on AECs) do not have regular exposure to. With zoos forming part of the scientific community, it also gave an opportunity for consideration of some of the unique challenges their AECs meet.

All C & D AEC members in Perth were invited to the events.

Program

Both the 2007 and 2008 sessions ran for approximately 3 hours, followed by a leisurely lunch. They included a small number of brief (10-15 minute) formal presentations and considerable opportunity for both small and large group discussions. At the 2007 event members were also treated to a behind the scenes look at Zoo life, while in 2008 extended opportunity for networking and conversing with others was provided (more information about the content of each event is provided in Addendum 1). In each instance the day's program was sufficiently flexible that individuals were able to raise issues or questions and contributions from their experience, and know that these could be incorporated into the day's discussions. Those who had attended relevant conferences were strongly encouraged to attend and share their learning with other C & D members.

In broad terms, the 2007 event resulted in members raising their questions and concerns, while the 2008 event attempted to elaborate in more detail on these topics and identify how community members could work with their institutions to resolve issues of specific concern to them. One or two members had expected us, as the organisers, to take on their issues and resolve them – either with specific AECs or more generically, however our vision was to provide a platform for C & D members to share through networking and to be able to define and articulate a way forward that might have wider relevance to all institutions.

[2] The approach was: If you are a Category C or D member of an AEC in Perth, we would like to invite you to a gathering of your peers. You may not be as isolated as you sometimes feel.
The event may include a formal presentation, discussion forums and social networking. This will be your function—how can we make it successful for you?

Attendance and feedback

There are approximately 12 AECs in Western Australia. All 12 committees supported the events by encouraging attendance; all 12 of the committees were represented between the two events, with 11 of the committees represented at each event. The overall number of C & D members represented on these committees is not known to us. However, a reasonable guesstimate, given that a small number of C & D members (we estimate 4) sit on more than one committee and that some committees have two or more members for each category, is that there are between 20 – 35 C & D members in Western Australia.

Each of the sessions was attended by 18 members. Nine members were able to attend in both years, thus making a total attendance of 27 individuals over the two years the sessions have been run. In each of the years of the program there has been a strong mix of individuals with varying lengths of service on their respective AECs. This can be summarized as:

Length of overall service on AEC

	Over 4 years	2 - 4 years	Under 2 years
2007	47%	24%	29%
2008	44%	37%	19%

The fact that 50% of the members who attended the 2007 event returned for the 2008 event gave a considerable sense of continuity to the events and to the themes discussed.

All who attended reported that they enjoyed the sessions and received value for their time-input. We have received a great deal of encouragement to continue supporting the members in this way. Indeed, it was several of the members who asked for this concept to be presented to a wider audience.

Specific Issues

The discussions at the 2007 event raised numerous issues, many of which were not unexpected. The benefit however, was that C & D members were raising them within the context of a relatively local network of peers and were encouraged to think together about solutions which they could take back to their AECs. Discussion started with an examination of the role C & D members have on an AEC, and eventually broadened into the wider requirements for being or becoming an effective C or D member.

- **Role:** Participants sought to enhance their understanding of the role of C & D members and resources available to them. Questions included the likely consequences if a C or D member cannot support a proposal and how this could be balanced against any sense of pressure to approve. Many expressed tension between the need to get through full meeting agendas and the desire to see more time allocated for wider ethical discussions of the concepts underpinning the work of an AEC. Some sought to identify ways of enhancing feedback about project concerns raised during a meeting. Broader questions emerged about the respective roles of C & D members. For instance, to what extent is the

community member's role one of *representing* community values or to what extent is it about bringing an independent person's views from the wider community? Can D members ever become C members by virtue of their experience?

- **AEC meeting arrangements:** Practical limitations for members were explored, for instance some asked for more flexibility with the scheduling of meetings for their AEC – would holding meetings on evenings or weekends enhance wider community participation? The question of sitting fees was raised - to what degree would a sitting fee encourage C & D membership? How much would members feel compromised or experience conflicts of interest? If so, are there other options which could be explored such as state government funding for these roles?

- **Sharing:** There were suggestions about improving the overall effectiveness of AECs, for example creating a central WA repository of general SOPs. A need for clear lay language is a perennial issue. Some suggested that benchmarks should be set, and others encouraged their AEC's to refuse to consider applications without a clearly understandable explanation. Discussion suggested that often when researchers provide diagrams or charts, clarity of communication is enhanced.

- **Project assessment:** A variety of project oriented questions were heard, including:
  - How do you assess how many animals are enough or too many?
  - What is effective assessment of pain in laboratory animals?
  - Can otherwise healthy animals be retired rather than euthanased at the end of a project? (*The "rat retirement home" option.*)
  - Is there value for members in watching some of the protocols the AEC have approved or even experiencing an animal euthanasia?
  - Are AEC's sufficiently aware of welfare during transport and extremes of weather – particularly where sub contractors are involved?
  - Are institutional Research Committees valuable and how do (or should) they impact on the work of an AEC?

- **Investigator competency:** The challenges associated with lay people assessing investigator competency was identified.

- **Recognition:** Members expressed concerns about how their work is valued and promoted in a wider framework. In order to encourage more success in recruiting C & D members it was suggested that the public benefit of community service such as AEC participation

should be promoted to business/corporations. It was further suggested that institutions and funding bodies should more openly recognise the role of the AEC and the costs involved when processing grants.

This summarises quite a diverse list of issues. It demonstrated to us that the community members who participated were very committed to their roles and aware of the consequences and influence of their AEC participation.

For the 2008 event, the four most strongly identified issues raised at the 2007 meeting were chosen for a further in-depth teasing out of the underlying factors. It was hoped that this might lead to elucidation of suitable ways to address or resolve them. The important point to underline is that these are the issues members themselves have raised and are seeking to resolve.

Members were separated into small groups with each one being given a specific topic to commence with, although they were not prevented from addressing all of the topics. The four topics provided were:

1. Enhancing lay language.
2. Standardisation of SOPs.
3. Meeting format.
4. Training.

What we discovered was somewhat surprising; our understanding of these topics was not necessarily the same as that of the community members. An expansion of each topic is available if requested. However, it is worth focusing on a few highlights:

- Efforts by institutions to ensure the provision by researchers of explanations for scientific terms and acronyms may not solve the 'lay language' requirement for many members. They expressed a view that they really require a greater understanding of the wider scientific concepts used to justify the value of the proposal and what the results could contribute to the current research picture. At the same time they clearly did not want to professionalise their role to the extent of becoming fully scientifically literate.

- A passionately expressed desire for more training for members, turned out to be more closely related to the quality of the initial induction training provided at the time of their appointment, rather than the need for additional ongoing training opportunities, beyond that already offered.

- Many members expressed value in the approach where researchers are invited to a meeting to speak to or address concerns about their application. They felt this to be a mechanism for enhancing comprehension rather than a form of 'lobbying'.

- Some expressed disappointment that the bodies who may be able to support AECs in a more centrally co-ordinated

manner and help eliminate duplication of effort, such as ANZCCART, were not taking up this task, at least in ways evident to the C & D members.

Members were asked to identify specific practical steps which could be taken to help make progress on the issues they had identified, these included:

- Inviting the Chair and / or Animal Ethics Officer of each institution to a future session;
- All those who attended would undertake to present summaries of the event to their AEC meetings;
- Scheduling at least one broad issue for discussion at each AEC meeting;
- Enhancing cooperation between institutions and their AECs, e.g through sharing SOPs;
- Provision of more 'behind the scenes' tours at other institutions;
- Enabling 'mini' ANZCCART meetings or summary presentations from each conference;
- Being updated on current investigations and concerns of animal ethicists;
- Finding ways of considering 'mock' AEC applications to gain better insights into how each C & D member addresses issues and translates their decision making;
- Presentations from selected researchers directed specifically towards C & D members;
- Presentations from experienced C and D members;
- Continuation of future events such as these;
- Finding an effective central mechanism for the distribution and co-ordination of information, policies, results and outcomes.
- Enhancing feedback from researchers about the results of questions raised (e.g. as conditions) and issues highlighted by the AEC. They felt that learning more about researchers' responses could inform ongoing decision making.

Feedback

Members who attended gave both formal and informal feedback.

The overall feedback indicates that all who attended felt the sessions to be worthwhile, and the structure and timing to be appropriate to their needs. Some would like to have more frequent sessions. An encouraging aspect of the feedback is that all members expressed their intention to attend similar events in the future, indeed many returned for the 2008 event. Highlights included "Seeing how other AECs function – the variation", "Identification of common issues", "Meeting other C & D's", "Listening to many and varied views". While opinions varied considerably on what was most constructive and what was least useful (the same session received both views), the major focus of feedback was the opportunity for members to network and share their experiences in a positive manner.

There was strong support for a community member's forum in the form of an email list* or 'Facebook' interactive space. However, as with many such ideas, this raises a fresh

range of practical considerations such as:

- Who will be responsible for managing this list?
- Are there any specific privacy consequences surrounding this proposal?
- How will the list be maintained and kept and updated?
- Who has access to the list?
- How can we limit the forwarding of either the list membership or list content to others?
- What formal significance might discussions on the list or subsequent network potentially be viewed as taking?
- Are there disadvantages for members who do not 'join'?

These issues have not yet been resolved. However, it gives us plenty to work on and we trust some valuable feedback to the ANZCCART community, about how to deepen the connections and strengthen the networks between these valuable members.

The input from the workshops, in addition to the comments of those who were unable to attend, needs to be acknowledged. Without their enthusiasm, this venture would have been less successful, and the outcomes less clear. We hope that the ideas generated by AEC community members will continue to provide challenges and improvements well into the future.

*Editors Footnote: ANZCCART maintains an anonymous email list for Category C & D members. Membership of this list is limited to Category C & D members (we reserve the right to verify membership with your AEC Chair or Secretariat). All emails are distributed to members only using the BCC (Blind Carbon Copy) protocol to ensure members anonymity. Further information can be obtained by sending an email to ANZCCART at ANZCCART@adelaide.edu.au.

Addendum 1
Session Outlines:

2007

Zoo Special Event
Ethical Questions: Short presentation
Insights from a Chair's perspective: Short presentation followed by brainstorming of ideas from attendees.
Small group discussion of topics from the previous presentation
Members discuss small group topics: open forum
Where to from here: open forum

2008

Icebreaker/networking
Update on monitoring of released Zoo animal: short presentation
Conference summaries 2008: short presentation on ANZCCART and AAWS conferences 2008
Small group discussion of 4 hot topics
Members discuss solutions and way forward for hot topics: open forum
Where to from here: open forum?

Animal Ethics and Animal Welfare of Virtual Fencing

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Abstract

Monitoring animal behaviour and movement using global positioning systems (GPS) has provided opportunities for automated animal control. Since the mid 1990's, work in both the United States and Australia has been developing virtual fencing application using GPS data. By monitoring the location and movement of cattle CSIRO have developed a welfare friendly virtual fencing system. However, the ultimate control via associative learning relies on the cattle experiencing some level of discomfort. Work has shown that the stress response of cattle that experience the electrical stimulation associated with the control algorithm is similar to the levels of stress cattle experience during normal routine handling through yards.

Virtual fencing relies on detailed monitoring information of both the movement behaviour and location of individual cattle. These data have been shown to provide valuable information on the behavioural status of individual animals. By monitoring changes in behavioural patterns it is possible to determine and predict when cattle are experiencing stress associated with sickness, lack of feed or general disruption to their environment. Monitoring background stress and discomfort provides a positive welfare benefit as a by-product to the virtual fencing application.

Whilst it has been possible to successfully control groups of up to forty cattle for several days, the long-term commercial success of virtual fencing will rely on extending the deployments. Currently, longer-term control is limited by battery power. Welfare friendly virtual fencing is very power inefficient and attempts to extend battery life monitor location and switch off the GPS when the cattle are some distance from the virtual fence line. It is unclear how successful this approach will finally be and the reduced rate of GPS positioning may introduce uncertainty that could compromise the welfare status of the virtual fencing.

Introduction

The use of pain to control animals has been implicit in human / animal relations since early domestication. Direct pain and the associated fear response have enabled societies to manage domesticated livestock (Bishop-Hurley *et al.* 2007). More recently, enlightened advocates of low stress animal handling have recognised the benefits of working with natural behaviours and tendencies rather than trying to force animals to behave in a predefined manner (Grandin 1998; Petherick *et al.* 2009). However, within agricultural production systems that need to manage animal movement, there will inevitably some level of stress caused by herding and containment. The challenge is to reduce the stress and optimise the welfare of the animal within normal farm management activities. The

development of technologies that enable remote automated control of animals creates new and significant ethical and welfare challenges (Lee *et al.* 2008).

Animal research conducted under the animal ethics code of conduct must address the 3R's (reduce, replace, refine) (Russell 2005), however, using technologies that fall outside of research and that directly impact on an animals welfare, operate within a legislation framework that either allows or prevents certain direct practices. Whilst wanton cruelty to animals is not allowed, there is within permitted practices, potential for animals to suffer pain and discomfort. It is and should always be the aim to eliminate all pain, however often some level of suffering is justified on the basis that short term discomfort will lead to some longer term benefit.

The concept of virtual fencing for livestock control has been around since the mid 1990's, however it is only in the last few years that the autonomous control technologies have developed sufficiently to be able to deliver a proof of concept working automated cattle control system (Anderson 2007). Containment systems that aim to prevent dogs leaving backyards, use a collar that is able to deliver an electric shock in conjunction with a buried wire that transmits a signal to activate the shock collar when the dog attempts to cross the line. Control of domesticated cattle in extensive paddocks requires a more flexible method to locate and subsequently control individual animals (Bishop-Hurley *et al.* 2007; Lee *et al.* 2009; Lee *et al.* 2007).

This paper will provide an overview of how virtual fencing works and some of the applications that the research is attempting to address. Finally the paper will explore how behavioural-based control algorithms provide the opportunity to prioritise welfare needs and within a whole systems context, lead to overall improvements in welfare standards.

Virtual Fencing Overview

Virtual fencing systems for cattle use global positioning system (GPS) tracking device that is fitted to a collar placed around the cow's neck. The GPS device monitors movement in relation to a predefined exclusion zone. The exclusion zone is programmed into the collar as geo-referenced co-ordinates. If a cow approaches an exclusion zone, the collar initiates an audible cue, then if the cow subsequently attempts to cross the line it will receive an electric shock. The GPS control algorithm receives continuous updates of the position and movement of the animal and uses the real time behavioural feed back to enable the control algorithm to apply appropriate stimulus and optimise the welfare of the animal. So unlike dog containment systems that aim to control the animal based on location, the automated virtual fencing system uses the animal's behavioural response to determine whether it is appropriate to even attempt to control a cow.

By using a behavioural-based control algorithm the cattle are able to identify appropriate behaviours via associative learning (Lee *et al.* 2009). In addition the combination of sound and electric shock gives the cattle some prior warning that the current behaviour is not appropriate and provides it with time to modify its response.

The hardware and software that are used within the virtual fencing collar includes a micro-processor, a GPS chip, two circuit boards, one to deliver sound and a second to deliver an electrical stimulation and finally a radio chip (Bishop-Hurley *et al.* 2007). When the cattle are fitted with collars, they are located within paddocks that have a collection of static radio nodes (Wark *et al.* 2007). The static radio nodes communicate with the cattle collars and enable the status of the collar to be monitored. Information is logged as the number and frequency of sound and stimulation episodes and summary data on position (as recorded once every 30 seconds) is also transmitted. It is also possible to enable and disable the collars remotely (Wark *et al.* 2009). The information from the collars is logged in a central database where it can be monitored and presented in a variety of formats to ensure the welfare of the cattle isn't compromised. Figure 1 shows an example of an overlay of the data on Google earth. It demonstrates the recent trajectories of the cattle and summary statistics that can easily and quickly be interrogated (Wark *et al.* 2009).

Whilst the database records 30 second positional information, the control algorithm uses a much higher sample rate at 2Hz (2 positional fixes each second). The high sample rate allows the control algorithm to apply the most appropriate sound and stimulus combination to achieve the optimal result. For example an animal that turns and starts to head out of the exclusion zone will immediately result in the sound/stimulus combination being disabled (Wark *et al.* 2009). Effectively, the algorithm quickly recognises that the cow is responding correctly, however if the animal starts to move back into the exclusion zone the sound/stimulus combination is enabled again. Through associative learning, the cattle quickly learn not only where the exclusion zone is, but more importantly the correct behaviour that will result in them exiting the exclusion zone (Wark *et al.* 2009).

The welfare & ethics of virtual fencing

The operation of virtual fencing relies on cattle being controlled using electrical stimulation with the potential to cause some minor pain (Lee *et al.* 2009). The focus on potential discomfort caused by the electric shock masks the many welfare benefits that virtual fencing technology can bring through more detailed monitoring of animal behaviour.

Before considering the welfare benefits, it is important to begin by exploring the extent of harm that might be caused by virtual fencing. The stress and pain caused by virtual fencing is predominantly caused by the electrical stimulation (Lee *et al.* 2008). There is also the potential for anxiety to be caused by behavioural uncertainty as individual cows respond to the virtual fencing cues and control. As a mob of cattle are controlled, the variable response to the virtual fencing algorithm can cause individual animals within the group to become separated. Whilst there can be a variable response the cattle appear to very quickly re-gather as a single mob (Wark *et al.* 2009). The herding instinct creates strong bonds between all members of the herd and this can be exploited to enable more successful control of larger groups of cattle.

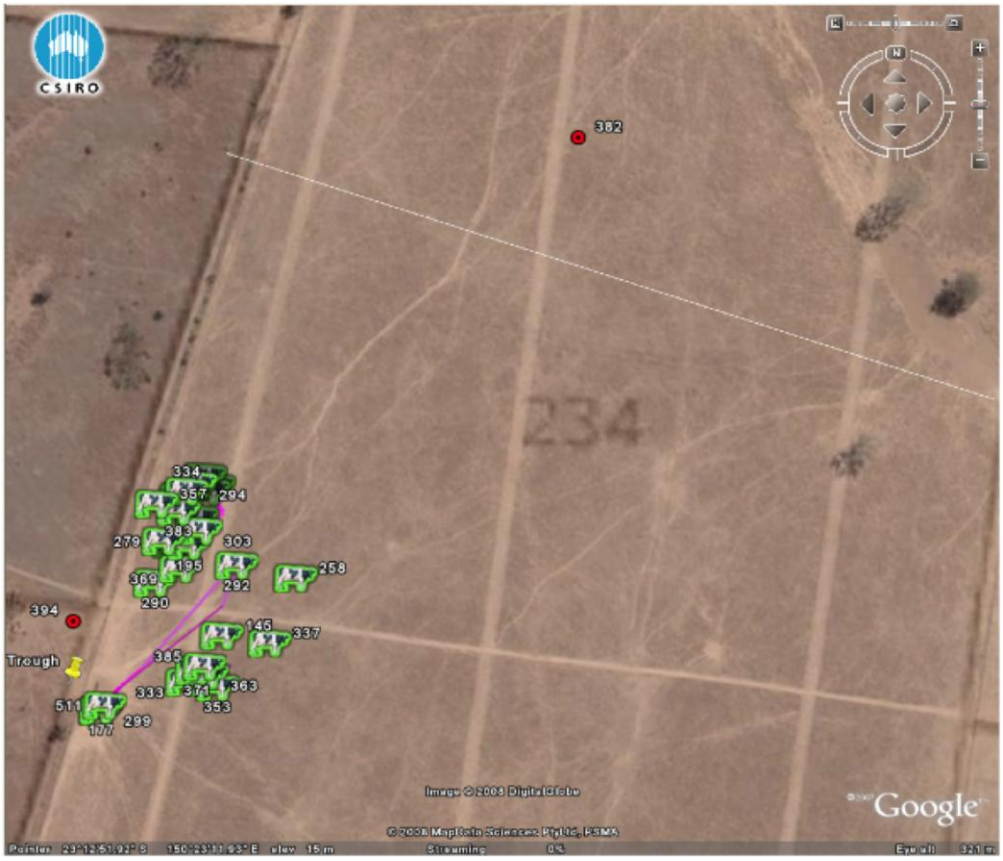

Figure 1 – Google earth display showing near real-time display of cattle positions and most recent movement trajectories.

Determining the pain response of cattle to an electric shock is very challenging. The virtual fencing control system results in a short duration shock that is preceded by an audible cue. The electric shock used is however significantly less than a conventional electric fence. Recent work done by Lee et al (2008) explored the stress response of cattle to electrical stimuli. The shock treatment involved three shocks at 2-second intervals; the shocks were at an intensity that was equivalent to that used in the virtual fencing control system. In the study, a number of key stress indicators including cortisol, β-endorphin, heart rate and changes in behaviour of cattle held in a handling race were measured. Whilst there was some behavioural difference between cattle that received an electric shock compared with those that were either head restrained or just remained in the race with no treatment, the main difference was in the speed the cattle exited the race. There were no significant differences in the cortisol, β-endorphin or heart rate whilst the cattle were held in the race. This study demonstrated that whilst there were some physiological and behavioural responses to receiving an electric shock, they were no more or less than for an animal that is going through a handling facility under routine management conditions. The cattle were monitored

for a four-hour period after the initial shock was administered and their cortisol and β-endorphin levels followed similar elevation patterns and rates of return as both the control and head restrained animals, suggesting that the shock delivered by a virtual fence collar causes no more stress than normal management practices. Whilst the study only explored differences in stress response of cattle subjected to electrical stimulation in a handling facility and didn't provide detailed information on a response in the field, it did nonetheless provide evidence to show that whilst the cattle suffered some stress, it was simular to that what happens to cattle as part of normal farm management activity.

The fully automated field based virtual fencing system provides a number of features that could significantly enhance the welfare status of the cattle that are being controlled. Recent work showed that it was possible to use high sample rate GPS data to derive behavioural classification (Guo *et al.* 2009) for example, classifying both the time and location that animals are grazing, resting or walking. By monitoring 'normal' behavioural patterns it is possible to identify changes and use this information to identify when an animal might be under stress. For example as cattle graze a paddock, changes to the location and time spent grazing might indicate they are getting short of food. The ability to monitor and manage longer term physiological stress associated with reduced food availability and associated weight loss, might outweigh the short duration stress from automated control that is part of an overall monitoring and management system. The detailed monitoring of changes in cattle behaviour and the relationship with a number of additional stressors including sickness, parturition, social exclusion, injury etc provides the opportunity for enhanced welfare status.

Practical use and limitations of virtual fencing

Virtual fencing has the potential to provide a number of practical solutions. One of the most promising avenues for early delivery of a virtual fencing application is environmental protection and the current work being carried out by CSIRO is focussed on automated control of cattle grazing in environmentally sensitive areas (Wark *et al.* 2009). Environmentally sensitive areas in the landscape are often dispersed within areas that have relatively high production value. Often areas that need protection are visually distinct from the surrounding landscape and this provides a much stronger visual cue for the cattle. Early work has shown that it is possible to successfully control cattle for several days and prevent them crossing a virtual fence line (see Figure 2). As the technology becomes more refined, so the application opportunities will increase. Potential areas for the future work include self mustering, rotational or cell grazing, movement between watering points and more detailed management of patches within a paddock e.g. discouraging cattle from grazing overgrazed perennial tussocks in tropical pastures.

One of the major challenges that will prevent commercial scale use of automated cattle control technology is operational longevity. Current

experimental systems are only able to operate for several weeks at the most. The use of GPS to track cattle behaviour uses large amounts of power. The behavioural-based control algorithm relies on very high sample rate (up to 2 Hz) positional information to make subtle changes to the cue control combination. The high sample rate data provides a welfare friendly, virtual fencing application based on the principle of associative learning and detailed feedback of behaviour to refine the algorithm response. However, the welfare friendly approach comes at a cost with the intense GPS sampling rapidly draining the batteries.

Recent work has used "duty cycling" to reduce the overall power requirements. Duty cycling uses an on-board algorithm to estimate when the GPS data is most needed and only turns the GPS on when the cattle need to be controlled. The estimation is based on infrequent monitoring of the cattle position, only turning the GPS on for short periods of time. If the cattle are close to the virtual fence line then the algorithm anticipates there may be a need to use a cue control combination and switches to a high sample rate mode. However, if the cattle are some distance from the virtual fence line, then it estimates the likely time it will take for the cow to get to the line and shuts down for a period of time that is based on previous movement information. Work is also looking at renewable energy options including solar power. However, these options are still some way off being able to address the ongoing power needs of the high sample rate GPS.

Conclusions

Technological advances will in part drive the success of a commercial fencing application. In particular advances in the development of lower powered GPS chips, smaller higher-powered microprocessors and improved radio communications. However the interface between technology and behaviour via the control algorithm is perhaps the most critical area of future developments. The work being carried out at CSIRO has focussed on a welfare friendly associative learning control algorithm. The extent to which GPS duty cycling will compromise the welfare integrity is yet to be shown, however, it does highlight the ethical challenge that virtual fencing continuously faces. It is clear that whilst virtual fencing relies on some level of discomfort to control cattle movement the system also provide detailed monitoring of the behavioural status of individual animals. This behavioural monitoring data has huge potential to significantly address a range of existing welfare challenges. Therefore, the debate over the ethical and welfare status of virtual fencing is not black and white. Work has shown that whilst there is evidence that the control methods produce some discomfort for cattle on balance it is no more or less than other accepted management practices. Discomfort and fear are intrinsic to all livestock production systems and the aim should always be to minimise them, however, balancing costs and benefits enables a balanced assessment of technologies like virtual fencing.

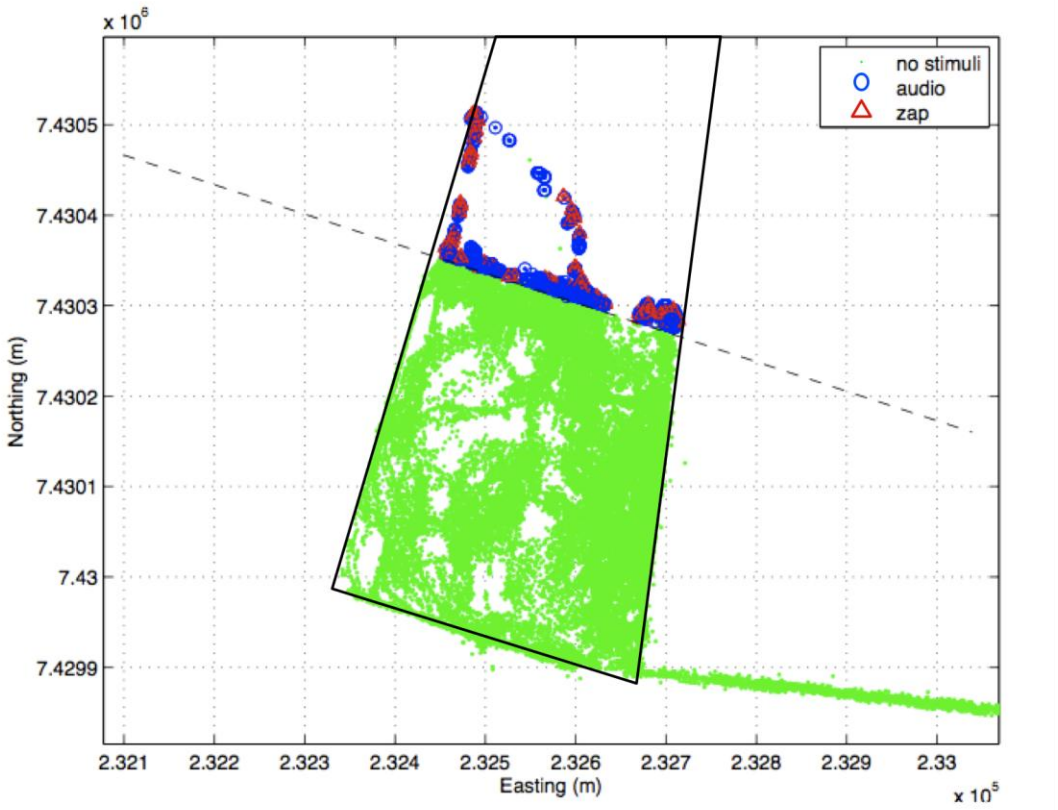

Figure 2 – Results from an automated control experiment with forty cattle over 2 days. The dotted line represents the virtual fence line; the northern section is the exclusion zone. The associative learning is shown by the incursions into the exclusion zone followed by cue (sound) or control (tactile stimulation). The green dots represent positional data with no cue or control and demonstrate that most of the time the cattle remained within the allowed area of the paddock.

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‘Best Practice’ Monitoring by AECs

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Abstract

Animal Ethics Committees (AECs) in New Zealand and Australia have two main statutory responsibilities. While the first, responsibility for considering and setting conditions for using animals in scientific work, is generally addressed in an appropriate manner, the second, responsibility to monitor approved work and facilities, has received little discussion in the literature. A range of monitoring activities is therefore discussed with the aim of helping AECs to develop appropriate monitoring programmes. The benefits of such monitoring are discussed with respect to animal welfare, AEC function and integrity of the relevant regulatory systems.

The views expressed are those of the presenter, not necessarily those of NAEAC.

Author’s background

The author has chaired an animal ethics committee for over 20 years, is an Accredited Reviewer under the New Zealand Animal Welfare Act 1999, and is a member of the National Animal Ethics Advisory Committee (NAEAC). He has also carried out many types of animal manipulations in his 35-year career as a scientist investigating improvements in the control of introduced vertebrate pests. The views expressed are those of the author, not necessarily NAEAC, and are presented as part of an endeavour to update advisory policy on the topic by NAEAC.

Introduction

The use of institutional AECs to control and oversee the legal use of animals in scientific research, testing and teaching (RTT) throughout Australasia is, in my opinion, well conceived. It provides for representation from lay members and community bodies, allows the use of practices that are appropriate to the scale and nature of the activities carried out and over time, encourages the development of a collaborative and highly responsive relationship between the regulators and those using animals in RTT (henceforth referred to as ‘project leaders’). The regulatory systems in the two countries differ in their statutory basis, as summarised in Table 1, but both systems require AECs not only to consider applications, but also to undertake monitoring.

In New Zealand, the Animal Welfare Act 1999 requires AECs to monitor:

i) compliance with the conditions of project approvals (section 99(1)(d)) and

ii) animal management practices and facilities to ensure compliance with the terms of the code of ethical conduct (section 99(1)(e)).

Table 1: Comparison of the key features of the regulatory systems of New Zealand and Australian States and Territories.

Country/State	Legislation	Principle	Mechanism	Review	Statutory oversight
New Zealand	Animal Welfare Act 1999	If animals[1] manipulated[1] for RTT[1,2] institution needs a Code[1] approved by the Director General of MAF	Institution obtains Code and forms an AEC[1] to regulate RTT under the Code	Accredited reviewers[1] assess compliance with Code every 5 years	NAEAC [1] advise Minister on regulatory system
ACT	Animal Welfare Act 1992	If animals[1] used for scientific purposes[1,2], institution must operate under national 'Australian Code'[1]	Institution operates under Code in forming an AEC[3] to regulate RTT under the Code	Review panel[4] assesses compliance at least every 3 years	The state regulator[5] advises the Minister on the regulatory system
New South Wales	Animal Research Act 1985				
Northern Territory	Animal Welfare Act 1999				
Queensland	Animal Care and Protection Act 2001				
South Australia	Animal Welfare Act 1985				
Tasmania	Animal Welfare Act 1993				
Victoria	Prevention of Cruelty to Animals Act 1986 Part 3				
Western Australia	Animal Welfare Act 2002				

[1] Term defined by legislation.
[2] Scientific use of animals in New Zealand legislation is referred to collectively as 'research, testing and teaching' (RTT), while Australian State laws use the term to encompass research (including testing) and teaching.
[3] In some Australian states, AEC members are appointed or approved by the Minister.
[4] The appointment process for review panels varies, but always involves State Government approval, appointment or leadership except in Tasmania where ministerially appointed inspectors maintain an oversight function and advise the Minister.
[5] State legislation is regulated differently, by use of permanent advisory committees, government departments, or state-appointed inspectors/regulators.

In Australia, animal welfare is regulated by the eight State and Territorial governments. The legislation in each of these regions mandates that animal research be conducted in accordance with the 'Code of Practice for the Care and Use of Animals for Scientific Purposes' (7th Edition) (Australian Government, National Health and Medical Research Council 2004), which requires AECs to monitor 'the acquisition, transportation, production, housing, care, use, and fate of animals' (section 2.2.1(ii)).

The terminology describing RTT differs between the two countries and between states, but all encompass use of animals in scientific research, testing, and teaching. The definitions of 'animal' also vary slightly, but in general they encompass all vertebrates, and in some cases large crustaceans and cephalopods.

In keeping with the devolved nature of their regulatory systems, neither country has specific requirements for monitoring. Rather, it is expected that AECs will develop appropriate monitoring processes. The adequacy of these processes is independently assessed every 3 years in Australia under the Code (see Appendix 1) and every 5 years in New Zealand under the Animal Welfare Act (sections 105–117). This system encourages the development of Codes (of Ethical Conduct) that are well attuned to the scale and types of animal-use undertaken. It is evident in New Zealand, where my experience is based, that the reviews conducted over the last 10 years (since the Act took effect) indicate a general incremental improvement in the design (i.e. content and structure) of Codes, and increased familiarity with and commitment to the aims and requirements of the regulatory system by both AECs and project leaders. In Australia, the Code that all states have operated under for 40 years has also been regularly reviewed and improved. Although I am unaware of any formal study, I suspect that these incremental improvements in both countries have been accompanied by similar gradual improvement in the standards of animal ethics (moral issues over the purpose for which animals are used in RTT) and animal welfare (standards by which animals are used in RTT).

While the devolved system is well conceived to achieve these benefits, it is important that this can be demonstrated to what is undoubtedly the largest group of stakeholders, the general public. A survey in New Zealand has shown that, in general, most of the general public accept the use of animals in RTT, with conditions, that include ensuring no unnecessary suffering (Williams et al. 2007[3]). Although about a quarter of respondents expressed a lack of trust in the regulatory system (but also knew little about it), among the 8% who claimed to know 'a lot' or 'a fair amount' about the regulatory system, there was a greater acceptance of animal-use in RTT and greater trust in the regulatory system. Because such animal use can (and should) only continue with public support, it is essential that it can be demonstrated transparently that the manner in which approved animal use is conducted, does actually meet the standards expected by the AEC and by the community. The mandatory inclusion of lay-members of the public on AECs

[3] Similar results have been reported in repeated UK surveys: the proportion objecting fell from 44% in 1999 to 29% in 2006 (Ipsos Mori 2006)

goes some way to providing this reassurance (Rose et al. 2007), but the requirement throughout Australasia for AECs to monitor the RTT it has approved is crucially important in maintaining public support. Without adequate monitoring, AEC approval may be viewed by some as 'rubber-stamping', or worse, 'window-dressing'. In this paper, I describe and discuss a range of monitoring activities with the aim of helping AECs achieve appropriate best practice.

Table 2: Summary of the monitoring approaches discussed

Purpose of monitoring	**Type of monitoring**
Compliance with AEC approvals	1. Scheduled observation of manipulations by site visits
	2. Non-scheduled observation of manipulations by site visits
	3. Reviews of completed projects
	4. Annual reports on AEC-approved projects
	5. Project presentations to the AEC
	6. Compliance reporting
	7. Monitoring of contracted or parented work
	8. Monitoring of animal suffering 'in study' by score sheets or checklists
	9. Statutory reviews
Animal management practices and facilities	1. Scheduled visits to facilities
	2. Non-scheduled visits to facilities
	3. Routine animal health monitoring by animal carers and AEC oversight
	4. Adverse incident reporting by facility staff
	5. Periodic review of Standard Operating Procedures by AEC vet
	6. Animal carers on the AEC reporting regularly on animal welfare
	7. Collection of animal use statistics

Monitoring methods

To meet the statutory requirements, monitoring activities can be categorised as ways of assessing whether (i) animal use is being (or was) conducted in the manner approved by the AEC, and (ii) the standards of animal care are acceptable (when assessed against all relevant statutes and Codes). I will therefore discuss a number of approaches (summarised in Table 2) that can be taken to meet these aims. Not all will be appropriate to all AECs, and no doubt some very good forms of monitoring may have been overlooked.

Ensuring compliance with AEC approvals

1. Scheduled observation of manipulations

The most obvious and direct means of assessing whether animal use meets the protocol and conditions approved by an AEC is to arrange visits to coincide with scheduled manipulations. This often requires some flexibility on the part of the AEC and is more easily achieved by the use of a subcommittee of perhaps two or three committee members whose attendance is easier to coordinate than that of the entire committee. It is advisable that subcommittees should always include a veterinary member and one other 'external' member. Committees should consider the need for monitoring when applications are reviewed. Monitoring should be focused on manipulations that have the greatest impact on animals, those that involve new procedures or personnel (especially contracted or 'parented' work – see below), and those that are considered only marginally justified. Routine, well-established manipulations may warrant only periodic monitoring.

In large institutions with a dedicated animal welfare officer (AWO), it can be advantageous to have such visits conducted by this person, and examples of the animal manipulation recorded on video for the AEC to observe later. This allows all members to observe the manipulation without disturbing animals or unsettling investigators who may make uncharacteristic errors due to the stress of having to 'perform' in front of a larger audience.

A report on the visit should be prepared on completion of the visit; this is necessary to inform other AEC members (where subcommittees conducted visits) of the findings, to support any recommendations that the AEC may make to the project leader or host institution and to provide statutory reviews with evidence of the monitoring that was undertaken. Apart from providing AEC members with first-hand experience of manipulations and hence, a better basis for evaluating ethical cost–benefit in future, it also allows them to meet with project leaders thereby facilitating the development of a relationship based on a common concern for animal welfare that may lead to suggested improvements in technique.

2. Non-scheduled (i.e. surprise) observation of manipulations

Monitoring reports from surprise visits hold the attraction of being highly transparent and objective. This approach has been used for many years in the UK, where compliance is assessed by Home Office inspectors under a centralised regulatory system. On the face of it, this would appear to be an admirable way of assuring the

general public that RTT is being conducted justifiably and to acceptable standards. Indeed, there appears to be a greater degree of public trust in the legislation in the UK compared with New Zealand (Williams et al. 2007). However, in my view, this approach suffers a significant disadvantage in that it engenders a defensive attitude amongst the RTT community that may, to a degree, obstruct the real intent of animal welfare legislation as it applies to RTT. If AECs in Australasia were to regularly adopt such an approach, I believe much of the trust, respect and collaboration that have developed between project leaders, AECs, and regulators could be lost, only to be replaced by a somewhat adversarial system that is less likely to encourage genuine concern for the welfare of animals in RTT. There may be circumstances where surprise visits are warranted, but this should always be weighed up against these possible negative consequences. It is advisable for an AEC to discuss the use of surprise visits with the managers of a host institution before using this monitoring approach. It is a sensitive concept, and the broader effects and benefits should be weighed up carefully. Use of the AWO to make surprise visits on behalf of the AEC is less likely to have negative consequences as it is presumably less surprising for project staff to have the AWO make an unannounced visit.

3. Review of completed projects

Reviews by the AEC of completed projects should be retrospective, detailed assessments of the conduct of a piece of work, from beginning to end, against the specifications of the AEC-approved protocol. There are a number of potential benefits to be gained by AECs periodically selecting a range of completed projects for more detailed review. Firstly, such reviews provide an overview of the work and contribute to a fuller assessment of whether it was conducted as approved than is possible from simply observing the actual animal manipulations. Importantly, the committee is more likely to be able to assess whether animal suffering was outweighed by the benefits accruing from the work once it has been completed, thus aiding evaluation of future proposals. Secondly, unanticipated difficulties may sometimes arise that, with hindsight, may change the balance of costs and benefits. Knowledge of this can be helpful to both project leaders and AECs in refining methods for future proposals to use animals for similar purposes. Thirdly, project reviews are useful in assessing the adequacy of the processes used by the AEC itself in regulating RTT. This is a particularly valuable benefit as it can form a regular, systematic means by which the appropriateness of AECs' Codes and processes are assessed and gradually improved. Fourthly, the code-compliance reviews carried out by independent reviewers (3-yearly in Australia and 5-yearly in New Zealand) will be helped by such 'internal' project reviews; as they provide concise but comprehensive 'case-studies' that can enable reviewers to assess how well AECs both regulate and monitor RTT.

Where the scope of work by a Code-holder is limited (e.g. training courses using animals), it is advisable to conduct a complete review annually. Where a wide range of animal use is undertaken, the criteria listed above (1) should be used to identify where project reviews will be most useful.

4. Reports to the AEC

It is often difficult for AECs to remain familiar with work once the approval

process has been completed, especially if no on-site monitoring of manipulations is undertaken or if projects are being conducted off-site at remote locations (especially in wildlife studies). It is therefore highly recommended that all AECs should require project leaders to submit interim reports at least annually and a final report on completion. In Australia, annual review and renewal is required under the Code for all approvals. Well-designed reporting formats should focus on succinctly gathering information on the achievements of the work in relation to the objectives and whether any animal welfare issues (positive and negative) have arisen. They may provoke an AEC to take a closer look at how a project is progressing or to re-evaluate some aspect of its own performance in relation to the project. Where Code-holders wish to publicise the value of animal-based RTT to company staff, shareholders, colleagues, or the general public, these reports can form an accessible summary of the complete portfolio of work undertaken. Such reports are not a significant additional burden to project leaders' workloads and if appropriately designed, have the additional benefit of reinforcing the need to consider animal welfare for the duration of an approval.

Where large numbers of reports (e.g. more than 10) are being received periodically by an AEC, the most efficient means of gaining the most value from them is to apportion them equally to individual or pairs of AEC members for careful consideration and reporting back to the whole committee. To assist this process it is sensible to design a template that elicits the most useful consideration from individual AEC members, covering such topics as: 'successes and failures', the ethical cost–benefit outcome, recognition of the three R's, improvements in experimental methods, animal welfare benefits and impacts of the study and its findings, adequacy of project reports, and adequacy of the AEC processes. Presentation of these assessments at committee meetings can generate some very useful feedback to project leaders and institutional management, again reinforcing consideration of animal ethics and welfare.

5. Presentations to the AEC

Another way for an AEC to maintain familiarity with a particular project or general area of investigation is to invite project leaders to AEC meetings to give presentations about their work. This could form a regular part of the agenda of committee meetings and provides an opportunity for presentation and discussion of proposed new work, work in progress, or recently completed work. As with written reporting, the emphasis of the presentation should be on the ethical costs and benefits of the work undertaken and the animal welfare issues it entailed. AECs aim to help project leaders carry out their work in an ethically appropriate manner and useful advice, particularly from AEC vets, can often be gained by researchers during the proposal stage, particularly where their work entails invasive manipulation. While AEC approvals are, in one sense, an indication of the committee's support for the proposed work, this support becomes much more evident when the ethical and welfare issues are discussed and difficulties resolved together. This contributes much to the relationship between project leaders and the committee and over time, helps to foster a sense of collaboration.

Once studies are underway, a presentation constitutes a form of monitoring that enables the committee to observe, albeit indirectly, how animals were manipulated and cared for. Indeed, it may be the only practicable way of gaining first-hand experience of the work where it is too hazardous to allow site-visits (e.g. work involving infectious diseases) or where it is being conducted in a remote location (e.g. Antarctic wildlife work). In these cases, project leaders should be encouraged to make use of video to demonstrate to the AEC the manipulations carried out.

6. Non-compliance reporting

AECs should make provision for any staff members within the host institution to raise a concern about the conduct of any project. In my experience, this provision is more likely to be used by project leaders than 'whistleblowers' and provides a structured means of informing the AEC and key staff when things don't go to plan. Sometimes the non-compliance may be considered justifiable in hindsight. On other occasions there may be a need to make changes to how work is conducted. The aim should be to firstly consider the action that may be needed to address any animal welfare concerns and secondly to address procedural and personnel matters based on a clear understanding of the nature of and reasons for non-compliance. Serious cases of non-compliance should be addressed by disciplinary procedures, as determined by management of the host institution in conjunction with the AEC.

In large, structurally complex institutions, statutory compliance has to be managed in a well-organised fashion and it is generally regarded as a 'high-risk' area for such institutions as failure can be disastrous. AECs can assist the institution in managing this risk by supplying reports of AEC activity on an appropriately regular basis. The emphasis here should be alerting institutional management to any instances of non-compliance and the measures that have been taken to address the causes and consequences of incidents, although in serious cases, some other reporting mechanism should be used to achieve this immediately (see 'Adverse incident reporting' below). Reports should demonstrate to management that the committee is continually striving towards improving the performance of both itself and staff in relation to statutory requirements. While this form of monitoring is not directly aimed at meeting the statutory requirement, it assists in maintaining the robustness of the regulatory system by regularly reminding institutions' management of the need to support the work of its AEC, and may also assist institutions in meeting their own internal objectives for annual reporting.

7. Monitoring of contracted or parented work

In some cases, an AEC may approve work that will be carried out for the host institution by a third-party animal facility under separate management. Similarly, there may be instances where an AEC is asked by another institution to 'parent' work where the institution does not maintain its own AEC. Where such arrangements are made, the AEC will have the same statutory responsibilities that apply to work carried out within the host institution and it is therefore important in both cases that agreements are in place that allow high standards of monitoring to be applied. Difficulties

may arise where the work is to be conducted at a distance that makes normal site visits impractical and in such cases the AEC should consider contracting the services of consultant vets or auditors to carry out monitoring. It is essential however, that the AEC defines the monitoring programme in relation to the key areas of animal welfare identified in the proposal. Where work is being parented, it is also advisable for the proposers to meet with the AEC when the work is being considered and at key stages of the project if it is to be of long duration.

8. Monitoring of animal welfare by researchers

Where applications to the AEC anticipate significant animal suffering, the AEC should ensure that this is regularly monitored through the use of a purpose-designed monitoring schedule and appropriate monitoring sheets (examples given in National Research Council 2008). In certain cases the AEC may have a particular interest in evaluating such monitoring data and could therefore require that the information be provided to them as a condition of approval. For practical purposes, it may be adequate for the AEC to receive a summary of such data.

9. Statutory reviews

Statutory reviews of code-compliance in both Australia and New Zealand are ultimately the most important forms of monitoring undertaken of the conduct of institutions using animals for scientific purposes. This is because they are the main mechanism by which public accountability can be demonstrated (Baker and Blaszak 2005). In New Zealand the reviews are conducted 5-yearly by MAF-accredited reviewers and subsequent evaluation by NAEAC to establish consistency. In Australia external review methods differ between states but many involve governmental representatives. It is also not usual to find some additional form of government oversight and this generally involves government officials observing the operations of AECs on a regular basis. While AECs themselves do not undertake this monitoring, they form a very important part of the system being reviewed. Evidence of AEC activities (e.g. minutes of meetings, and monitoring information) provides a tangible basis by which code-compliance can be partly assessed, and consequently contributes to the process by which regulators, and in turn ministers and the public, are assured of the ethical scientific use of animals.

AEC monitoring of animal management practices and facilities

1. Scheduled visits

The purpose and scope of AEC inspections of animal facilities needs to be defined clearly and may vary from, for example, inspection of a specific aspect of animal husbandry practice or the adequacy of a particular building, to a complete assessment of all practices and facilities. Complete assessments are probably most beneficial at a point midway between scheduled statutory reviews and in New Zealand, AECs are able to use the comprehensive checklists employed by accredited reviewer during statutory reviews for this purpose. AEC inspections of animal facilities should be preceded by familiarisation with the relevant documents (e.g. livestock codes, standard operating procedures, etc.) that describe the physical

conditions under which animals are kept and the routine husbandry practices and experimental techniques that are used. Reference to these documents enables AEC members to judge the adequacy of facilities and practices and may result in suggested improvements or alternatively, modifications to SOPs. The main benefits of such visits are the assessment of animal welfare in response to specified practices and facilities, the possibility that incremental improvements may be made, and the development and reinforcement of a collaborative relationship between the AEC and animal facility staff.

2. Non-scheduled visits

As with the case of surprise visits to monitor approved work, there is the possibility that non-scheduled visits to monitor animal facilities and routine practices may have negative consequences. AECs in both countries generally include in their membership an animal carer from the host institution. This has often proved useful in forming a close linkage between the AEC and the operation of animal facilities, such that high standards are reinforced and incremental improvement of standards is encouraged. Non-scheduled monitoring visits are likely to erode this collaborative approach, with the relationship becoming increasingly adversarial the more visits occur. However, the AEC and institutional managers need to consider whether these disadvantages are outweighed by, for example, a greater degree of public accountability in the use of animals.

3. Routine monitoring of animal health

All animal facilities should routinely monitor animal health. This is essential to prevent unnecessary suffering, to ensure that the quality of scientific data is not compromised by animals behaving or functioning abnormally and to avoid costly and disruptive disease outbreaks. It is expected that animal carers will have been appropriately trained and capable of designing and implementing such a health monitoring programme. There is a large body of literature available to assist this process.

AECs should utilise the expertise of their veterinary representatives in periodically reviewing the monitoring programme (perhaps in conjunction with visits or as part of reviews of SOPs – see below). Committees could also request regular summaries of animal health data from facility staff as a means of overseeing the effectiveness of the husbandry practices used.

4. Adverse incident reporting

Adverse incidents are unanticipated or atypical events that occur involving an animal as a result of routine husbandry, experimental manipulation, or diseases. Where unexpected adverse incidents or outcomes occur during RTT, rapid reporting is essential - primarily from the point of view of animal welfare. Understanding of incidents and how to respond to them may require specialised knowledge, so it is important that key information is recorded and reported promptly to those responsible for the work and the AEC so a collective response can be made. This may be for example, isolation of affected or potentially affected animals, closer monitoring, changes to routine husbandry or experimental procedures, or suspension or termination of the work.

5. Periodic review of SOPs

As the scientific body of knowledge underpinning animal management practices is constantly expanding, there is a need to periodically review the adequacy of SOPs being used by animal carers and users. This is an activity in which researchers, animal carers and the AEC all have an interest as there are implications for animal welfare and consequently, the robustness of experimental data. Significant improvements in common practices such as anaesthesia or analgesia are generally well publicised, but more specialised practices, such as fitting radio-tracking devices to wildlife, may require more effort by the researcher and the AEC to establish current best practice. Typically, review of SOPs at 3-year intervals would be considered appropriate, but in rapidly evolving areas of scientific knowledge, more frequent review should be considered.

6. Animal carer on the AEC

The most direct means for the AEC to monitor the day-to-day operation of an animal facility is through the membership of an animal carer of the host institution on the committee. This is not expecting such members to constantly audit their own activities; rather, it is a means by which the AEC gains, through the broad range of discussions held in meetings, an insight into the culture, commitment, capability and effectiveness of the staff responsible for animal welfare. Many AECs have a regular part of meetings devoted to discussion of items raised by the animal care representative. Animal care staff have much to gain from the support of the AEC, particularly where invasive or controversial work is involved.

7. Collection of animal use statistics

Data are collected throughout Australasia on the numbers of animals used in RTT, the purposes for using them, and the degrees of suffering involved. The data are potentially a means of informing the general public about the overall situation and trends relative to usage in previous years. In New Zealand, regulations under the Animal Welfare Act require Code-holders to present the data annually (for presentation in the annual report of NAEAC) and this is enabled by the records kept by the AEC. However, in Australia, there is no clear requirement in the national Code for AECs or host institutions to report to a national body and although the value of national reporting is well recognised, differences in State/Territorial legislation have made it difficult to achieve a comprehensive and consistent reporting system (Baker and Blaszak 2005). The most recent collation of available data that I could find indicated that approximately 6.2 million animals were used in 2006 (Australian Association for Humane Research AAHR 2007). Since this is almost double the figure reported for 2004 by Baker and Blaszak (2005), it would suggest that consistent reporting at a national level is urgently needed if the public are to be reliably informed. For the present, it would be wise for all AECs to maintain records of animal usage in a form that is supported by a broad consensus.

Conclusions

The law in both New Zealand and Australia requires monitoring of approved animal use, animal facilities and practices. The laws are not prescriptive in specifying the types of monitoring practices used, but instead require AECs to develop their own

processes. I have described a range of activities which AECs could undertake to meet this statutory monitoring responsibility. While the statutory requirement is pre-eminent, AECs should be mindful of the underlying reason for that requirement. Firstly, the welfare of animals in RTT is the most important concern. Secondly, maintaining public support for ongoing use of animals in RTT rests partly on the belief that the system that regulates such use is demonstrably effective and this is in part enabled by AECs collecting monitoring information.

The type of information collected will depend on the nature and scale of work carried out under AEC approval. It is very important that AECs periodically review their monitoring needs and develop appropriate processes. The monitoring approaches I have suggested deliberately lack detail as I believe it is important that AECs tailor the processes they expect to use to their own specific needs. This is more likely to lead to efficient and effective monitoring than a 'one-size-fits-all' approach. It should result in a monitoring programme that is appropriately focused, efficient and more likely to be easily understood and adopted by the AEC and accepted by project leaders. In designing monitoring programmes however, there is a danger in structuring the detail of best practice to the extent that it becomes the focus of the activity. It should be remembered that all monitoring should primarily be concerned about the welfare of animals and that processes, forms, meetings and so on are tools by which this should be achieved as simply as possible.

I welcome comment and suggestions on this topic as I am greatly aware that my experience in the New Zealand animal ethics system gives me a particular perspective. The monitoring options discussed are intended to be generally applicable but there may be additional approaches that can be applied both generally and with specific types of animal manipulation in mind. Given the benefits discussed in animal welfare and in underpinning support for approved use of animals in RTT, this is a topic that should be promoted and developed within the RTT community.

Acknowledgements

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A welfare approach for captive wild birds

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Abstract

Working with captive wild birds presents researchers with a multitude of challenges. Not least of these is appropriate cage size. Previous studies have highlighted some AEC concerns in this area. Our AEC has worked with a research group to ensure improved outcomes for captive wild birds in a specific study as well as for future studies. This involved the redesign of an outdoor aviary for the latest cohort of birds (n=8). The re-design includes 8 individual aviaries with sufficient space to allow flight for small birds (<150 g). The birds have been taught to feed in smaller cages within the aviaries so that they are easily re-caught and can be handled for the research. The capacity to reduce the aviary size for trial participation has also been incorporated, allowing researchers to conduct experiments with minimal handling of the birds. Current occupants (Silvereyes, ~10 g) appear to have adapted well. The AEC has also endeavoured to set some guidelines for the time space between the various components of the research so that the birds are provided with time frames free from research interaction in the aviaries. The student researcher has been proactive in including remote monitoring through cameras as well as through nearby windows, and has recently implemented a remote design to close the smaller cages. This session will discuss the process and evaluate its outcomes to date.

Introduction

Research that involves captive wild animals presents a range of particular challenges, both for researchers as well as for an AEC. There are studies which necessitate wild caught animals and which would be impossible to conduct in the wild. Such studies may have many kinds of outcomes, including improvements in animal welfare and potential for human health advances. Utilising captive wild animals for research highlights some fundamental tensions for animal welfare issues and the science. Success may therefore require taking steps that include: minimising impact, accommodating the needs of each particular species and at the same time enabling sound research leading to strong results. All these considerations need to be carefully balanced. In the wider framework, research with captive wild animals raises a number of ethical and practical questions.

Traditionally birds have been caught and acclimatised to small cages and / or laboratory settings. More recently, increasing recognition of their need for space to fly has led to the use of larger aviaries where the birds are often housed communally. However, this can create difficulties for the research and for the birds. It is important to get the space right – too little does not achieve the aims and too much may also impact negatively on the welfare of the birds (e.g. in some instances too large a cage can lead the birds to be isolated or even injure themselves such as by flying into the aviary walls).

At the same time as welfare issues are addressed, methodological issues

related to appropriate housing also need to be considered. A proposal for the use of wild caught birds caused Murdoch's AEC and the researchers to wrestle again with some of the issues.

In the experiments which form the focus for this paper, one important feature is the need to isolate individual birds for varying periods of time. Ensuring methodologically suitable caging while at the same time meeting the welfare requirements of the birds can be complex to achieve.

In what follows we address some of the practical solutions which the researchers developed in response to the AEC's deliberations and questions for this particular proposal to utilise wild caught birds. We will address these questions by looking at the capture and acclimation, as well as housing of the birds in this project. We will briefly describe some experimental issues and highlight current and planned welfare oriented developments.

The research in question is a physiological study of wild caught birds, examining their food intake and measuring various elements associated with this work. For this project, one species was initially approved. The AEC required that suitable cages be provided, which demanded considerable design and construction effort impacting on the research design and project implementation as well as the timing of the experiments. This process delayed formal approval of the project by around 12 months. The overall result was to house the birds in individual aviaries within a larger aviary, with each individual aviary fitted with a feeding cage that can also be used to facilitate the catching and handling of the birds. This provided the project with the best compromise between communal and individual housing for the birds.; It allowed a number of experiments to be undertaken in the aviary without the need to remove the birds into a laboratory as it had the birds housed in a more acceptable environment. The work undertaken provided an ongoing resource for potential future projects. A rough indication of costs was around $6,000 in design and materials, to which the labour and costs of the automated equipment need to be added.

Housing

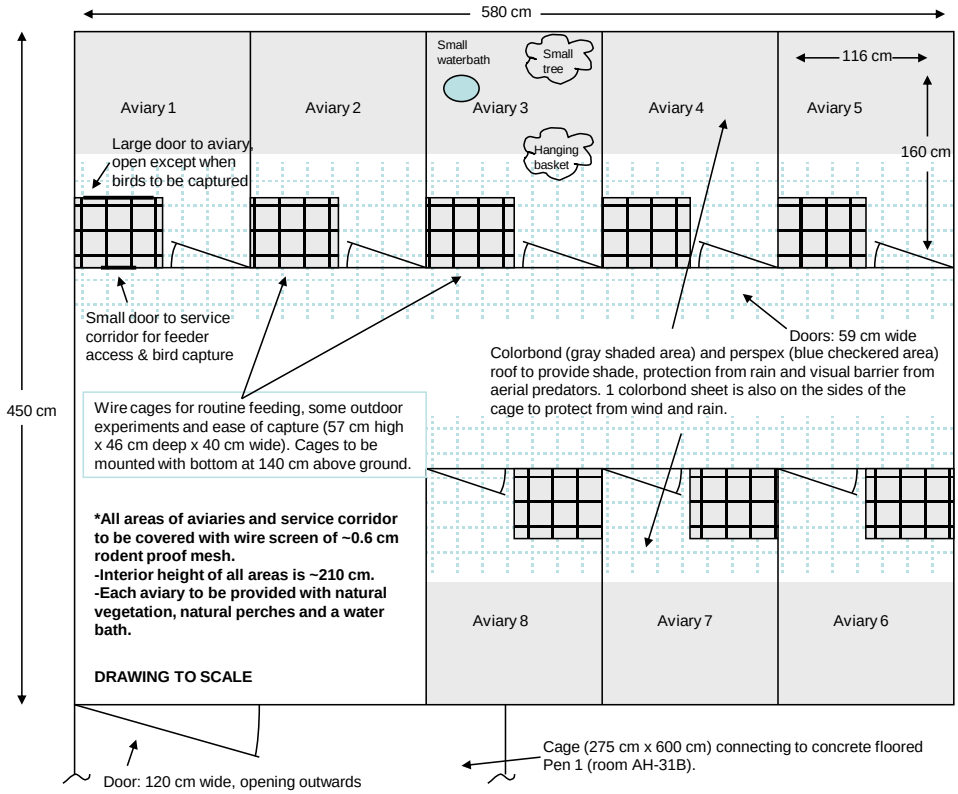
The benefits of housing birds in outdoor aviaries as opposed to indoor housing in smaller cages include space for free flight and exposure to natural light and other ambient conditions. However, there are also wider risks involved, both from a research perspective (e.g. the lack of control over climatic variables) and environmental factors (e.g. exposure to the elements and visually to predators). The re-design of a large outdoor aviary at Murdoch University by the research group took these considerations into account, as well as ensuring the ability to allow several experiments to take place entirely within the outdoor aviary. This also meant minimising the handling of the birds and any stress associated with repeated capture and transfer to experimental cages. This was achieved through redesigning the approach to the experiments as well as ensuring the most suitable housing.

<u>Aviary design:</u>

An existing large outdoor aviary (580 x 450 x 210 cm) was divided into eight individual aviaries (116 x 160 x 210 cm) joined by a central service corridor (see Figure 1). Individual housing averted risks associated with communally housing birds captured from different populations, dominant individuals restricting feeder access to

other birds, as well as other confounding factors. Physiological studies (e.g. intake of different feed types) require examination of individuals for appropriate statistical analyses. Furthermore, individuals are able to be closely monitored for normal behaviour and food intake. With this housing design, the requirements of the researchers are met, and at the same time, the birds have visual and auditory contact with one another through the mesh of the aviaries.

Figure 1



Each aviary is equipped with two natural perches, one fixed and one hanging from chains, two native plants (a potted *Calothamnus* and a hanging basket containing a *Grevillea*) and one shallow water bath.

Each individual aviary and the service corridor were skinned with 0.6 cm rodent proof galvanised wire mesh. This fine mesh served two purposes: first allowing the housing of very small birds (weighing < 12 g), and second removing the risk of predators (e.g. rats and snakes). The mesh was buried 30 cm into the ground to prevent entry by predators tunnelling underneath. The roof of each aviary was half covered (80 cm wide) by colorbond roofing material to allow protection from sun, wind, rain and visual protection from aerial predators. The sides of the aviary were also covered by sheets of colorbond (80 cm wide) to provide a corner in each aviary for birds to shelter from inclement weather and to provide additional shade. The presence of large trees surrounding the aviary provides natural shade over the area. To increase the filtration of natural light to the aviaries and ensure continued shielding from rain, the other half of the aviary's roof was covered by transparent Perspex sheets (110 cm wide).

Smaller feeding cages (47 x 54 x 41 cm) were mounted to the front wall of each aviary, 140 cm above the ground. These feeding cages allowed for ease of capture and experimental participation. Feeders (stoppered 30 ml syringes) were placed on the outside of the feeding cage by way of the service corridor, with the opening facing towards the aviary, thus feed can be supplied without the need for entry into each individual aviary. The door of the feeding cage facing the aviary is left open so that the bird is freely able to enter and exit. This design also enables researchers to capture the birds with minimal handling - the door to the feeding cage can simply be lowered, confining the bird to the feeding cage. Birds can then quickly and easily be caught by hand if they need to be weighed or moved to a different experimental cage. This enables short-term trials to be carried out while the bird is retained in its familiar feeding cage. While this method of capture is feasible, it is often not optimal for the long term.

Capture and experimental design

Eight silvereyes (*Zosterops lateralis*, average ± SD body mass 9.93 ± 0.49 g) were captured on the grounds of Murdoch University, Perth, Western Australia, by mist netting on 12 May 2009. The birds were confined to smaller feeding cages within the aviary for the first 48 hours to ensure acclimation to the feeders and maintenance diet. A towel was placed over the cages to minimise visual disturbance for the first two days. All birds adapted to the maintenance diet of Wombaroo® nectarivore mix (Wombaroo Food Products, South Australia) very quickly. Birds were released from the feeding cages into the aviary after 48 hours, with all birds successfully locating the feeders (in the smaller feeding cages) within 3 hours. Feed intake was closely monitored for two weeks, with all birds feeding well from the maintenance diet and various fruits (grapes, rockmelon, re-hydrated currants and apricots). Birds were free from research interaction during this time. To minimise impact on the birds, monitoring was conducted via video cameras mounted on aviary walls, visual observation from outside the aviary by researchers, and by marking feeders (to monitor intake). The current cohort of eight silvereyes have adapted extremely well through the acclimation and initial experimental phase.

Experiment protocols were designed to give the birds rest days where they are able to fly freely in the aviary after completion of each experimental protocol. Several of the experiments required the use of experimental cages in laboratories (i.e. controlled environmental conditions), while other trials could be conducted in the aviary feeding cages. The experimental timetable has been designed so that the trials within the aviary are conducted in the first 2.5 months, and the laboratory trials will be conducted later in the period of captivity when the birds are more habituated to human presence and handling. Trials where birds are transferred to the laboratory are followed by multiple rest days in the aviary, free from research interaction.

Natural variables such as temperature and natural light times will be treated as variables in the analysis of experimental data. Temperature and humidity are recorded by a HOBO® Onetemp placed in the aviary, and sunrise and sunset times are obtained from the Bureau of Meteorology. This ensures experimental rigour while continuing to minimise the need for unnecessary interactions with the birds.

The current experimental trials commence within an hour after sunrise. At this time the birds are active but are not able to see the researcher well in the partial light. To capture the birds, researchers have needed to position themselves in the aviary to close the feeding cage doors just before sunrise. Where experiments will be conducted well after sunrise, this approach is not ideal. This lead to a system being developed that allowed remote closing of each feeding cage door. The remote device involves an infra red trip switch triggered when the bird inserts its bill into the feeder (located some distance from the door). The device can be set to close the feeding cage doors at preset timeframes so that the birds can automatically be confined for the commencement of an experimental trial. This method further reduces stress on the birds as it does not require human presence and maintains the normal environment for the bird.

Benefits and drawbacks of this housing system

The obvious benefit of using an outdoor housing system is the space and freedom afforded to the birds. The aviaries have also afforded the opportunity to measure physiology of the birds under more 'natural' conditions than experienced in a laboratory.

However there are also drawbacks to outdoor housing. One very obvious problem has been the need to adjust experimental schedules to the weather. Over the last month of feeding trials, ambient temperatures averaged (average ± SD) 15.60 ± 3.68ºC, with a minimum of 4.99ºC and maximum of 24.01ºC. In addition to cold temperatures, winter rainfall delayed some feeding trials. Although the cages are protected overhead, wind-blown rain can interfere with the fine scale recordings required to discern feed preferences. Some trials are significantly influenced by ambient conditions and will still need to be conducted in the laboratory.

The infra-red devices used to contain the birds in their feeding cages have so far proven very successful. Video monitoring has shown that while the bird expresses a startle response and flutters for a brief time, it does not attempt to escape through the closed door and it recommences normal preening or feeding within 30 seconds. The equipment currently fitted has a drawback, namely that it cannot be used under wet conditions. In the long term this can be addressed by improved equipment design.

Apart from logistical issues, there is also the very important consideration of how the bird's physiology is affected by variable climatic conditions and additional flight costs, given that these variables cannot be controlled in an outdoor aviary. A recent, investigation in another study of the link between behaviour and energy intake in New Holland honeyeaters revealed significant differences in energy intake due to housing conditions in these birds[4].

[4] Birds housed in wire feeding cages in visual and auditory contact with conspecifics demonstrated a 40% increase in energy intake compared with a trial when the same individuals were housed in opaque cages with a one way mirror, used in studies where researchers must be able to observe the birds under controlled conditions with no visual contact (Purchase et al. unpublished data). This may reflect the importance of both auditory and visual contact between wild caught birds whilst being housed individually in captivity.

For the current project a similar investigation was conducted of the maintenance costs of silvereyes held over a 24 hour period in the feeding cages compared with their energy requirements when they were free-flying within the aviary, with visual and auditory contact in both situations. Our data indicate that housing conditions did not have a significant effect (paired samples t-test, $p=0.482$) on intake when feeding on a 0.63 $molL^{-1}$ sucrose solution whilst free-flying within the aviary (0.315 ± 0.011 g sucrose/g body mass ± s.e.m.) or confined to the feeding cage (0.321 ± 0.009 g sucrose/g body mass). The birds did not appear to have additional energy requirements whilst free flying in the aviary. These results pave the way for future behavioural studies to address some interesting questions: for example, are the birds utilising the space available in the aviary, and are there significant differences in time spent flying between the two housing types?

Future welfare developments

At present, the birds are weighed weekly during experimental participation. This involves catching each bird from the feeding cage and weighing it in a cotton bird bag. While the procedure is undertaken as quickly as possible to reduce stress associated with capture, there is still the stress of capture for the bird. A remote weighing system is being investigated. The idea is that each perch will be suspended from an attached balance that will automatically record weight when a bird lands on the perch. This will enable researchers to record the weight of birds more frequently and possibly more accurately during experimental trials without the stress of physical interaction.

Conclusion

While it is too early to draw any conclusions from the research, it can be said that the welfare improvements that underpin this study are pointing to new possibilities where technology combined with well designed aviaries will enable continuing research to be undertaken with captive wild birds while at the same time meeting high welfare standards. The point is that strong animal welfare need not undermine good science, but at the same time it can place limitations on science and often, as in this case, may require considerable re-thinking of the experimental protocol and its implementation.

Acknowledgements

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GRIFFITH UNIVERSITY AEC IMPLEMENTING THE CODE 2002-2008

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Abstract

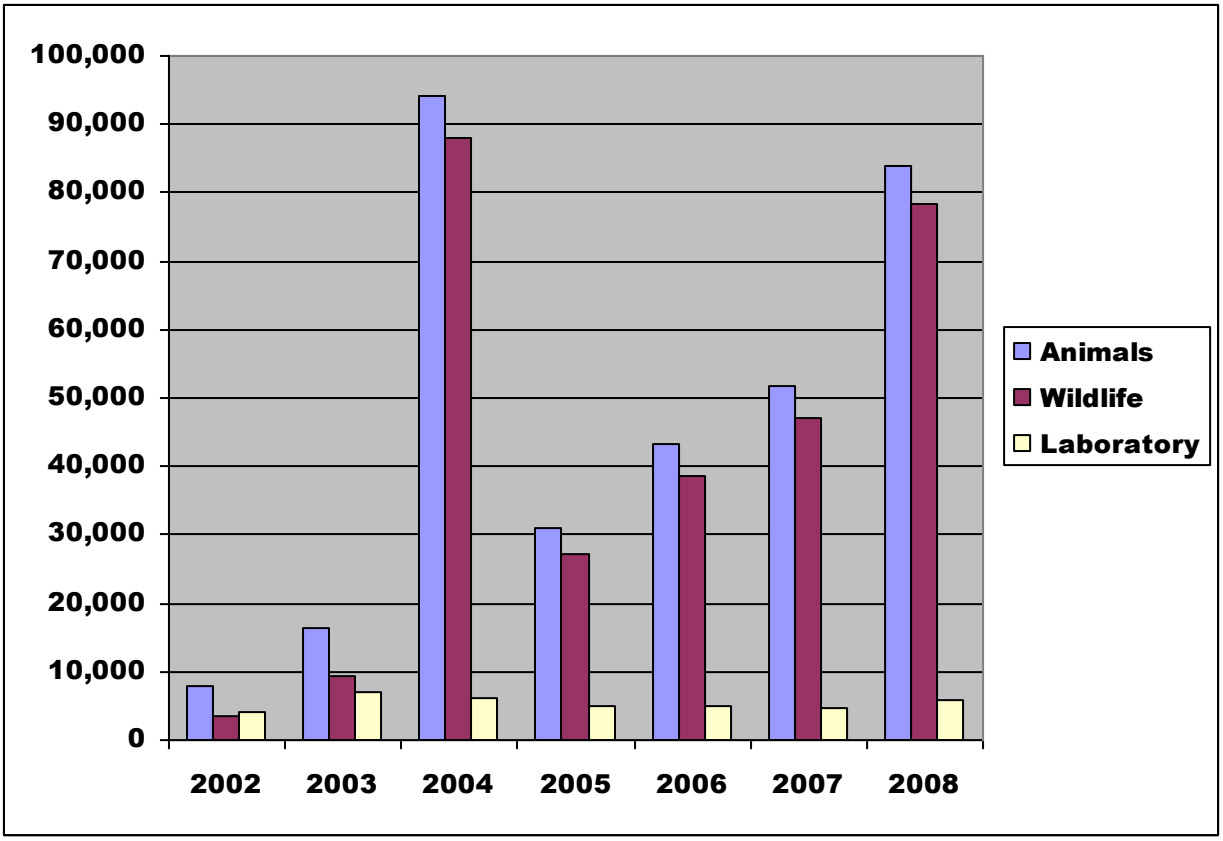
Griffith University Animal Ethics Committee members describe their work with the University as maintaining compliance with the *Australian Code of practice for the care and use of animals for scientific purposes*. We are presenting data on animal usage and evidence of improvements to animal welfare on campus over a 7 year period. Numbers of laboratory animals used on campus during that timeframe remained steady or decreased. University staff worked hard to improve standards of animal welfare on campus and the status of animals generally through educational research and their involvement in animal law in the wider community.

Meanwhile, off campus, the number of animals used in wildlife studies climbed steadily by ~10,000 individuals *per annum* as research on new large scale fish projects began. Ninety–eight percent of the reported wildlife now used is marine or freshwater fish. More scientists are now studying fish. Refined sampling methods like fin-clipping or using fish larvae and developing new standard operating procedures are used in genetic and bio-geographic studies. A new set of scientific purposes involving resource assessment, biodiversity conservation and fish farming are current problematic issues for the AEC. Some of these include; monitoring effective compliance, wildlife moving long distances between state jurisdictions, inter-jurisdictional differences in the application of the Code and how fish perceive pain and stress. The AEC is challenged by this change of direction. Griffith researchers are working on studies to adapt and help address some of the gaps in our knowledge of fish experimentation and their welfare.

Starting in 1975 Griffith University has grown rapidly and is now spread across 5 campuses between Brisbane and the Gold Coast in South East Queensland. Today 37,000 students are enrolled and 1200 Academic Staff are employed. It has only one AEC to receive applications to use animals in teaching and research. Animal based projects are evenly spread between the faculties of Health and SEET (Science, Environment, Engineering and Technology) who together employ around 100 Staff (7.5%). They supervise some 150 (15%) higher degree research students who also work with animals. The University is still growing and building new facilities such as the Eskitis Institute which was completed in 2008 and

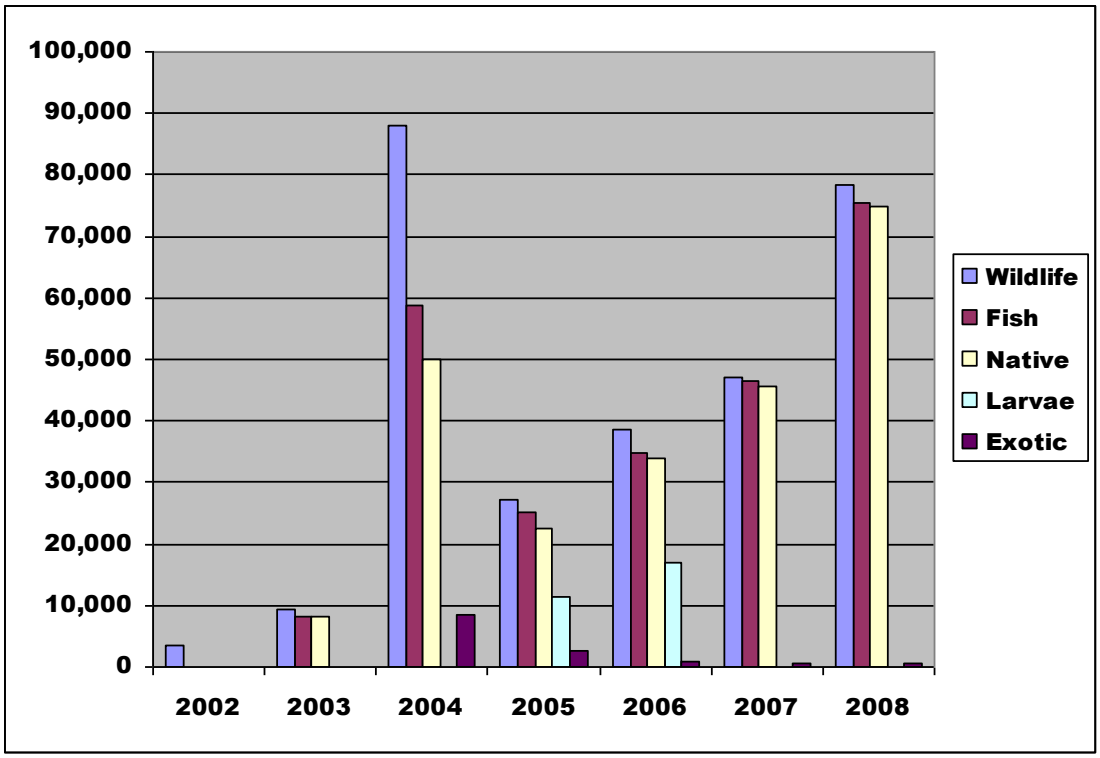
houses the National Centre for Adult Stem Cell Research, incorporating a modern animal facility.

From 2002 to 2008 the number of animals used in research and teaching has grown by 10,000 annually and the number of animal facilities the AEC will inspect has increased from 2 to 5. The number of fulltime staff employed to care for animals in on–campus facilities has increased from 1 to 5 (backed-up with 10 fully trained part time staff). The total number of active projects per annum monitored by the AEC that use animals for research and teaching has grown modestly over this period from 110 to 150 (an increase of ~ 8/year). The AEC has worked very hard to minimise the numbers of animals used and any negative welfare effects on them by insisting on accountability for the numbers used, re-use and project refinement in line with the Code of Practice "3Rs" policy. Today, significantly fewer animals are used for teaching purposes than previously. The University has benefitted from this work by remaining compliant with the Code and has responded by building new facilities in which higher standards of care are possible. The numbers of laboratory animals used has not increased over the period (~3000 per year). Griffith staff helped organise conferences on compassion for animals (in 2007) the status of animals in law (Sankoff &White 2009) and conducted research on empathy for animals in education (Tulloch 2007; 2009).



The animals housed on-campus for use in research and teaching at Griffith are primarily rodents (rabbits, guinea pigs, rats & mice), chickens and fish and the animal care and welfare remains the priority of the AEC and animal care staff. Staff (animal care & investigator) culture and attitude is fostered by the writing and use of an increasing number of Standard Operating Procedures. Animal housing has been improving over the years with controlled environment caging, cage enrichments and rewards, optimisation of nesting material / foods / music / lighting and potential for animal re-homing (adoption). The University Animal Manager is a permanent member of the AEC and reports both orally and via a written report to the Committee monthly at its meetings. This input is considered essential to effective project approval, roll-out and monitoring, plus any dispute resolution between the AEC and project investigators. Griffith University and its AEC has been audited twice by the QPIF as part of the triennial NHMRC recommended review guidelines, and some practices/procedures have been used as a model for other institutions. Griffith University has an animal welfare framework (as part of broader research ethics and integrity policy) that has been successfully balancing the needs of researcher, animal care and welfare and legislative requirements.

With respect to the challenges of the increasing number and diversity of wildlife based animal projects, Griffith University has experienced large increases in fish use while numbers of all other types of wildlife used remained steady. Today 98% of the animals reported to the AEC as "used" for scientific purposes are fish. Why is this so? What is the impact on these animals?



Fish used in Griffith research are mainly native species from freshwater and marine habitats and are released alive either as by-catch or after non-destructive sampling (fin clipping / tag insertion). There are clearly many species in need of study and some project aims include large and small scale surveys for biodiversity conservation and management, resource assessment, ecology, control and culture. Much of the research is funded by and informs the actions of governments and private industries. Numbers in by-catch can be high and may include exotic pest species like Carp that must be euthanased by law. Large numbers of fish larvae in by-catch from prawn fishing have also been studied. Fish welfare and ecology is the least well known of all the types of vertebrate animals, for example at the 2008 ANZCCART conference, speakers presented their research findings on attempts to identify pain thresholds and appropriate analagesia in fish. In January 2009 the EU Panel on Animal Health and Welfare published a scientific opinion about its general approach to fish welfare and to the concept of sentience in fish (European Food Safety Authority 2009). The opinion was motivated by the concern about welfare aspects of husbandry systems for farmed fish. It suggested new areas of research are needed and that indicators should be species specific, validated, reliable, feasible and auditable. We have some way to go…

It is physically impossible for Griffith University AEC to monitor all this wildlife activity firsthand. Research is being conducted, geographically, all over Australia, in other countries and in the seas between. It maybe difficult (and inappropriate) to reduce the animal numbers involved. Fishing methods can be refined further but by-catch cannot be totally eliminated. Tagged fish move long-distance between countries and different jurisdictions that define animals, their use and welfare often in very different ways, for example some Australian states do not classify fish as a reportable animal species for AEC purposes. There is little information about how fish perceive pain.

Griffith University alone cannot answer all of these questions but it is conducting research to address some. Two examples are: White Shark satellite tagged in New Caledonia moving to north Queensland during habitat research. Research is being conducted on suitable temperatures to promote reproduction and fitness in farmed Salmon and provide knowledge to address effects of climate change for native fish.

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Physiological sheep studies: metabolic crate versus pen.

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Abstract.

For many years the metabolic crate has been in routine use for housing sheep during *in vivo* physiological study. The advantages of this type of housing are that the animal cannot take flight easily, it represents less danger to the investigator and feed in /excreta out measurements can easily be performed. Most importantly, sensitive instrumentation can be protected (e.g. vascular catheters and electrodes etc). Sheep studies at urban-based research institutions in particular, have a constitutive reliance on the metabolic crate. While there are still many instances where short term housing in metabolic crates may still be the most appropriate, it is important that investigators and animal care staff routinely interrogate their absolute necessity. Long term housing in crates of more than two weeks duration, represents an undoubtable compromise of animal freedoms and hopefully this is recognised and justified in any research situation.

Why use metabolic crates?

Existing research infrastructure within a facility may dictate the necessity to use metabolic crates. In some situations sheep are housed in urban laboratories with limited space, so containment in a metabolic crate is practical from a management perspective. Sheep in a crate are also much less able to take flight during a procedure or manipulation and perhaps pose less risk to the personal safety of the researcher. Excreta is contained and easily collected within a well designed crate and the reasons for doing this may relate to management and/or scientific requirement (e.g. quantitative or qualitative measurement of urine or faecal matter).

Certain experimental characteristics may also benefit from metabolic crate containment. Some experiments may require the use of radioactive tracers that are administered in drinking water or by direct infusion. In these situations, containment issues are clearly a determining factor in the decision to use crates. In other experimental setups the use of fragile electrophysiological instrumentation (e.g. for cardiovascular monitoring and/or brain electrophysiology) may also require that sheep are contained and unable to access equipment or leads connecting them with such equipment. However, in all of the above situations it is remarkable how often a sheep kept in a metabolic crate, no matter how they may be constrained, find ways to access and chew on such items!

An important factor in the decision to use metabolic crates is dogma. The attitude "this is the way we have always done it" is still a common factor. This reason is obviously not exclusive to the issue at hand and is commonplace in research laboratories, despite the ironic fact that they are in the business of discovery and innovation. In animal research, innovation must be much broader than

just the focus of the work or question being dealt with; it should always also involve the "3Rs" of ethics. Often, quite serendipitously, new approaches to manage the experimental animal actually do benefit the quality of the scientific output.

Pens can work better.

Our research group was faced with the prospect of performing a large indoor sheep experiment involving nutritional manipulation that covered a time frame from 2 months before mating right through pregnancy, until 3 weeks after birth (over 7 months, see references). The experiment required individual manipulation of maternal food intake for specific periods of time, so housing of sheep in individual pens was required. Prior to the introduction of ewes into the feedlot, outdoor feed intake/weight gain trials using specially designed pelleted concentrate feed were performed in order to exclude sheep that were poor eaters of this diet (5-10% of all ewes).

Maternal and foetal surgery to fit catheters was performed on day 110 of pregnancy (term = 147 days) to allow regular blood sampling from the foetal sheep until delivery at term (twice a day for the last 10 days). Often necessity brings about change, and this was a case in point. Prior to this work, our approach to foetal/maternal instrumented sheep work had been limited to the use of metabolic crates and terminal experiments ending before birth. The long period of intense study as well as the scope and size of the project demanded a more practical and ethical solution than metabolic crates, so housing in pens was implemented. Pens in our feedlot are 1.2 by 1.4 m in size with flexi-mesh flooring. The sides are composed of a 10 cm mesh so animals have easy vision and contact with neighbouring sheep. Daily feeding and regular weighing allows sheep to become well accustomed to human contact.

Within our sheep laboratory, we have research staff that possess high skill levels when it comes to dealing with vascular catheters in an aseptic manner and who are also "good with animals". In between sampling periods, catheters are secured in a plastic bag anchored on the back of the ewe and covered in a tubular dressing. Losses due to catheter mishaps and foetal infections are no higher than similar long term experiments we had previously performed using metabolic crates. Problems with not eating were far less frequent. Staff also felt more ethically comfortable performing these experiments in pens and bonded better with the sheep.

Work on this project has continued with progeny sheep also being kept indoors intermittently from birth to four years of age. It is difficult, when working with these well conditioned sheep, to resist the anthropocentric belief that they actually enjoy their "hotel" stays in our facility. The only real difficulty with this approach of using pens has been that staff have become very attached to the animals and studies of normal sheep behaviour under these conditions have become virtually impossible because of high degree of tameness exhibited by these sheep! However this effect is not without its benefits and if you are interested in cognitive function rather than fear responses you may be on a winner. Also if you are performing tests of stress hormone axis (or nearly all physiological tests) the less stressed the animal is at baseline observation, the better your data will be.

Barriers to change.

Despite our experience with the experiment described above there are still barriers to adopting pen based housing over the continued use of metabolic crates. Some have been outlined earlier including the use of existing infrastructure and protection of the delicate instrumentation needed for more sophisticated monitoring. Lack of funding avenues for change has also been a significant a significant impact in addressing these issues. Other barriers may include the technical ability of staff or investigators to perform studies in pens rather than metabolic crates. Certainly, the level of training required for pen based work is higher and demands superior animal handling skills than for the crate, as well as a lot of "sheep whispering" ability. Training can be improved and additional outside perspectives can be sought; senior investigators should always encourage staff suggestions. Willingness to change is of course influenced by an investigator's attitude to animals in research and their genuine concern for the importance of animal welfare. It is sometimes easier for researchers to be somewhat tunnel visioned for the specific scientific outcomes they wish to achieve, while forgetting that there should be a constant re-appraisal of the welfare costs involved. Peer review should include welfare issues and these should not be regarded as a "non-academic" management issue.

Importantly, it is also worth reminding colleagues that improvements in animal welfare standards will almost inevitably also result in improved experimental outcomes.

New possibilities and ideas.

Technological innovation is often cited as a barrier to the use of pens rather than metabolic crates. Slowly more remote monitoring and wireless technology is becoming available (remote sensors for glucose, heart rate etc). The problem with this is that most of this equipment is designed and marketed for medical rather than scientific use. The most common consequence of this medical targeting is a very high cost and low possibility of re-use. Often medical equipment will function only within limited ranges in order to cover manufacturers and practitioners from misadventure/malpractice. Biomedical industries are profit driven, health providing agencies are restricted to marketing/provider agreements and politically there is little will for change. There is however a small industry of equipment providers for physiological research. Some investigators do become involved at the ground floor of the technological development of the equipment before it reaches commercialisation and can therefore use it more economically. The biomedical and biological scientific community must enhance and communicate this type of activity whenever possible.

Use of radioactive isotopes in sheep studies is often a good reason for using a metabolic crate rather than a pen; for containment purposes. Gradually however, non radioactive isotopes are becoming more available. These cold isotopes are usually no more hazardous than excreta. Once again cold isotopes are used in medicine more commonly and therefore, attract a premium price. It is worth attempting to explore with cold isotope suppliers the possibility of entering into a material transfer agreement or similar arrangement that might allow cheaper or free access to these substances in exchange for "some" IP rights. However be warned, as when procuring pharmaceutical agents by these means, dealings can be very protracted and negotiations can

involve details that will drive your average academic nuts.

If metabolic crates need to be used but there also pen facilities available, investigators should consider using crates episodically rather than continually. In our research facility, we currently do not have access to remote telemetry for electrocardiogram research. Our animals are very tame, accustomed to human contact and are therefore easily adapted to short term caging in metabolic crates for this purpose. As long as the food is good and the background music is to their liking the sheep appear unstressed and produce useful data. The music suggestion is not in jest – particularly when metal, rather than wooden crates are used, as the metallic bangs etc can be annoying, even startling to sheep. Soft background music does help desensitize sheep to extraneous noise.

Institutional Animal Ethics Committees and organisations like ANZCCART naturally have a big role to play when it comes to encouraging change where possible. Interaction between investigators with related welfare issues also needs to be encouraged. During this recent ANZCCART meeting in Port Douglas, the discussion following my presentation included a comment from the audience saying that their institution was using adjustable sized crates to deal with similar issues we faced. In this case, they were using a crate the size of a pen, which had a slide in barrier that could reduce the floor space available to the sheep back to that of a crate during some procedures. It is a kind of hybrid crate/pen, which is a great idea. The diversity of perspective on welfare issues gained at meetings like ANZCCART will often allow practical means to improve the welfare of all animals involved in research.

Summary.

Metabolic crate based sheep research will continue for the foreseeable future as there are situations where it is unavoidable. However there are probably many situations where use of pens could be considered, or perhaps, the episodic use of crates. Change in this area is not just the responsibility of the researcher but also of parent organisation supplying the facilities and the funding bodies including governments. Solutions need to be workable and not cost prohibitive for researchers. At the same time wide consultation should be sought to find both the best welfare and the most ingenious and cost effective solutions for making the switch from metabolic crates to pens.

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The welfare status of experimental animals in South Africa: The Past, Present and Future

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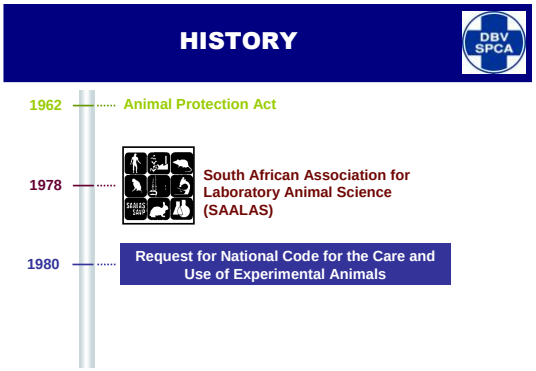
Abstract

Animals have been used in biomedical research in South Africa (SA) since the early 1900s. The first attempts to co-ordinate laboratory animal interest in South Africa began in 1970. In the late 1980s, under pressure from animal welfare and rights groups, Government (Department of Agriculture) initiated working groups to draw up specific legislation to control the use of animal experimentation. No legislation resulted from this and only in 1990 a National Code (National Code for Animal Use in Research, Education, Diagnosis and Testing of Drugs and Related Substances in SA) was published. In 1997 the Office of the Director-General of Agriculture was commissioned by Government to draw up guidelines for new legislation pertaining to the use of animals in research. This once again resulted in a dead end. Frustrated by this, the National Council of SPCAs (NSPCA) in South Africa suggested that the South African Bureau of Standards (SABS) should be used to set a national standard for the use of animals during research, testing and education. During 2001 the NSPCA and members of the South African research community utilising research animals approached StanSA a division of SABS, with a request to create a new standard to be developed as the research community faced new challenges. There was a perception that the previous code was no longer contemporary as science had progressed, the political and economic environment has changed and so did public opinion. Nearly eight years later during December 2008 the South African National Standards for the Care and Use of Animals for Scientific Purposes (SANS 10386:2008) was published. This standard encompasses all aspects of the care and use of, or interaction with, animals for scientific purposes in medicine, biology, agriculture, veterinary and other animals sciences, as well as industry and teaching studies in South Africa. Where applicable, the SANS 10386:2008 can be used as a supporting document to be read in conjunction with the Animals Protection Act (71 of 1962). If vigorously implemented, the standards will help ensure that the justification for using animals in research is always critically questioned with more done to replace or avoid their use. It will also play a significant role in helping to reduce the suffering and improve the welfare of those research animals still used, ultimately ensuring the effectiveness of Animal Ethics Committees in South Africa.

Animals have been used in biomedical research in South Africa since the early 1900's when organisations such as the South African Institution for Medical Research, the Veterinary Research Institute at Onderstepoort and various Governmental diagnostic, serum and vaccine production laboratories were established. Animal colonies, mostly comprised of rodents, were established within institutions, on a departmental basis to meet local user needs.



The first attempts to co-ordinate laboratory animal interest in South Africa began in 1970. Eight years later (1978) the South African Association for Laboratory Animal Science (SAALAS) was established and still exists.

In the late 1980's, under pressure from animal welfare and rights groups, the South African Government (Department of Agriculture) initiated working groups to draw up specific legislation to control the use of animal experimentation. While this did not result in any legislation being passed, a National Code (National Code for Animal Use in Research, Education, Diagnosis and Testing of Drugs and Related Substances in S.A) was published in 1990.

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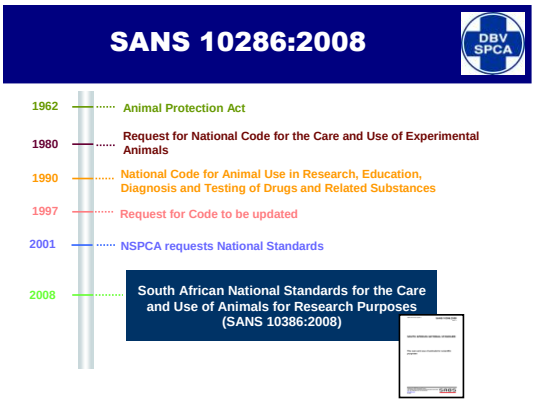
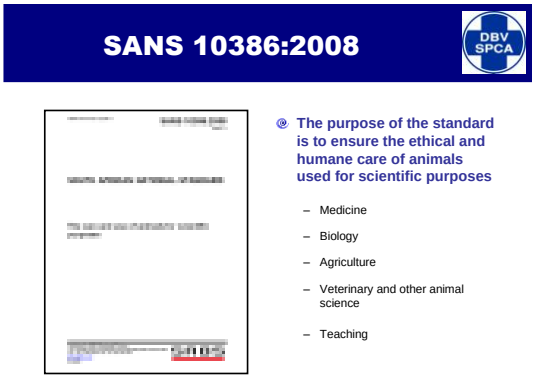


The standard (SANS 10386:2008) covers, amongst others, the:

- Responsibilities of institutions and their Animal Ethics Committee's;
- Responsibilities of investigators and teachers;
- Acquisition and care of animals in breeding and holding facilities;
- Wildlife studies;
- Care and use of farm animals for scientific purposes; and
- Use of animals for the purpose of teaching.



Species-specific annexure provide institutions with reference material, including minimum requirements for housing.

If vigorously implemented, the standards will help to ensure that the justification for using animals in research is always critically questioned, with more done to replace or avoid their use. It will also play a significant role in helping to reduce the suffering and improve the welfare of those research animals that are still used.

National Council of SPCAs

The use of animals in research is an extremely complex and controversial issue, both within South Africa and internationally. Broad-based practical initiatives are needed to address animal welfare concerns within this field. When the NSPCA began investigating the South African situation, important focus areas were identified which would form a strategy for addressing animal welfare issues. These focus areas have been tried and tested internationally and have provided a good platform for South Africa.

Animals are used for many different purposes in research and testing, with each area of use raising specific ethical, welfare and scientific issues and questions. The NSPCA adopts a constructive and practical approach, assessing every issue individually and critically questioning the necessity and justification for animal use.

The ultimate aim of the NSPCA is the replacement of animal experiments with viable alternatives. Until this can be achieved, animals used in research should receive humane and compassionate treatment at all times. The NSPCA therefore campaigns for measures that will help to replace animals, reduce the number of animals used, minimise and avoid suffering and improve the welfare of those animals that must be used. It is essential that these measures are implemented throughout the animals' lives and not just during experiments.

The NSPCA is the only welfare organisation in South Africa with a specialised unit (Research Ethics) dedicated to working with the issues surrounding animal experimentation. The Unit consistently works within four key operational areas:

- Inspection of facilities using animals for experimental purposes;
- Identifying legislation and national standards governing animal experimentation and subsequent areas of improvements;
- Identifying institutions conducting animals experimentation with the view to establishing and/or assisting with the effective functioning of Animal Ethics Committees; and
- Seeking and providing information on ethics and alternatives to animal experimentation and animal welfare issues.

Nussbaum's Capabilities as Criteria of Good Practice

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Abstract

The paper outlines Martha Nussbaum's capabilities approach, as applied to animal ethics, and then assesses the relevance of each capability as a criterion of good practice. The use of pound animals in veterinary and science courses is taken as a case study.

The conference theme is "Best practice' and we're all very familiar with the 3Rs and the 5 Freedoms, but in this paper I'd like to augment those ideals by throwing Nussbaum's 10 capabilities into the mix.

I will initially examine some aspects of animal ethics and then focus on Martha Nussbauam's so called "capabilities" approach.

ANIMAL ETHICS : Animals have long been considered inferior to humans and different in kind, not merely in degree – though this firm boundary was made problematic by Darwin's 'The Origin of Species' (1859). In Judaeo-Christian ethics, God gave humans dominion over animals – moderated by injunctions towards kindness. The medieval notion of the Great Chain of Being, with man at the apex, expressed this ideal. The philosopher Kant argued that animals were not rational or autonomous, so their lives were not ends in themselves. On Kant's view, in "Lectures on Ethics", our duties to animals are merely indirect duties towards humanity and if we treat animals kindly, we strengthen the disposition to behave kindly towards humans – like exercising a moral muscle on a proxy object. Martha Nussbaum regards this concept as a fragile empirical claim about psychology.

The corollary for Kant was that animals could appropriately be treated as means to our ends. For Kant, moral duties can only be to self-conscious beings. Only such beings can be members of the moral community. Animals could thus be relegated to beings of secondary concern – if concern at all, for want of a soul, of rationality (albeit construed in a particular, narrow way), of autonomy or of language.

The Christian notion was at best, one of human stewardship and at worst, human dominion over the rest of nature, including animals. This exacerbated the long-established prejudice in western culture in favour of rationality as the defining and unique characteristic of human beings.

In the Enlightenment, Rene Descartes argued that like clocks or robots, animals were but machines that moved and made sounds but had no feelings. In such a context it was easy to portray animals as quasi-clockwork animated robots – "furry clocks". Such a conception rationalised vivisection, for

creatures with no consciousness could feel no pain.

Sentience

Jeremy Bentham, the founder of utilitarianism, was the first major figure in Western ethics to advocate in 1789 that animals should be included in our concepts of ethical thinking. As he memorably argued:

> What else is it that should trace the insuperable line? Is it the faculty of reason or perhaps the faculty of discourse? But a full-grown horse or dog is beyond comparison a more rational, as well as a more conversable animal than an infant of a day or a week, or even a month old. But suppose they were otherwise, what would it avail? The question is not "Can they reason"? nor "Can they talk"? But "Can they suffer?"

In this way, Bentham addressed the issue of the boundary between human and animal and introduced the concept of sentience – or the capacity to feel pleasure and pain as the central criterion of issues of animal ethics. This was the driving force behind the POCTA – Prevention of Cruelty to Animals Act – tradition of legislation which still prevails today. It is an animal welfare framework, evident in the RSPCA charter and in the work of some animal activists.

Peter Singer's work is grounded in this "Benthamite" tradition, and he further argues that the difference between humans and animals is one of degree, not of kind, i.e. not absolute, and that the boundary is quite amorphous.

Circles of Compassion

As early as the 2nd century AD, the Stoic philosopher Hierocles created a vivid metaphor for extending the boundaries of our moral concern. Imagine, he argued, that each of us lives in a series of concentric circles, the nearest being our own body, and the furthest being the entire universe. The task of moral development is to move the outer circles progressively to the centre, so that one's relatives become like oneself, strangers like relatives, and so on. Singer adopts this metaphor and argues for explicitly extending the circle of one's concern beyond the boundary of one's own species, to include animals and ultimately further, to the whole environment. Why we should do this, is meant to be intuitively obvious; at least learning to see it in this manner is the 'path of enlightenment' in some religions.

Speciesism

Speciesism was the second great driving idea in animal ethics after sentience. It was a term coined by Ryder and popularised by Singer. It means a prejudice or attitude of bias in favour of members of one's own species against those of members of another species. Speciesism obviously picks up on the unfavourable connotations of racism and sexism and the movements to extend equal consideration to the interests of coloured people and of women.

The task to change deep-seated, unreflective notions of the species barrier is the task we now face and it is perhaps the hardest of all because the attitudes are so entrenched and the economic incentives to persist with cost-cutting, production-line, inhumane treatment of animals are so great. Pope Benedict has condemned the 'industrial use of creatures, so that geese are fed

in such a way as to produce as large a liver as possible, or hens live so packed together that they become just caricatures of birds.' It is in this context that the argument to expand our circle of compassion appeals to considerations of animal welfare, but also makes a transition to animal rights, as animals are considered as sentient beings who deserve quality of life.

Bentham makes this point at the beginning of the quoted passage, by asking what is the boundary between humans and animals? Is it the capacity of reason or of language – the 2 most common candidates after soul. He rejects both, citing a dog or a horse as more advanced and rational than an infant. So the preference for an infant sounds speciesist. Opponents usually invoke potential at this point. So Bentham made both points – the speciesist point as well as the sentience point – in that passage, though it is the final famous sentence and the sentience point for which he is commonly quoted. Singer uses the same arguments.

I accepted Singer's position for a long time (actually since the early 70s – when as a postgraduate student I heard him give a paper on Speciesism in the Monash University Philosophy Department) and certainly the concept of sentience is central to his hypothesis, as is the opposition to cruelty which is its corollary. But the focus here is primarily negative, with an indirect appeal to empathetic identification with those animals most like us, and appealing to quality of life – whether human or animal - needs specification if it is to be more than vague.

I now think there's an even better theoretical approach, which is more broad-ranging and specific, and grounds positive guidance for action. It's the capabilities approach, advocated by Martha Nussbaum and Amartya Sen, Nobel prize-winning economist, who pioneered a Quality of Life approach to human capabilities in the context of aid and human development, tied to the UN Declaration of Human Rights.

THE CAPABILITIES APPROACH

The capabilities approach was first articulated in 'The Quality of Life', published in 1993 and based on their research in a World Institute for Development Economics Research study for the U.N. University. The book comprises papers from a 1988 conference in Helsinki, which they organised for WIDER.

WIDER's mandate is to engage in interdisciplinary research and the conference brought together economists and philosophers around the question what is meant by "quality of life' and what is required in terms of social policy for improving it. Nussbaum extended the approach to animals, initially in her mammoth book 'Upheavals of Thought' (2001), arguing for the intelligence of the emotions as a discriminative response to issues of value and importance..

Martha Nussbaum

Nussbaum is Professor of Law and Ethics at Chicago University and is a classicist and moral philosopher, who has been influential in the non-postmodern pockets of literature departments, and the turn to virtue ethics and applied ethics; and more recently, animal ethics.

She was in Australia for a seminar on her work at the Humanities Research Centre at the Australian National University in 1999 and again to present the Tanner Lectures on Human Values in 2002. The title of the 3-lecture series was "Beyond the Social Contract: Towards Global Justice, and the 3 lectures were on "Capabilities and the Mentally Disabled", "Human Capabilities Across National Boundaries" and "Justice for Non-Human Animals" – which became the core of her contribution to the 2004 book 'Animal Rights', which she edited with Cass Sunstein.

Nussbaum and Animal Ethics

So, what does the capabilities approach, as extended by Nussbaum, have to offer? It appeals for animal welfare based on rights derived from their capabilities – which are outlined. The approach lists ten capabilities, nine of which also apply to animals. It stresses how much more has to be considered and provided for than is implied by sentience and covers the whole range of animals, including those in zoos, rodeos, museums, and laboratories. It involves a radical paradigm shift in outlook and has huge practical implications. It's observable and it's easy to identify where the shortcomings fall. It is in my view the most current and the most exciting development in animal ethics.

In the Tanner Lectures in Canberra (2002), as well as in 'Animal Rights' with Cass Sunstein (2004), Martha Nussbaum addresses ethics for non-human animals. She argues that the capabilities approach is the best basis, theoretically and practically. She also argues for extending the focus beyond traditional appeals of compassion and humanity to considerations of justice for non-human animals.

The Tanner Lecture is preceded by 3 epigrams – One from the political philosopher John Rawls (which gave the lecture its title), one from Aristotle, and one from the Nair case considered by the Hindu Kerala High Court in 2000. This case affirmed animals as 'beings entitled to dignified existence'. Nussbaum derives from this, entitlements to adequate opportunities for nutrition and physical activity; freedom from pain, squalor, cruelty and fear; freedom to act in ways characteristic of the species, opportunities for interacting and to enjoy light and air in tranquillity.

To some people, this may echo the Five Freedoms – freedom from hunger and thirst; from discomfort; from pain, injury , disease; from fear; and to perform normal behaviour - which have been influential and valuable as a guide to policy since their formulation in 1965. Nussbaum's approach does however, go further.

Nussbaum goes on to argue that cruel and oppressive treatment of animals raises issues of justice rather than merely of compassion and humanity. Like the notion of humanity, compassion involves the thought that a being is suffering significantly and is not to blame for the suffering. Compassion thus omits the essential element of blame for wrongdoing, according to Nussbaum and even if we add - that duties of compassion involve the view that it is wrong to cause animals suffering, this falls short, in Nussbaum's view, of saying that mistreatment of animals is not just morally wrong, but morally wrong in a special way, raising questions of justice. So saying mistreatment of animals is unjust means not only that it

is wrong of us to treat them that way, but also that they have a right – a moral entitlement – not to be treated that way.

It was in the penultimate section of the Tanner lecture – "Toward Basic Political Principles : The Capabilities List" – that the strength of the capabilities approach really emerged, for the plausibility of her practical and policy prescriptions feeds back into the theoretical persuasiveness of her argument.

Nussbaum lists 10 capabilities, and individuals may be said to have an interest in expressing these capabilities. This goes for animals too. The capabilities are listed below:

The Capabilities Approach

1. Life
2. Bodily Health
3. Bodily Integrity
4. Senses, Imagination and Thought
5. Emotions
6. Practical Reason
7. Affiliation
8. Other Species
9. Play
10. Control over One's Environment

Let us consider the example of using pound animals in research and teaching as we consider what these capabilities imply.

The first capability is **LIFE**, which entails animals are entitled to continue their life, whether or not they take a conscious interest in it. This puts pressure on the meat industry to reform its harmful practices, as well as highlighting problems with killing for sport (such as hunting and fishing) and for fur.

BODILY HEALTH is the second entitlement and where animals are under human control, this entails laws banning cruel treatment and neglect, confinement and ill treatment of animals in meat and fur industries; forbidding harsh or cruel treatment for working animals, including circus animals, regulating zoos, acquaria and parks, as well as mandating the provision of adequate nutrition and space. Nussbaum points to the anomaly that animals in the food industry are not protected as domestic animals are and recommends that this anomaly be eliminated.

BODILY INTEGRITY is the third entitlement, which would prevent the declawing of cats and other mutilations, such as tail-docking, that make the animal more beautiful to humans. It would not ban forms of training that are part of the characteristic capability profile, such as training horses or border collies.

SENSES, IMAGINATION, & THOUGHT constitute entitlement four and entail access to sources of pleasure such as free movement in an environment to please the senses and which offers a range of characteristic activities.

EMOTIONS are entitlement five. Nussbaum argues that all animals experience fear and many experience anger, resentment, gratitude, grief, envy and joy, while a small number can experience compassion. Hence they are entitled to lives where it is open to them to have attachments to others and not have these attachments warped by isolation or fear. While this is understandable in relation to

domestic animals, it is overlooked in relation to zoo and farm animals and research animals.

PRACTICAL REASON (entitlement six) is 'a key architectonic entitlement in the case of human beings' and has 'no precise analogues in the case of non-human animals.' However, we should consider the extent to which the being has a capacity to frame goals and support it if this is present, as well as providing plenty of opportunity for movement and variety of activities.

AFFILIATION is entitlement seven on the capabilities list. Nussbaum argues that animals are entitled to form attachments and to relationships with humans that are rewarding rather than tyrannical, as well as to live in 'a world public culture that respects them and treats them as dignified beings.'

OTHER SPECIES is capability eight and calls for the formation of an 'interdependent world in which all species will enjoy cooperation and mutually supportive relations with one another.' This idealistic entitlement calls, in Nussbaum's words, 'for the gradual supplementation of the natural by the just'.

PLAY is capability nine and is central to the lives of all sentient animals. It entails adequate space, light and sensory stimulation, as well as the presence of other species members.

CONTROL OVER ONE'S ENVIRONMENT is capability ten and has two aspects in the case of humans – political and natural. For nonhuman animals, it entails being respected and treated justly, even if a human guardian must go to court, as with children, to vindicate those entitlements. The analogue of human property rights is respect for the territorial integrity of their habitat, domestic or wild; while the analogue of work rights is the rights of labouring animals to dignified and respectful labour conditions.

Only Practical Reason does not fit smoothly with animals and much of what it requires can be derived from the criteria for flourishing. However, even excluding it, if the other 9 of these 10 capabilities were taken seriously, it would transform the common conception of how much needs to be provided as basic conditions for animals – not just life, health, and the maintenance of bodily integrity, but opportunities to experience the senses, imagination and thought, emotions, affiliation, relations with other species, play, and control over the animal's environment. Yet it is hard to think of a single instance where adequate allowance is made for these capabilities.

Nussbaum recognises that these rights need international cooperation, via accords, such as the U.N. Declaration of Human Rights, as well as the in eliminability of conflict between human and animal interests. Some bad treatment of animals, she argues, can be eliminated without serious loss of human wellbeing. In the use of animals for food for example, she suggests setting the threshold by focussing on good treatment during life and painless killing. In the use of animals for research, she argues much can be done to improve the lives of research animals, without stopping useful research. It is unnecessary and unacceptable for primates used in research to live in squalid, lonely conditions. Nussbaum advocates asking whether the research is really necessary; focussing on the use of less complexly sentient animals; improving the conditions of research animals

including terminal palliative care; removing psychological brutality; choosing topics cautiously so no animal is harmed for a frivolous reason; and making a constant effort to develop experimental methods (such as computer simulation) that do not have bad consequences. The Australian Animal Welfare Strategy's 3 Rs – Replace, Refine, Reduce – has some affinity with Nussbaum's approach here.

As earlier emphasised, Nussbaum comes from a justice perspective, fitting the issue into a global justice approach. Finally, it is important to stress that the list of 10 capabilities is not presented as a hierarchy; rather, all spring from the conception of flourishing. It does seem to me, though, that life is presupposed, as is arguably, health and perhaps bodily integrity, if capabilities 4 to 10 are to be exercised.

This capabilities approach is to me the approach that has most to recommend it in terms of simplicity, scope, power, and precision of recommendations. It does not make shortcut appeals to what is natural, but spells out in detail what are the capabilities that constitute flourishing, why each is important and what observing them would imply in policy and practical terms.

It therefore has the greatest capacity of current animal ethics theories to protect and enhance the wellbeing of animals in a nuanced way that takes account of differing needs of different species and categories of animals. It is an account of animal nature that gives clear guidance as to what constitutes animal welfare and what constitutes the good life for all animals.

An Example of Good Practice re Research Animals and Capabilities

Now I wish to highlight what I think demonstrates best practice in relation to research animals in terms of all the capabilities listed, by describing practice at Griffith University in relation to environmental enrichment and animal adoption.

Environmental enrichment involves modifying the environment to ensure animals are able to express natural behaviours. Social opportunities are provided; the policy is not to house animals singly. If this has to occur, for example after surgery, cages are next to each other. There are nesting materials and nutritional rewards, such as sunflower seeds in bedding, to encourage foraging, and music in the corridors, to minimise sudden loud noises. Lights are on timers, and incandescent and the labs are humidity and temperature-controlled. There are PVC pipes, and paperclips on wires for mice to hang off and with which they can play. Empty milk cartons are made into igloos for mice and rats and there are scratching posts and things to chew.

Animal adoption is a policy to re-home any animals that have not been altered in any lasting way – metabolically, physically, or genetically. There is a small collection of training animals – Oscar the rabbit, who shows others the ropes, such as how to rattle the bell for food and pats, as well as two rats, Moppet and Benjelina, and two mice, Chup a chup and his son Junior, with the right temperament for handling, to train researchers and new staff. Rabbits cannot be rehoused, as they are declared a pest species in Queensland, but five rabbits have been driven to N.S.W. at weekends by staff, to be rehoused. This shows the trouble that is taken. Many students adopt animals that have been used in class, for

example where rats are given different types of water to drink and a urine sample is taken, but nothing more invasive occurs.

The animals used in research at Griffith are rabbits, mice, and fish, and the practices seem to me to be as good as it gets. It is a matter of attitude, expressed in a series of Standard Operating Procedures. The Animal Laboratories Manager is a member of the Animal Ethics Committee and reports monthly orally and in a written report to the Committee, which is very conscious of the 3 Rs of Reduce, Refine, Replace, and is constantly querying the number of animals involved in a project, as well as their treatment throughout, and how their life is ended humanely – if that is to be the endpoint. It goes far beyond merely observing the 3 Rs of the Australian Animal Welfare Strategy – Reduce, Refine, Replace -, though these are scrupulously considered.

It is an animal welfare framework and shows how good and effective a strategy can be. The Griffith Animal Ethics Committee has been audited twice and has been used as a model for other institutions. Though not explicitly attempting to, I think its policies and practices do express many features of the capabilities approach, which I commend to you as a framework that provides criteria of good practice to be taken into account by Animal Ethics Committees.

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Euthanasing invading "captured from the wild" cane toads with carbon dioxide

Lee Scott-Virtue, Sandra Boulter Brenda Potts and Del Collins
Representing and on behalf of the Kimberley Toad Busters Inc., Registered Environmental Organisation, ABN 715 008 59318, Inc 797 223 032

Abstract

The Kimberley Toad Buster volunteers have been cane toad busting at least weekly, throughout the year at the westerly colonising cane toad front, since September 2005, up to 400 kms from home on unmade roads in very harsh terrain. In the early days this always required camping out overnight.

The Kimberley Toad Busters must keep their volunteer toadbusters as safe as possible. We will not use violence, guns, or sharp implements to pith or sever the head of cane toads. We will not carry chemicals or anaesthetic agents, into the field especially given that toadbusters often include children and teenagers, some of whom are "at risk" for a number of reasons. We have pre-literate and non-English speaking volunteers. Our leaders are volunteers working between their day jobs. Our message from all our toadbusters, who have now contributed over 592,805 safe volunteer hours in the field, is this:

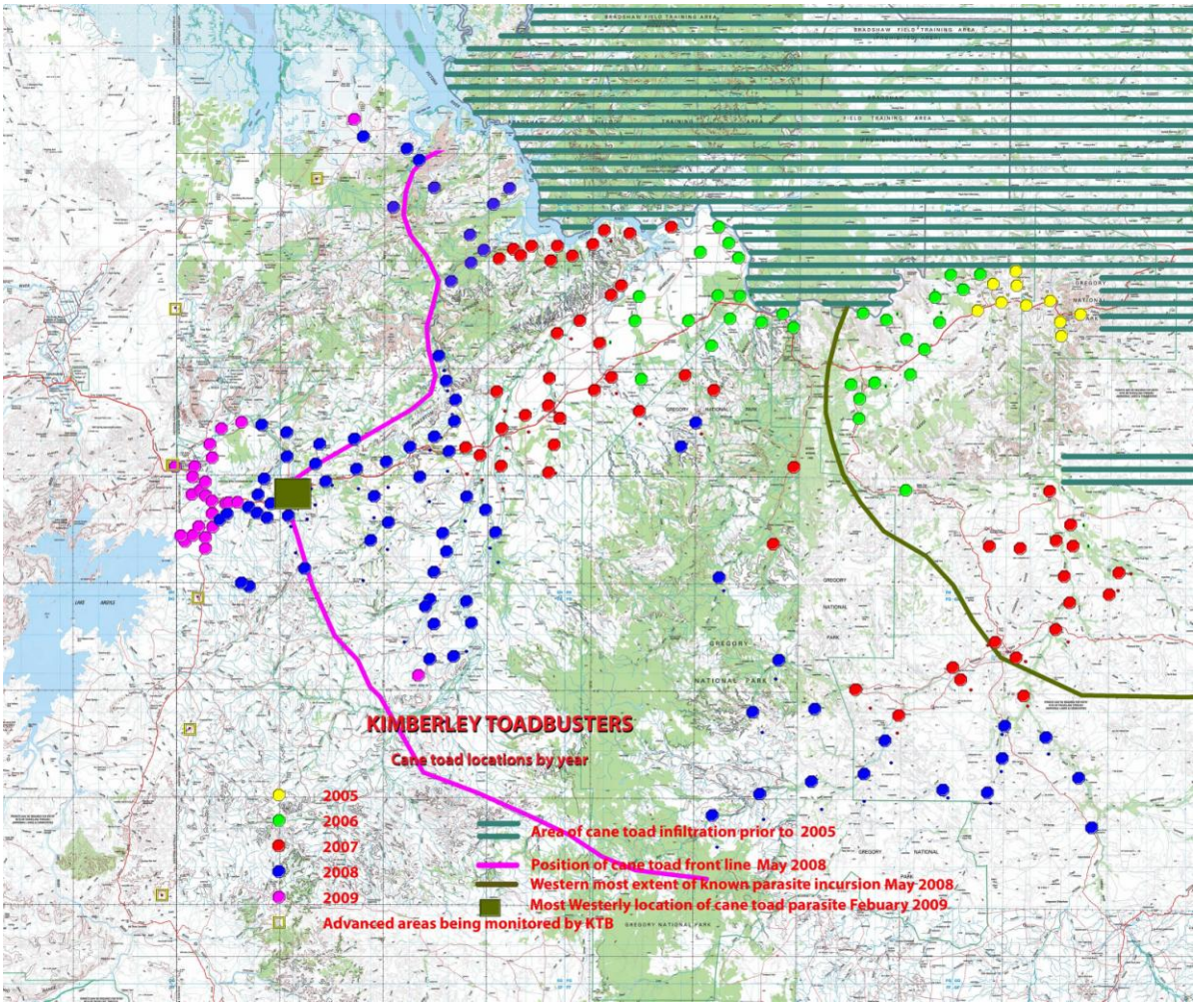
Just because we want to kill cane toads does not mean we want to hurt them, and we must have safe effective toadbusting that does not include violence

The Kimberley Toad Busters have developed their own cane toad euthanasing techniques through trial and error with the help of our volunteers who include trained nurses, medical doctors and a veterinary surgeon. Our primary and preferred method for humane disposal of large numbers of adult cane toads (our record was 6,182 toads in one night caught by a team of 8 volunteers) is euthanasing by CO_2. There are no cane toad carcass disposal points provided by government. We are prohibited from carrying cane toad carcasses over the WA/NT border. We cannot use uncontrolled fire to dispose of our toads, so toad carcasses must be buried before we leave for home to ensure, amongst other things, that they cannot be eaten by predators. Our KTB CO2 Standard Operating Procedure will be presented to the ANZCCART forum.

Australia's Cane Toad History:

Back in the 1920's and 1930's, Queensland sugar cane famers were having great problems with cane beetles spoiling their crops and in search of a solution. In 1932, cane growers learned of the possibility of using cane toads while attending a conference in Puerto Rico. The Queensland government and local cane growers then set about importing the toads from South America via Hawaii to Australia.

On the 18th August 1935, 101 cane toads were released into Gordonvale Cane Fields. The toads quickly became established and started breeding prolifically in the ideal Queensland conditions. The only problem was that they could not reach the beetles which were grazing to high up the sugar cane for the toads to be able to do the job they were imported to do, so suddenly there were two problem species living in the cane fields. Of course, they didn't remain in the cane fields of Gordonvale too long and have been spreading across the continent ever since. Their amazing ability to survive and prosper in an environment where they have no natural predators has meant that it has only taken then 74 years to make right across the top end and over the border of Western Australia.



For the last 40 years, governments in northern Australia have been putting millions of dollars into projects to control the spread of cane toads but so far nothing has come of these efforts. Cane toads remain unstoppable as there has been nothing developed that can kill or even weaken the toads in Australia. Australian wildlife, cats and dogs all are vulnerable to bufo toxin without any level of natural immunity.

So far, the only method that has shown any sign of slowing the spread of cane toads across the continent is hand catching. Interestingly, the term "Toadbusting" now appears in the modern Oxford dictionary.

Toad Busters

The Kimberley Cane Toad Busters are a diverse group of volunteers who do not believe that cane toads belong in Australia and are concerned about the damage they are doing to our natural environment as well as the devastating effects they are having on our wildlife. The aim of the group is to try and prevent or at least limit the spread of cane toads into Western Australia. To this end, we undertake frequent trips out into areas at the forefront of toad migration to capture and painlessly euthanase the toads.

During these frequent trips, we have seen numerous examples of cane toads causing problems that include poisoning native animals, eating out food sources, taking over native animal habitats and polluting waterways. Invading toads behave differently to our native toads. The also look different and so are identifiable. Our real fear is that without a concerted effort to stop the cane toads, we will loose some of our wonderful and unique Kimberly wildlife.

Our advice to potential tourists is "If you have not experienced our unique Kimberley wilderness, do it now before the toads invade and change it forever."

Cane Toad Life Cycle:

It is important to realise that cane toads are poisonous at all stages of their life cycle except late stage tadpoles.

Fresh cane toad spawn (as shown above) appear as long strand of darkly centred eggs, which are quite unique in Australia as all our native amphibians lay their eggs in clusters. Collection of these eggs is one of our key goals as

this is an excellent method for preventing the development of thousands of toads with each strand collected.

The tadpoles and metamorphs are also easily identified by their dark colour, large size and shape (see images below). Capturing toads at this stage is far more difficult and so we generally resort to killing these by spraying with dettol. The following sequence of photographs depicts the various stages of development from tadpole through to adult toad.

have clearly fallen victim to the cane toad poison. The following series of images illustrates the diverse nature of animals effected and includes everything from fish and crabs, lizards and goannas, birds, snakes and even some small crocodiles (although larger crocodiles appear to be unaffected by their toxin).

It is important to remember that because the toad is poisonous at virtually all of these stages, they can and do kill a vast array of potential predators including native animals, birds and fish. Than are also responsible for the poisoning death of many household pets.

Unfortunately, it is now increasingly common to see dead bodies or even skeletal remains of native animals that

Interestingly, the cane toad is not toxic to itself, so if a larger cane toad eats a smaller one (not uncommon), the predator toad suffers no ill effects from the toxin.

How do Cane Toad Busters Catch Toads?

Each volunteer groups splits up into teams, where each team will have at least one experienced toad buster among their number. All members of each team wear reflective safety vests and wear disposable latex gloves. Our volunteers often include children and teenagers – some of whom are "at risk" for a variety of reasons. We also have a number of pre-literate and non-English speaking volunteers that regularly take part.

Our leaders are volunteers that devote themselves to the cause in between their day job commitments.

Because we rely so heavily on all these volunteers, their personal safety is of paramount importance. We will therefore never use any form of violence, firearms or sharp instruments to capture or kill toads. We do not carry chemicals or anaesthetic agents

into the field – particularly because we so often have children taking part.

Each team then heads out into the bush, at night, to hand capture toads by torchlight. The advantage of hand capture in this way is that it is both safe and allows for easy direct and identification of toads to ensure that native species are not taken.

How do we Euthanase Toads?

This really brings me to the point of why we have come to speak at ANZCCART. Our preferred method for killing the cane toads is CO_2 narcosis – for reasons that will be elaborated below. The Western Australian Department of Environment and Conservation are however, proposing to ban the use of CO_2 for euthanasing cane toads in WA on the grounds that it is inhumane. They are not however offering a viable alternative that we can use. We are therefore seeking the collective opinion of ANZCCART delegates and hoping to draw on your collective expertise in order to either validate our CO_2 euthanasia techniques or come up with a viable alternative.

As mentioned earlier, our volunteers are a very diverse group that include locals, tourists, travellers, adults, teenagers, children, indigenous and non-indigenous individuals, who between them possess a wide variety of backgrounds in education, literacy, expertise, experience and life in general. We have some teenagers and children that have been (for a variety of reasons) described as being 'at risk'. This may or may not be as a result of being exposed to a violent lifestyle. Others have a history of 'risk taking' behaviour, are unused to discipline or do not respect property. When there are tourists, travellers and people from vastly different geographical regions involved, it is difficult to be confident of knowing all peoples character traits. All these factors combine to mean that the method of choice for killing cane toads must be as peaceful and non-violent as humanly possible. It is therefore clearly inappropriate to be carrying firearms, drugs, or other dangerous implements. Nor do we want to expose any of our volunteers to a violent or unpleasant death of any toads. Accordingly, we have adopted the use of a few euthanasia methods we consider to be humane and are practical in a rural setting.

The constraints we face in terms of finding a suitable euthanasia method can be summarised by the following ten points:

1. No qualified disposers
2. Mobility
3. Difficult terrain
4. Across borders up to 900 km round trip
5. Out overnight
6. Volunteer safety in harsh wilderness environment
7. Volunteer physical and psychological health
8. Social dividends and education
9. Need to dispose of toads on site
10. Cross jurisdictional/ land tenure issues (WA and NT)

Equally, our euthanasing objectives can also be best summarised by the following nine points:

1. Humane collection and euthanasia of cane toads
2. Safe, environmentally acceptable
3. Keeping toadbusters safe
4. Minimising mistaken identity and native frog harm

5. Prevention of native species being poisoned by dead toads
6. Minimising likelihood of captured cane toads exuding or squirting poison onto toadbusters
7. Minimising discomfort to cane toad
8. Safe, gentle handling of cane toads
9. Non-violent

These various constraints resulted in our focussing in on the use of either Dettol, CO_2 narcosis or refrigeration followed by freezing. In each case, toads would be disposed of by deep burial. Of these options, Dettol has been used to spray cane toad tadpoles and metamorphs, but CO_2 is the preferred option for euthanasing adult cane toads. In our hands, this method has proven to be simple, effective and appears not to cause any pain or distress to the toads. Cane toads show stress in the following ways:

- moving about in a bag or bin in an agitated way rather than settling calmly into a comfortable pile
- exuding poison from the primary poison gland and/or from the little poison glands all over their warty skin areas; and/or squirting poison from their poison gland.

The white milky toxin can be seen in these two images

Euthanasing Method:

1. prior education
2. wear reflective safety vests
3. use thin disposable gloves for catching toads
4. work in pairs for safety, faster toad pickup rate & maximise accurate identification
5. cane toads handled gently, held away from toadbuster's face
6. cane toads not squeezed
7. avoid grip of cane toads' poison gland
8. avoid pick up by toad mouth or face
9. held in open nets, bags or bins

10. disposable gloves for catching, measuring and recording toad statistics & checking identity
11. euthanasing bag placed on firm flat smooth surface , no holes, toads stack evenly to breathe
12. euthanasing bags not overloaded
13. remove most of air from bag by smoothing with hands, up from toads
14. top of euthanasing bag is held in hand with small opening to insert hose
15. bag inflated, balloon like, with 100% carbon dioxide
16. euthanasing bag containing toads and CO_2 is tied off with a balloon knot and left for not less than one hour
17. cane toads inspected on release from bag into pre-dug pit
18. dig hole away from water, bury, cover with soil, weigh down, secure from predators

Outcomes

- Native Frogs are not euthanased - double handling means double checking
- Toads not overly stressed when CO2 is introduced
- Toads are dead or comatose when bag opened

Assessment of CO_2 Administration by Slow Fill Techniques

Bag	$C0_2$ Filling Technique	Agitation of Toads at filling	Time Sealed in Bag	Toad Conscious State at Bag Opening	Time Lapse from Bag Opening
1	Slow Fill: 3 minutes 20 seconds, gauge showing delivery under 1 litre per minute	Toads moving in first seconds but not really agitated	One Hour	Comatose or dead, very hard to tell	2 hours and start regaining conscious state but very sleepy and slow
2	Slow Fill: 3 minutes	Less agitation than usual with fast fill	Two hours	Comatose or dead, very hard to tell	After 2 hours toads just starting to wake up very slowly
3	Slow Fill: 2 minutes, 15 seconds	First 30 seconds	3 hours	Comatose or dead, very hard to tell	At 2 and 3 hours, still comatose/no movement > autopsy of one toad > no obvious breathing, but slow heartbeat evident, toads do not wake up
4	Re-gas toads that woke up by Quick Fill, less than 8 seconds to fill	No obvious agitation of toads, but may be camera angle/ temperature of toads/ re-gas	Left Overnight	Comatose or dead, very hard to tell	Autopsy shows no beating heart

As the use of CO_2 for euthanasia of laboratory and other animal species has not been without controversy and there has been quite a lot of work done recently with some laboratory animal species to determine the best and most humane way to use CO_2 in this way. As a result, we too decided to try out different methods of administration to see which was best for us to use CO_2 to euthanase cane toads.

Much of the experimental design was based on the findings of the CO_2 consensus meeting held in Newcastle UK a few years back. The findings of that meeting clearly endorsed the slow fill techniques for use with rats, so we felt it appropriate to test this out with toads as well.

As shown in the table above, use of slow fill techniques seemed to have less effect on the toads initially, with them slipping very quietly into a state of deep unconsciousness. However, it may be possible that this technique also leant itself to greater problems with toads eventually recovering consciousness after prolonged exposure. It is tempting to even suggest that the slower inductions of CO_2 narcosis may lead to toads having time to adapt their metabolism to a long period of anaerobic survival. This meant that when toads were taken out of bags after two or even three hours of exposure to 100% CO_2, a significant number were able to eventually regain consciousness.

This ability of toads to recover from prolonged exposure to CO_2 has been reported previously and was what the WA government cited as a reason why CO_2 should not be used to kill cane toads.

We have pointed out to the government and continue to assert, that toads will only recover consciousness if they are reintroduced to an O_2 rich atmosphere. If they are maintained in an anaerobic environment such as the bag filled with CO_2 or if they are buried, they would not be exposed to O_2 again and so would never regain consciousness.

It is our belief that the use of CO_2 is a humane and effective way to kill cane toads. It is a method which is safe, effective and ethical and so fulfils all our criteria.

The final point is therefore to seek your endorsement for the use of CO_2 to kill cane toads in the field. This would help us to continue our important work without the risk of prosecution.

friendsktb@westnet.com.au www.canetoads.com.au

Unexpected Adverse Events - What are they and what do I do about them?

Janine Barrett

Biosecurity Queensland, Queensland primary Industries and Fisheries.

The *Australian code of practice for the care and use of animals for scientific purposes*, 7th Edition (Scientific Use Code) includes four references to keeping records and reporting unexpected and/or adverse event/effects/impacts (sections 2.2.27, 2.2.38, 3.1.9 and 3.1.12).

These requirements enable AECs to effectively monitor the wellbeing of animals and require investigators, teachers, animal facility managers and the AEC to investigate the cause/s of unexpected adverse events to enable them to develop strategies to improve animal welfare and scientific outcomes. However, the Scientific Use Code does not define 'unexpected, adverse events' or provide any further information about what records should be kept, what information should be reported or what the AEC should to do about the report.

It is proposed that the requirements of the Scientific Use Code apply to any unexpected adverse event defined as anything that happens, an occurrence, that meets *both* the following criteria:

- **unexpected** = not as described in the approved proposal or subsequent documents to the AEC, i.e. unexpected by the approving AEC, an event not taken into consideration by the AEC when assessing the welfare impact, benefit and justification of the activity.
- **adverse** = having a negative effect on the animal's welfare, i.e. not good from the animal's point of view, including being painful and/or distressing.

Some adverse events, where the cause is known and all reasonable steps to mitigate them are already being undertaken, may require only a brief report and little or no further action. More significant or severe events, particularly those suggesting that modifications to underlying management, scientific procedures, facilities or training are required should be reported in more detail.

It is proposed that AECs should develop forms to guide investigators and teachers in the provision of detailed reports, which should include:

- what the event was
- how the event and welfare of the animals has and will be monitored and addressed
- the actual and potential impacts of the event on animal welfare
- the actual and potential impacts of the event on the aims and outcomes of the activity
- what immediate and longer term steps are being made or considered to investigate causes and develop future prevention strategies.

It is proposed that the AEC should consider the report and require further information or actions until satisfied that all reasonable steps have been taken to ensure that

unnecessary and preventable recurrence is likely to be averted. The AEC should also consider what if any actions are required to ensure the continued use of animals is justified on the basis of revised expectations of the welfare impact and anticipated scientific or educational value. For further information see http://www2.dpi.qld.gov.au/animalwelfare/18561.html .

No Formal Paper was received for this presentation

NHMRC Survey of Animal Ethics Committees in Australia

Gordon McGurk Ph.D
Director,Program Assurance Section, Quality and Regulation Branch
National Health and Medical Research Council

Abstract

NHMRC has a role in research both as a funding body and as a standard setting body. Funding for research is provided to institutions that meet requirements for the ethical and accountable conduct of research. This includes adherence to the principles of the *Australian Code of practice for the care and use of animals for Scientific Purposes 2004* (the Code of Practice), a standard endorsed by NHMRC, CSIRO, the Australian Research Council and the Australian Vice-Chancellors' Committee. As the Code of Practice is currently under review, NHMRC took the opportunity to conduct a survey of the activity of all animal ethics committees in Australia in order to inform the review. The response rate for this survey was approximately 60% and provided an indication of some of the challenges faced by AECs. The purpose of this presentation is to discuss some of this data in the context of NHMRC's role as both a standard setter and as a funding body.

The National Health and Medical Research Council (NHMRC) is Australia's peak body for supporting health and medical research; for developing health advice for the Australian community, health professionals and governments; and for providing advice on ethical behaviour in health care and in the conduct of health and medical research.

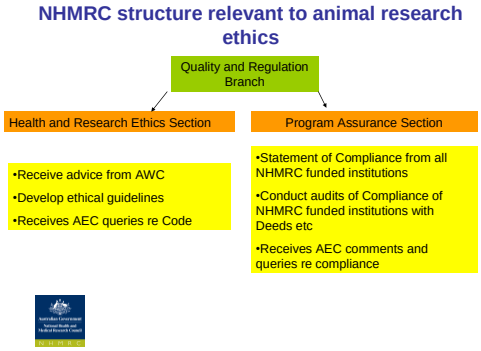


Figure 1: NHMRC & Animal Ethics

As part of its role in providing advice on ethical behaviour in health and medical research, NHMRC has published the *Australian Code for the care and use of Animals for Scientific Purposes* (the Code). The Code is endorsed by NHMRC, the Australian Research Council, the Commonwealth Scientific and Industrial Research Organisation and Universities Australia (formerly the Australian Vice-Chancellor's Committee).

Researchers who receive funding from NHMRC must comply with the requirements of the Code as a condition of funding. In the past, compliance with the Code was assessed by the mandatory completion and submission of a Statement of Compliance by all Animal Ethics Committees (AECs) that considered applications for research involving

animals that was funded by NHMRC. As the Code was undergoing a revision, NHMRC took the opportunity to gather information on a range of issues from AECs across Australia in an attempt to ascertain some of the challenges faced by AECs and to gain an appreciation of the type and volume of applications assessed and the workload of the AEC.

Information was gathered in the form of a survey which was distributed to AECs by relevant State and Territory Departments. The survey was voluntary for those AECs which did not consider any NHMRC funded research. The survey was divided into five sections dealing with: Composition of the AEC; Application Assessment; AEC procedures, Monitoring and Reporting; and Review of the Activities of the AEC.

Out of approximately 150 AECs throughout Australia[5], responses were received from a total of 101 AECs[6], representing 78 academic institutions, research organisations, State and Territory Departments, schools and private companies (see Figure 2). The high rate of response is attributable partly to the assistance provided by the State and Territory Departments with responsibility for AECs. Approximately 50% of the surveys were received from universities and 25% from State or Territory Government Departments or agencies.

[5] The exact number is not known as the number of AECs considered by States and Territories overlaps due to activity being conducted in multiple States and Territories.

[6] Only 99 were received before this paper was presented.

2008 Survey Results: AEC Responses

Sent to approximately 150 AECs. Approximately 66% (n=99) of AECs submitted the voluntary survey.

- *25% of the surveys were received from non-NHMRC linked organisations*
- *Surveys received from 99 AECs representing 76 organisations*

Affiliation of AECs that responded to the survey	n
University	49
Government Department/ Agency	25
MRI/ Hospital	17
Research and Teaching	4
Private	4
TOTAL	99

Figure 2: Survey Responses

Information provided on the composition of AECs indicated that category B members were represented most, with an average of 3.2 members per HREC and a maximum of 12 reported. Universities had more members for AECs than other sectors, while AECs that represented private companies had the least number of members (mean= 7). When the number of new applications assessed annually by AECs (range = 0-320) was considered, it was clear that AECs have a high workload, irrespective of the number of members on that AEC. The average number of proposals assessed ranged from 9 proposals by AECs that acted on behalf of private companies to 82 proposals by university based AECs.

2008 Survey Results: Composition of Committees

Committee membership as a function of sector:

		Number of Organisations.	Range	Mean number of members per AEC
Organisation Type	MRI / hospital	25	(8-13)	9.8
	Government	17	(6-19)	10.5
	Private / Other	4	(6-8)	7
	Teaching	4	(7-13)	9.3
	University	49	(6-32)	11.3
	TOTAL	99		

Figure 3a: AEC Composition

Information was collected on the numbers of AECs that assessed applications which involved the use in

research of animals for which guidelines had been issued or endorsed by NHMRC. These types of animals included great apes and other non-human primates, cats, dogs, Australian native mammals and GM animals. Almost half of all AECs that responded considered applications for research involving GM animals.

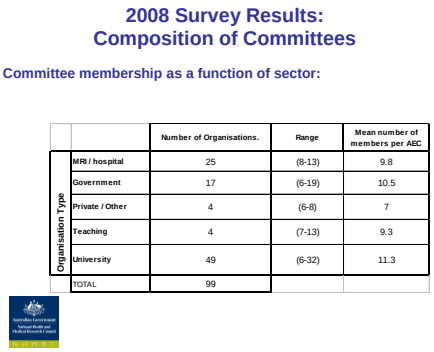


Figure 3b AEC Composition

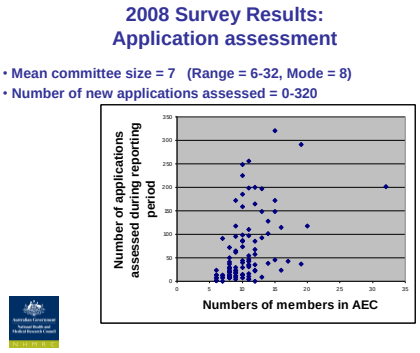


Figure 4: Applications assessed per year

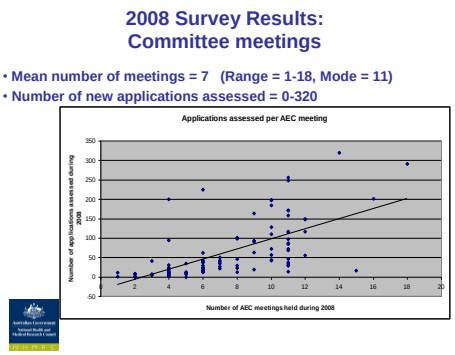


Figure 5: Applications assessed per meeting

The survey also gathered information on the numbers of grievances or non-compliances with the Code that were reported by AECs. All AECs reported having procedures in place for dealing with non-compliances. Of the non-compliances reported, the majority were reported to State and Territory regulators, indicating a high level of co-operation between AECs and State and Territory regulators.

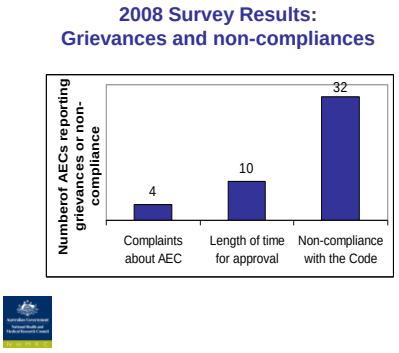


Figure 6: Grievances

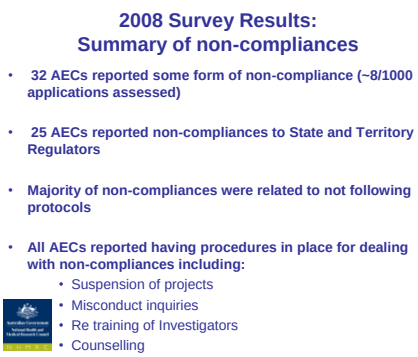


Figure 7: Issues of non-compliance

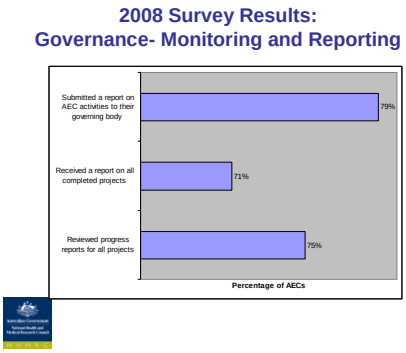


Figure 8: Monitoring and Reporting

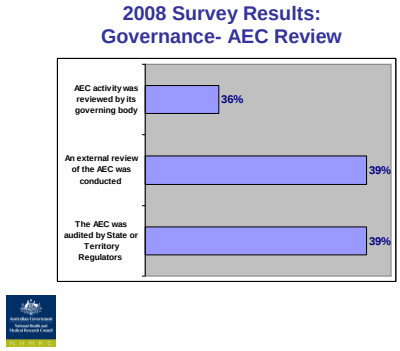


Figure 9: Review of AEC operations

This survey provided a snapshot of the AEC work carried out in Australia and the information provided will be valuable to NHMRC when considering revisions to the Code. NHMRC is grateful to all AECs who responded to the survey and appreciate the assistance of all State and Territory regulators who distributed the survey on behalf of NHMRC.

"AEC – Best Practice". A perspective from a Category B Member

Dr David Pemberton
University of Tasmania AEC

I have been involved with the ethical dilemmas of wildlife biology since the age of 10. This is when I trapped and manipulated the life of a wild animal for the first time. This means I have 41 years of exposure to the methods and justifications for studying wildlife. However, as a Category B member on the UTAS AEC, I have found that I was totally unprepared for the challenges of applying the 3 R's.

I will present a discussion of my experience of ethical dilemmas, including examples of issues faced both before I joined the AEC (such as branding seals), and during my tenure (establishing post rescue survival of stranded whales). These research scenarios will be discussed with reference to application of the 3 R's.

The role of a category B member will be discussed along with possible methods for improving AEC best practice. This will include discussion of the convention of a specialist Welfare Advisory Panel by UTAS AEC as a response to the complexities of wildlife research. This has resulted in the production of an addendum to the UTAS AEC Initial Application Form for applications to use birds or native mammals (and accompanying guidelines).

My conclusion is that experience is not enough; on-going learning is what best practice calls for. Indeed, a fourth 'R' should be introduced: 'Relevant'.
This is not a quantitative approach, but the story of one AEC member's deliberations when confronted with a pile of research application up to 20cm high every month for the last 6 years!

No Formal Paper was received for this presentation

The Enabling Role of Animal Ethics Committees

Simon Bain
Director Office of Research Integrity
Australian National University

Abstract

Based on observations at successive World Congresses on Alternatives and Animal Use in the Life Sciences, the Australian Code for the Care and Use of Animals for Scientific Purposes ranks well internationally. The 7th edition of the Code has bought us to a point where we ask questions that ensure a very high level of ethical and humane care of animals used for scientific processes. As members of AEC's we are the trustees of that Code, but at the same time we must recognise that science is an internationally competitive business and also that scientists are increasingly being asked to jump through more and more administrative hoops therefore we need to facilitate the processes relevant to animal ethics administration while operating within the bounds of the Code and State and Territory legislation. We need to think in terms of AEC's being facilitators rather than an additional layer of bureaucracy. It's important to note that by facilitating the processes we also reduce the chance of non-compliance.

In particular we need to think about the following essential components of the proposal application process:

- Ease of application.
- Incorporation of practices that minimise the turn around time from application to consideration by the Committee and from consideration to final outcome.
- The inclusion of practices that allow a quick decision on minor amendments.
- Within the terms of State legislation, the design of Annual Review and Completion/Discontinuation reports that ask the questions be limited to those the Code directs us to ask, and questions that need to be asked for reasons of animal welfare.
- We need to consider that some processes might be readily accomplished by ethics administrators outside a meeting rather than requiring a formal amendment/modification.
- The ready providers of information that facilitate the completion of a high standard application.

Within the terms of the Code Animal Ethics Committees have quite considerable powers. The enabling of science by the AEC extends beyond the ethics application process and the presentation will also discuss broader aspects where the AEC has a considerable capacity to facilitate the broader aspects of research including:

- Facility upgrading
- Education to enhance the use of best practice
- Defence of research in the face of public challenge
- The enabling of wildlife research through registration with State and Territory authorities and the necessary relevant reporting

Introduction.

Based on observations at successive World Congresses on Alternatives and Animal Use in the Life Sciences, the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes ranks well internationally. The 7th edition of the Code has bought us to a point where we ask questions that ensure a very high level of ethical and humane care of animals used for scientific processes. As members of AEC's we are the trustees of that Code, but at the same time we must recognise that science is an internationally competitive endeavour and also that scientists are increasingly being asked to jump through a steadily increasing number of administrative hoops. We therefore need to facilitate the processes relevant to animal ethics administration while operating within the bounds of the Code and State and Territory legislation. We need to think in terms of AEC's being facilitators rather than an additional layer of bureaucracy. It's important to note that by facilitating the processes we also reduce the chance of non-compliance.

In particular we need consider the following essential components of the proposal application process:

- Ease of application.
- Incorporation of practices that minimise the turn around time from application to consideration by the Committee and from consideration to final outcome.
- The inclusion of practices that allow a quick decision on minor amendments.
- Within the terms of State legislation, the design of Annual Review and Completion/Discontinuation reports that ask the questions be limited to those the Code directs us to ask, and questions that need to be asked for reasons of animal welfare.
- We need to consider that some processes might be readily accomplished by ethics administrators outside a meeting rather than requiring a formal amendment/modification.
- The ready providers of information that facilitate the completion of a high standard application.

Ease of animal ethics application.

The application process can be facilitated by the inclusion only of sections that are required to be addressed by the Code or State and Territory legislation. There are advantages for ethics administration in the introduction of on-line application processes in so much as the collection of data for reporting to institutional and Governmental authorities is considerably facilitated by the data coordination elements inherent in an on-line system. However such systems need to be designed with ease of application in mind. The translation to an on-line system format can impose added difficulties to the applicant unless ethics administrators are able to closely liaise with programmers in system design. The ability of ethics administrators to assist applicants in the early stages of the introduction of on-line systems will considerably facilitate the process.

Incorporation of practices that minimise the turn around time of AEC applications

Turn around time from submission of an animal ethics application to

consideration by the AEC and eventually, approval is often critical. The Code, 2.2.21, stresses that decisions must be made as promptly as possible. Science is very much a competitive endeavour and a system that minimises turn around time, while at the same time ensuring compliance with the Code and State and Territory legislation offers advantages to that institutes researchers. Rapid turn around time also reduces the temptation of researchers to commence work before AEC approval.

The ideal situation is where researchers submit an application and all processes relative to that application are completed within 5 working days of the next AEC meeting. Efficient administrative processes facilitate this but procedure at the meeting may expedite the relevant processes. One way of doing this is for AEC members to read each proposal, and ask questions that reflect their concerns in advance of the meeting. The AEC secretary then directs all questions to applicants. Questions are answered before the meeting. Relative to a particular proposal full discussion can still occur, but it occurs with most major concerns already addressed. Another system used by some institutions to good effect is to have specific members of the Committee read a number of proposals and present these to the AEC, outlining key points in the proposal. A scientific sub-committee plays a strong role in some institutions, in so much as they review scientific aspects of the proposal and are able to present these to the AEC in a readily interpreted format.

The inclusion of practices that allow a quick decision on minor amendments

The Code allows for approval of minor amendments outside a meeting. The definition of what constitutes a minor amendment needs to be agreed to by the AEC, but such amendments may be approved by an executive sub-committee (Code 2.211) or by email circulation to the AEC. Decisions on minor amendments outside normal meetings have potential to assist research progress, again at the same time reducing the chances of non-compliance.

Milestone form completion

Within the terms of State and Territory legislation, we need to consider the design of Annual Review and Completion/Discontinuation reports that ask the questions which are limited to those the Code directs us to ask and questions that need to be asked for reasons of animal welfare.

The need to consider that some processes might be readily accomplished by ethics administrators outside a meeting

AEC's may delegate authority to approve some minor changes such as the addition of co-workers to a proposal so this can occur outside an AEC meeting with the proviso that should questions arise concerning qualification or experience, these then be referred to the next AEC meeting. This proviso has less potential to facilitate the research process than other recommendations, but it will reduce AEC meeting workload.

The providers of information that facilitate the completion of a high standard application

Ideally AEC administrative staff with their knowledge of process are in a position to advise investigators about

matters that relate to proposal content and therefore are able to contribute towards a higher standard of application. Much can also be achieved by AEC members and administrators in the formal education of investigators and technicians and this is detailed below.

The potential of AEC's in enabling science extends beyond meetings and approvals….

Within the terms of the Code (Section 2.1), Animal Ethics Committees have quite considerable powers. The enabling of science by the AEC extends beyond the ethics application process and there are areas where the AEC has a considerable capacity to facilitate the broader aspects of research including:

- Facility upgrading.
- Education to enhance the use of best practice.
- Defence of research in the face of public challenge.
- The enabling of wildlife research through registration with State and Territory authorities and assisting with the necessary relevant reporting.

Facility Upgrading

There may be a tendency for senior officers of an institution to regard expenditure on animal houses as being secondary to other demands on institutional purse strings. The AEC are in a critical position to change that line of thinking. The Code 2.2.1 asks institutions to seek comment from AECs on all matters that may affect the welfare of animals used for scientific purposes, including the building or modification of animal facilities. In addition to being advocates for building upgrading the AEC has considerable potential in coordinating the expertise of animal care staff and the needs of researchers together with architects and builders to produce a facility that has the capacity to house high standard animal based science. The AEC also potentially has the ability to instigate plans for essential upgrades via their annual report to the institution (Code 2.2.40).

Education to Enhance the Use of Best Practice

The training of investigators and relevant technical staff in animal ethics and related training courses such as animal handling, anaesthetics and analgesics, as well as surgical techniques is very much the prerogative of the AEC. The author's personal experience is that a practical ethics seminar that included the history of how we have arrived at where we are today with animal ethics, the factors that the AEC takes into account when assessing applications, AEC functions, and basic requirements of the Code and legislation, subsequently resulted in a better standard of application. There is much to be said for making such courses and seminars mandatory but that is very much an individual institutional decision.

The Defence of Research in the Face of Public Challenge

From time to time there is potential for animal based research to be criticised by sections of the public and this may escalate to protest activity with attention from the media. The potential for this to happen is greater with research using primates, but cannot be entirely discounted with regard to any animal based research.

Institutions need to respond to activities aimed at animal based research and arguably, the AEC represents the best source of informed comment, at the same time providing a perception of less bias than is the case should the primary investigator be deemed to be the person to respond. The AEC composition including animal welfare nominees and community representatives, its evaluation of the science against the costs in terms of animal welfare and its system of checks and balances all contribute to a process that provides a solid base for the defence of animal based research. So it is often much better if the institutional spokesperson comes from within the AEC.

The Enabling of Wildlife Research in a Number of State Jurisdictions

To enable wildlife research to occur across Australia it is necessary for an institutional AEC that deals with wildlife proposals to be registered in a number of States and Territories. Each of these jurisdictions has processes that an AEC can gain from, but the downside is that each has different reporting requirements and a considerable amount of AEC administrative time can be taken up with this kind of work. Never the less, the registration of an AEC in multiple jurisdictions certainly enables the wildlife scientists to carry out work with a relatively small amount of cross - jurisdiction negotiation on the researcher's part.

Reducing stress in fish using a "non- acceptable" euthanasia method: refinement works with a progressive animal ethics committee

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Fish research and its compliance with animal ethics committees in Australia has evolved differently among the various research institutions. However, in 2004, the release of the 3rd Edition of the *"Australian code of practice for the care and use of animals for scientific purposes"* and the responsibility for compliance led by each individual state has ensured a consistent approach to animal ethics for research across Australia. Furthermore, there is an increasing recognition by scientific journals, such as *Animal Behaviour* and *Journal of Fish Biology* that research must have been done in an ethical manner if it is to be published. Having research methods assessed and accepted by animal ethics committees (AEC's) ensures such ethical standards. As researchers, however, we need to convince members of AEC's to getting the most efficacious and our preferred methods accepted.

In this presentation, we report on a research method that did not initially satisfy an AEC based upon their "understanding" of the Code. Our initial proposal was to use immersion in ice-slurry as a euthanasia method for the warm-water fish, bony bream (*Nematolosa erebi*). We were instructed to instead use a chemical method (benzocaine) as it was a registered product. Following negotiations with the committee we were granted approval to run a pilot study to test the influence of the two methods on our experimental results (testing lipid levels in bony bream) and on the levels of stress placed upon individual fish. The results clearly showed that immersion in benzocaine for euthanasia was indeed more stressful to fish than immersion in ice-slurry. Fish in benzocaine exhibited heightened levels of stressful behaviour and took longer to die than fish in ice-slurry. Following this study the ethics committee accepted ice-slurry euthanasia as a standard operating procedure. We suggest that the NHMRC guidelines which recommend benzocaine need to be updated to reflect that the use of ice in fish euthanasia (and potentially anaesthesia) needs to be re-considered.

Introduction

In Australia all scientific research on fish, other non-human vertebrates and some higher-order invertebrates requires ethical clearance as specified in the *Australian code of practice for the care and use of animals for scientific purposes* (NHMRC, 2004). The approval of research projects and the methods they employ is controlled by animal ethics committees convened according to the requirements specified in this legislation. The requirement for adoption of animal ethics codes varies between countries, although irrespective of where research is conducted, some international journals require adherence to ethical procedures for all papers they publish (e.g., *Animal Behaviour* and *Journal of Fish Biology*). Hence, as animal researchers it is inevitable that we will directly or

indirectly deal with animal ethics committees

Animal ethics committees and researchers

The prime role of AEC's is to ensure we stick with the Australian code of practice (NHMRC 2004). There are positives and negatives outcomes to these interactions. Committees often provide new ways of thinking; for example by relaying information about what or how other researchers have approached similar studies. In many cases such advice can reduce costs and improve our scientific techniques. Committees invariably ask researchers to justify their experimental design such as by questioning the numbers of replicates used or whether our aims are justified. Such questions should easily be answered by a researcher with a sound research design. However, if this process results in modifications to the original design then it is likely that the project outcomes will be improved. From a researchers' point of view there can also be negative interactions with committees. Not all ethics committees function the same way and hence, conflict may arise where committees appear rigid or inadequately experienced in particular areas of research.

Case Study

In this paper we discuss a case study where conflict arose between researchers and their AEC and the process of negotiating a desirable result for both parties.

This was the first time we had presented any research to this particular committee. Our broad research area was related to natural resource management, while the committee had no experience in this field. Their expertise lay in agricultural research which typically involves small numbers of animals and established protocols. Furthermore research governed by this committee is generally undertaken on live animals, hence, humane killing is rarely an issue.

Many fish research projects require data to be collected from representative specimens that are captured and killed, such as trophic studies (e.g. Hesslein *et al.*, 1991; Sternberg *et al.*, 2008). In the majority of cases, however, these types of data can only be collected from dead fish. In some cases alternative approaches using non-lethal methods can be employed, for example using fin-clips instead of fish muscle tissue for genetic analyses (e.g. Wasko *et al.*, 2003). From an ethical viewpoint, the killing of fish to gather data, infers that the need for the data must be both reasonable, well justified and collected using methods which are as humane as possible. These include appropriate handling, water quality, holding densities and euthanasia (or killing) method (Huntingford *et al.*, 2006). Hence, the method of humane killing can often be a sticking point for ethics committees to deal with. Note that throughout this paper we use the term "humane killing" rather than euthanasia as we are not killing with the purpose of alleviating pain and distress.

The initial application we presented to our ethics committee involved using fish proximate body condition (direct measure of fish health, e.g. body lipid content) across a number of catchments and river reaches to inform on the relative success of a water resource plan. To achieve this aim we needed to sample fish across a range of sites and humanely kill a subsample of fish at each site to measure body lipids and water content as a direct measure

of fish condition /health. For precision we needed the tissues to be free of any oily residues that could lead to spurious results. Hence, we wanted to humanely kill our fish by immersion in ice-slurry, followed by freezing for sample preservation.

The committee assessed our proposal and judged that the research was sound but they did not accept our method of humane killing. Instead they instructed us to humanely kill our fish using benzocaine overdose. They based this decision by referring to the NHMRC Guidleines: "The assessment and alleviation of pain and distress in research animal" (NHMRC 2008). For the humane killing of fish the guidelines state that hypothermia and freezing are not acceptable methods as they are inhumane.

This lead to the dilemma of how to deal with problems when an ethics committee disagrees with protocols that you as a researcher believe are sound and humane. We were uncomfortable with using chemical anaesthetics based on our previous experience of using them and observing adverse behavioural reactions by different fish species in a range of environments. The use of lipid-soluble anaesthetics are known to accumulate in fish tissue (Hayton *et al.*, 1996; Stehly *et al.*, 2000), and as benzocaine is lipid-soluble, we were concerned that its use could influence our results by effecting tissue lipids. We had also used ice slurry successfully on a number of different species and across a range of environments and were confident that on the species we were using (bony bream, *Nematolosa erebi*) that it certainly was a humane method. Our reticence to use benzocaine was, however, based largely on previous experience rather than having tested scientific hypotheses. Thus it was difficult to convince a committee that is armed with a legitimate set of guidelines to follow. But given our concerns the committee invited us to present our arguments in person and then gave us the scope to prove that our methods were sound and ethical. The committee asked us to run a pilot study testing the relative merits or benefits of ice-slurry verses benzocaine for killing fish. We tested both methods for effects on behavioural stress response and on body lipid and water content in bony bream.

Background on the two methods

An overdose of benzocaine kills fish by depressing their central nervous system activity and because it is considered an effective and humane mode of euthanasia it is recommended by many guidelines (European Commission, DGXI - Working Party, 1996; Barker *et al.*, 2002; Reilly *et al.*, 2001; European Commission, DGXI - Working Party, 1997) Lipid soluble anaesthetics such as benzocaine enter nerve-cell membranes and inhibit nerve conduction by physically blocking sodium channels (Cakir & Strauch, 2005). Benzocaine powder is dissolved in alcohol or acetone to make it water soluble and bioactive. In this form it readily enters fish by crossing biological membranes, chiefly via the gills (Hunn & Allen, 1974).

The traditional method of immersing fish in an ice-slurry to achieve death by hypothermia relies on lowering the core body temperature resulting in anaesthesia and subsequent death. This has been approved by some fish euthanasia guidelines (Barker *et al.*, 2002), but rejected by others (e.g. European Commission, DGXI - Working Party, 1996; Barker *et al.*, 2002; Reilly *et al.*, 2001; European

Commission, DGXI - Working Party, 1997). Rejections of the method have been based firstly, on evidence that the method potentially causes an initial period of discomfort due to ice crystal formation both on the skin and within the body (Reilly *et al.*, 2001), and secondly on a potentially long treatment time before achieving death (Van De Vis *et al.*, 2003) because of the poor thermal conductivity of tissues surrounding the brain (European Commission, DGXI - Working Party, 1996).

However, it should be noted that studies of the use of ice-slurry for fish euthanasia have often been undertaken on large cold-water species from the northern Hemisphere, such as turbot (*Psetta maxima*), gilt-headed sea bream (*Sparus auratus*) and Atlantic salmon (*Salmo salar*) (Van De Vis *et al.*, 2003; Morzel *et al.*, 2003). Current Australian guidelines are based on these northern hemisphere studies (Reilly *et al.*, 2001), but it is not clear if such assumptions are universally valid, particularly for small to medium bodied, warm-water fish.

Brief Methods

Individual fish (41 bony bream in total) were randomly assigned to one of two treatments: ice slurry or benzocaine. The sequence of treatments was also randomized. Fish were videoed and observed to record behavioural stress responses and time to equilibrium loss and death. All test fish were subsequently analysed for body lipid and water content to quantify the effect of killing method on proximate body condition. The full description of methods and results for this pilot study can be found in Blessing *et al.* (in press).

Comparison of benzocaine and ice-slurry as humane killing methods

In contrast to our expectations benzocaine had no effect on either lipid or water content of bony bream. This could probably be best explained that fish were not held for significant periods as would be the case in the food industry where benzocaine is used as an anaesthetic (long exposure) rather than for killing (short exposure).

As a humane killing method, however, benzocaine was inferior to ice slurry on a number of counts. In the benzocaine treatment all fish exhibited behavioural stress responses. Of these 78% exhibited rapid swimming behaviour with their head orientated downwards coupled with rapid opercular movements. The other 22% had similar stressful swimming behaviour except their heads were orientated upwards and were observed to be gasping at the water surface. All fish in the ice-slurry treatment exhibited the immediate rapid swimming response which persisted briefly (seconds) followed by slowed motion.

Along with the stressful behaviour, fish in benzocaine also took significantly longer to reach the point where they lost equilibrium and time to death. It was also noted that in the benzocaine treatment the range of times to reach equilibrium loss were greater than ice-slurry (0.12 – 26.0 mins for benzocaine and 0.03 - 0.35 mins for ice-slurry). There was similarly a larger range in time to death in benzocaine compared with ice slurry (0.22 – 29.0 mins for benzocaine and 0.06 - 1.5 mins for ice-slurry). The other problem noted while there was a strong positive association between fish standard length and both time to equilibrium loss and death in the ice-slurry there was no such relationship for benzocaine. Hence, it is not possible to predict which fish are

likely to endure longer periods of stress in the benzocaine.

The combination of behavioural stress exhibited by all fish and the particularly long times to reach equilibrium loss and death certainly demonstrate that benzocaine is not an appropriate method for for humanely killing bony bream. The short times coupled with the low behavioural stress response in the ice-slurry demonstrate that this method is indeed appropriate for the humane killing of bony bream. We were invited to present our results to the following ethics committee meeting where they subsequently accepted our method of humane killing with ice-slurry immersion and agreed to accept it as a standard protocol.

Implications of this research

Animal ethics committees can only judge on the knowledge available to them. In this case based on NHMRC guidelines they were correct to disallow the use of ice for humanely killing fish. However, suggesting we use benzocaine (as it is a registered product and that chemical anaesthetics are appropriate methods) demonstrates the folly of a "one size fits all policy for euthanasia, humane killing or anaesthesia of fish. While we are not discounting the benefits of using chemicals for fish euthanasia or humane killing or as ananaesthetic for some fish, we also have to be aware of the limitations of using some chemicals. Dosage rates are likely to be species specific and are likely to vary within species depending upon age, fish size, health and in relation to the physical and chemical backgrounds the fish inhabit.

We suggest as the next edition of the code is written there should be guidelines to give ethics committees the scope to enable researchers to use methods that are appropriate to their study species or be given the opportunity to explore the validity of different killing methods. This is especially important for small or specialist committees that may lack the experience across all members that may be found in either larger more generalist committees. Furthermore, there should be recognition within the code that we truly lack knowledge in the area of fish anaesthesia and humane killing. There is a far greater research base on anaesthetics and euthanasia methods in mammals and we certainly cannot transfer the same ideas to fish especially given the vast array of species, habitats and hence, environmental backgrounds they occupy.

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Pain Recognition & Relief during the Dehorning of Cattle

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Dehorning of cattle is used as horns pose a significant risk to animal handlers and can cause bruising/injuries to cattle, particularly in yards and during transport. The northern Australian beef cattle herd (cattle in QLD, NT and northern sections of WA) is said to contain greater than 80% *Bos indicus* or *Bos indicus* cross genotypes (Riley *et. al.*, 2001). With up to 91% of the *Bos indicus* population being horned, a large number of calves will be dehorned each year (Prayaga 2005 & Prayaga 2001). Due to the scale of the northern beef cattle production system, it is common for cattle to only be yarded once or twice a year; hence calves are usually dehorned from 3.5 to 10 months of age. In Australia, dehorning under 6 months of age, or at first muster is permitted without using anaesthetics or analgesics. The most common method of dehorning is by amputation, using a dehorning knife, cups or scoops. Currently there is no alternative to dehorning. Dehorning could be practiced using anaesthesia/analgesia if practical and effective procedures were available to the industry. Although there is published research on dehorning and pain alleviation, most work has been done with *Bos taurus* (dairy) calves of a few weeks or months of age. It is unknown whether the responses of older, *Bos indicus* animals are different from those of younger, dairy calves. A review by Stafford & Mellor (2005) of published dehorning and disbudding studies concluded that a combination of a local anaesthetic and a non-steroidal anti-inflammatory drug (NSAID) produced the greatest pain relief in young, dairy calves.

Pain is a subjective experience and consequently, its assessment is problematic. Researchers recognise that identification of pain is best achieved by recording a combination of behavioural, physiological and production responses. Previous dehorning studies have recorded behaviours such as head shaking, locomotion, walking backwards and head rubbing. The most common parameter for assessing physiological responses is blood cortisol (Mellor, *et. al.*, 2000). Other physiological responses used include heart rate, packed cell volume (PCV), serum haptoglobin, and total protein. Production response measures include feed intake and liveweight change.

This project combines a series of studies on *Bos indicus* and *Bos indicus* crossbred animals 2 to 9 months of age in animal house and field investigations. The first animal house experiment investigated pain alleviation techniques including the recommended combination of local anaesthetic and NSAID. A major drawback to this technique is that the local anaesthetic must be administered between 10 and 20 minutes before dehorning. This means cattle have to be handled twice, which not only increases the time of the procedure but potentially increases the stress on the animals. We therefore examined an NSAID-only treatment, which may be less stressful for the cattle and more likely to be adopted by industry if proven effective. These two treatments were compared to the current industry practice of dehorning with no anaesthesia/analgesia, and a control group of sham dehorned animals. The second animal house study investigated four treatments: sham dehorning; dehorning only; application of a topical anaesthetic (as trialled for sheep during mulesing) immediately post-dehorning; and wound cautery immediately post-dehorning. The

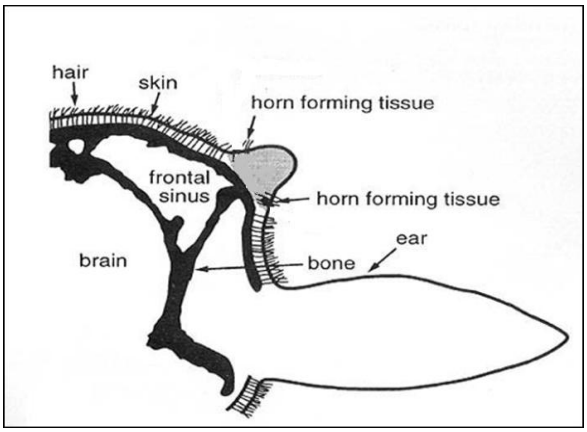
field trials have compared different dehorning tools and examined the effects on calf welfare of returning dehorned calves to their mothers compared with weaning them. In all of these experiments, behaviour has been recorded on the day of dehorning and at regular intervals post-dehorning. Physiological responses have been determined through measures of plasma cortisol, haptoglobin, fibrinogen, PCV and creatine phosphokinase. Wound healing and liveweight changes post dehorning have been monitored.

Horn Removal (dehorning)

Dehorning is a routine management procedure commonly practiced in Australia. Horns are removed because during cattle handling, it reduces the risk of injury to stockpersons and working animals, as well as reducing the space required by cattle at feed and water troughs and during transportation. Currently in Australia, it is common practice for stock owners to dehorn their animals without anaesthetic or analgesia. Although there is published research on dehorning and pain alleviation, the work has been done with *Bos taurus* calves of a few weeks or months of age. It is unknown whether the responses of older, *Bos indicus* animals are different from those of younger, *Bos taurus* calves.

Horn Development

The horns of cattle develop and grow from a specialised area of skin. There is individual variation in horn development; however until a calf is approximately 2 months of age, this area of skin is free-floating over the skull (Anonymous 1974). Over time, the horn bud attaches to the skull bone to form a horn (Newman 2007). Once the horn bud has attached, the horn will grow out from underneath the skin and the resulting horn will become a bony extension of the skull (Anonymous 1974; Newman 2007). As the horn develops, the centre of the horn can hollow out and this cavity becomes an extension of the frontal sinus.



Dehorning Methods and Devices

The most common methods of horn removal are via amputation, cautery, disbudding or chemical application. *The Model Code of Practice for the Welfare of Animals: Cattle* (which from here on, will be referred to as *The Cattle Code*) recommends scoop dehorners, gouging knife or heat cautery as methods for dehorning and also stipulates that whatever method is chosen "must be able to remove all horn-growing tissue in one action with minimal damage to adjacent tissues" (p. 19) (PISC 2005). Concerns have been raised about the danger of caustic substances coming in contact with an animal's eyes and mouth and *The Cattle Code* states that "Cattle must not be dehorned with corrosive chemicals" (p.19) (PISC 2005). In Australia, both amputation and cautery disbudding are common methods of dehorning.

The horn is innervated by the cornual nerve, a branch of the trigeminal nerve

and potentially other nerves (including the infratrochlear nerves, frontal nerves, and possibly branches of spinal nerves C1 and C2) (American Veterinary Medical Association Animal Welfare Division 2007) and as all types of dehorning involve a degree of tissue damage it is highly likely they will induce a pain response (Petrie *et al.* 1996; Schwartzkopf-Genswein *et al.* 2005).

If the horns are removed after skull attachment occurs, it is probable that the frontal sinus will be opened and exposed. Estimates for the time taken for the exposed cavity to heal-over after dehorning are between 2 and 6 weeks dependent on the age of the animal. Open sinuses subject the animals to a greater chance of infection and fly strike post-dehorning (Loxton *et al.* 1982; Newman 2007). The issues of horn attachment and open sinuses highlight the fact that if an animal is to be dehorned, it is preferable to dehorn before the horn attaches to the skull (Loxton *et al.* 1982). Under the extensive rangeland conditions associated with cattle rearing in Northern Australia in particular, this is not always easy to achieve. *The Cattle Code* indicates that calves in Australia should be dehorned "as young as possible, preferably prior to weaning"… "at the first muster and preferably under 6 months of age"(p.19) (PISC 2005).

The Australian Beef Cattle Herd

It is estimated that currently 52% of the Australian beef cattle herd is horned (Prayaga 2005). In the northern Australian beef industry (incorporating Queensland, the Northern Territory and northern Western Australia), the trend has been to increase the *Bos indicus* content of the herd due to their suitability to the climate and their parasite resistance (Riley *et al.* 2001; Bortolussi *et al.* 2005a). Breeds with a predominant *Bos indicus* content are more likely to be horned, for example, the Australian Brahman and Santa Gertrudis herds are estimated to contain approximately 89% and 91% horned animals respectively (Bortolussi *et al.* 2005a; Prayaga 2005). As a result, in northern Australia a large number of horned calves will be dehorned each year (Prayaga 2005; 2007).

The rangeland production systems present in northern Australia mean large numbers of cattle are dispersed over great areas. As a consequence, a special muster for dehorning is uneconomical and thus, dehorning is often performed in conjunction with tagging, branding and castration (in males) (Anonymous 1974; Ernst 1977). Cattle are often only brought into the yards once or twice a year and hence, dehorning is carried out on calves between 3.5 to 10 months of age (Bortolussi *et al.* 2005b; PISC 2005; Primary Industries Standing Committee 2005). This has welfare implications as older calves are likely to be harder to handle and thus require more restraint (Newman 2007) and as their horns have had more time to grow, they are bigger and hence, the resulting wound size is larger. This means that dehorning will be more stressful and painful and there is a greater potential for blood loss and infection (McMeekan *et al.* 1997; Petherick 2005).

Assessment of Stress and Pain

Pain is a subjective experience which presents difficulties for its assessment, although it is recognised by researchers that its identification is best achieved through recording a combination of

behavioural, physiological and production responses (Laden *et al.* 1985; Gibson *et al.* 2007; Stilwell *et al.* 2008). Numerous studies have indicated that dehorning causes significant stress to the animals, as judged by an increase in concentrations of hormones, enzymes, pain-related behaviour and in some cases, negative effects on production responses such as weight gain [see Table 1]. In addition to the process of dehorning, animals are also subjected to the experiences of restraint and handling which can in themselves be stressful. The parameter most commonly advocated and used for assessing physiological responses is the blood concentration of cortisol (Mellor *et al.* 2000).

Many studies have show significant increases in plasma cortisol in response to dehorning. Sylvester *et al.* (1998b) compared the reactions of calves challenged with adrenocorticotropic hormone (ACTH) which stimulates the maximal cortisol response post-injection, with the response of dehorned calves. The responses of the ACTH challenge and dehorned calves were similar, suggesting a high degree of stress and pain experienced by the dehorned animals (Sylvester *et al.* 1998b).

Responses to Dehorning

Amputation Dehorning

Horn amputation is conducted with single or double bladed instruments such as the dehorning knife, scoop dehorners or cup shears. With larger horns, extensive bleeding can occur with amputation dehorning, although it generally ceases without treatment (Anonymous 1974). Studies have indicated that the cortisol response to amputation dehorning is severe and without local anaesthesia or analgesia an elevated response can last for up to 9 hours post-dehorning. The pain and stress experienced as a result of dehorning is supported by an increase in pain-related behaviours and a decrease in 'normal' behaviours in dehorned calves (McMeekan *et al.* 1997; Stafford and Mellor 2005).

Comparisons of amputation dehorning devices and scoop dehorning depths have been conducted, concluding there were no significant differences between the cortisol responses and by implication, the pain and stress experienced by 5 – 6 month old calves (McMeekan *et al.* 1997; Sylvester *et al.* 1998b). A common method of amputation dehorning that has not currently been investigated is the dehorning knife, an Australian invention, which is in common use throughout northern Australia.

Cautery Dehorning

Cautery dehorning involves cauterising the skin and growth tissue by a hot iron (heated via electricity, gas ring, or heating in a fire). The corium cells are destroyed in this process preventing further horn growth. This method has been promoted as a 'bloodless' alternative to horn amputation and as there is no open wound infection is less likely to occur. Petrie *et al.* (1996) proposed that nociceptors are destroyed during the cautery process thus creating a loss of sensation to the affected area. Pain is experienced by calves dehorned by cautery, although the duration may be shorter (approximately 6 hours) than that experienced following amputation dehorning (Milligan *et al.* 2004; Stafford and Mellor 2005).

Between the processing of each animal, the cautery iron must be reheated. This takes extra time and in a sizeable herd, may slow the dehorning process considerably.

Parameter	Studies Reviewed Using this Method
Adrenocorticotropic hormone (ACTH)	(Sylvester *et al.* 1998b; Graf and Senn 1999; Stewart *et al.* 2008)
Alanine-aminotransferase (ALT)	(Lepkova *et al.* 2007)
Plasma Albumin	(Laden *et al.* 1985)
α1-acid glycoprotein	(Doherty *et al.* 2007)
Aspartate-aminotransferase (AST)	(Lepkova *et al.* 2007)
β-endorphin	(Cooper *et al.* 1995)
Catecholamine	(Mellor *et al.* 2002)
Integrated Cortisol Response	(Petrie *et al.* 1996; McMeekan *et al.* 1997; 1998a; Sylvester *et al.* 1998a; Sylvester *et al.* 1998b; Sutherland *et al.* 2002a; Stafford *et al.* 2003)
Plasma Cortisol	(Johnston and Buckland 1976; Carter *et al.* 1983; Laden *et al.* 1985; Boandl *et al.* 1989; Wohlt *et al.* 1994; Cooper *et al.* 1995; Morisse *et al.* 1995; Petrie *et al.* 1996; McMeekan *et al.* 1997; 1998a; McMeekan *et al.* 1998b; Sylvester *et al.* 1998a; Sylvester *et al.* 1998b; Graf and Senn 1999; Grondahl-Nielsen *et al.* 1999; Mellor *et al.* 2002; Sutherland *et al.* 2002a; b; Stafford *et al.* 2003; Milligan *et al.* 2004; Stilwell *et al.* 2004a; Stilwell *et al.* 2004b; Schwartzkopf-Genswein *et al.* 2005; Doherty *et al.* 2007; Heinrich *et al.* 2007; Lepkova *et al.* 2007; Stewart *et al.* 2008; Stilwell 2008; Stilwell *et al.* 2008; Heinrich *et al.* 2009)
Salivery Cortisol	(Taschke *et al.* 1993)
Creatinkinase (CK)	(Lepkova *et al.* 2007),
Eye Temperature	(Stewart *et al.* 2009)
Plasma Glucose	(Laden *et al.* 1985)
Haemoglobin	(Laden *et al.* 1985; Doherty *et al.* 2007)
Haemorrhage	(Carter *et al.* 1983)
Heart Rate	(Grondahl-Nielsen *et al.* 1999; Millman *et al.* 2005; Schwartzkopf-Genswein *et al.* 2005; Gibson *et al.* 2007; Stewart *et al.* 2008; Heinrich *et al.* 2009; Stewart *et al.* 2009)
Heart Rate Variability	(Stewart *et al.* 2008; Stewart *et al.* 2009)
Infrared Thermography (IRT)	(Stewart *et al.* 2008)
Fibrinogen	(Doherty *et al.* 2007)
Lactate	(Lepkova *et al.* 2007)
Lactate-dehydrogenase (LDH)	(Lepkova *et al.* 2007)
Neutrophil: lymphocyte ratio	(Doherty *et al.* 2007)
Packed Cell Volume (PCV)	(Laden *et al.* 1985; Boandl *et al.* 1989; Wohlt *et al.* 1994)
Progesterone	(Cooper *et al.* 1995)
Red Blood Cell Count	(Doherty *et al.* 2007)
Respiratory Rate	(Millman *et al.* 2005; Heinrich *et al.* 2009)
Total protein	(Doherty *et al.* 2007; Lepkova *et al.* 2007)
Vasopressin	(Graf and Senn 1999)
White Blood Cell Count (total and differential)	(Doherty *et al.* 2007)
Behaviour	(Taschke *et al.* 1993; Morisse *et al.* 1995; Graf and Senn 1999; Grondahl-Nielsen *et al.* 1999; McMeekan *et al.* 1999; Faulkner and Weary 2000; Stafford *et al.* 2000; Milligan *et al.* 2004; Stilwell *et al.* 2004a; Sylvester *et al.* 2004; Millman *et al.* 2005; Schwartzkopf-Genswein *et al.* 2005; Vickers *et al.* 2005; Doherty *et al.* 2007; Heinrich *et al.* 2007; Lepkova *et al.* 2007; Kahrer *et al.* 2008; Stewart *et al.* 2008; Stilwell 2008)
Body weight	(Loxton *et al.* 1982; Hand and Goonewardene 1989)
Feed Intake	(Grondahl-Nielsen *et al.* 1999)
Size of horn post-dehorning at 170 days, 18 and 30 months	(Bengtsson *et al.* 1996)
Weight Gain	(Winks *et al.* 1977; Hand and Goonewardene 1989; Goonewardene and Hand 1991; Grondahl-Nielsen *et al.* 1999; Faulkner and Weary 2000)

Table 1: Review of Parameters Recorded in Published Dehorning Studies

Concerns have also been raised about the efficacy of cautery dehorning in older calves, particularly after horn buds have attached to the skull. As a result, cautery disbudding has not been adopted readily by the northern Australian beef industry (Anonymous 1974; Newman 2007).

Wound Cautery

Cauterising the amputation wound (wound cautery) is also an option when dehorning calves. When horns are too large for cautery dehorning and amputation is the only option, wound cautery can be used to stem blood flow. This process involves placing a hot iron onto the amputation wound to cauterise the blood vessels. Sutherland *et al.* (2002b) demonstrated that wound cautery virtually eliminated blood loss from scoop dehorning wounds. However, concerns were raised about the length of time for healing to occur as cauterising the wounds increased the presence of necrotic tissue (Sutherland *et al.* 2002b).

Methods for Reducing Stress and Pain

Breeding

One way in which dehorning can be eliminated is to breed polled cattle. Studies into *Bos indicus* genotypes have indicated that the inheritance of horns is not a simple Mendelian trait and therefore polled parents do not always result in polled offspring. It is also unlikely that the northern Australian beef industry could achieve complete change over to a polled herd within one – two decades, as there is currently an insufficient number of polled bulls available in the northern beef herds (Petherick 2005; Prayaga 2007). Until such time as breeding of polled cattle is achieved it is important to consider animal welfare issues and how the pain and stress associated with dehorning may be reduced or eliminated. Methods for the management of pain and stress must be shown to be effective and adoption will be greater and faster if they are also practical and cost-effective.

Pharmaceutical Pain Alleviation

As previously mentioned, there is published research on dehorning and pain alleviation, however, the work has been mostly done with *Bos taurus* calves of a few weeks or months of age. The work is summarised below.

Anaesthesia: General anaesthetic agents have been used to sedate animals undergoing surgical procedures. Sedation has been shown to reduce the escape behaviours associated with dehorning and reduces the need for physical restraint during the procedure (Bengtsson *et al.* 1996; Grondahl-Nielsen *et al.* 1999; Faulkner and Weary 2000; Vickers *et al.* 2005). It has been demonstrated however, that general anaesthetic agents did not eliminate the cortisol response, with Stafford *et al.* (2003) concluding that sedation is inferior to local anaesthetic at alleviating the pain of dehorning (Stafford *et al.* 2003). The complete anaesthesia (general anaesthesia) of cattle is also difficult to achieve, the animals often become recumbent and are difficult to manage and this can contribute to significant health complications (Stafford *et al.* 2003; Lepkova *et al.* 2007).

Studies of both amputation and cautery dehorning have compared control animals without anaesthesia with animals given anaesthetic injections around the horn site. Local anaesthesia resulted in a reduction or complete elimination of the plasma cortisol response and pain-related behaviours (such as tail wagging, head movements and ear flicking) seen during the

dehorning process (Petrie *et al.* 1996; McMeekan *et al.* 1998b; Sylvester *et al.* 1998a; Stafford *et al.* 2000; Gibson *et al.* 2007). More effective anaesthesia is thought to be achieved with a multiple site, or 'ring' cornual block, rather than a single site injection, however no direct comparison has been published (Morisse *et al.* 1995; Stafford *et al.* 2000; Heinrich *et al.* 2009).

A delayed plasma cortisol increase is often evident in treated animals around the time of the local anaesthesia wearing off (Petrie *et al.* 1996; McMeekan *et al.* 1998a; McMeekan *et al.* 1998b; Sylvester *et al.* 1998a; Graf and Senn 1999; Grondahl-Nielsen *et al.* 1999; Doherty *et al.* 2007). The magnitude of this increase varies between studies, however the area under the response curve, or the integrated cortisol response in these studies indicates that overall, there is often no difference to those dehorned without anaesthesia (Boandl *et al.* 1989; McMeekan *et al.* 1998a; Graf and Senn 1999; Faulkner and Weary 2000; Sutherland *et al.* 2002a; Milligan *et al.* 2004; Doherty *et al.* 2007; Stilwell *et al.* 2008). Corresponding increases in pain-related behaviours have also been reported around the time anaesthetic action is wearing off (Sylvester *et al.* 1998a; Stafford *et al.* 2000). This indicates that the pain relief of local anaesthesia is short-lived (Petrie *et al.* 1996; Sylvester *et al.* 1998a).

General and local anaesthesia of calves can be difficult to achieve and maintain in the field due to issues such as unknown liveweight and therefore insufficient dosage rates, or incorrect placement of local anaesthetic. In addition, there are possible differences in the innervation and shape of the horn bud between individual animals that may influence anaesthetic efficacy (Stewart *et al.* 2008). Anaesthetic use has not been readily taken up in the northern Australian beef industry and this is probably because anaesthetics require a period for them to take effect, resulting in longer restraint, or the need to handle the cattle twice. In addition, anaesthetic use is restricted to registered veterinarians and would require veterinary administration and/or supervision during the dehorning process. Anaesthetic use is not a practical approach when dealing with large numbers of calves and requires more labour as well as longer retention times in the stockyards; in addition to the increased costs associated with purchasing and administering the anaesthetics (Faulkner and Weary 2000; Petherick 2005).

Trials of wound cautery on amputation wounds were found to greatly reduce the acute cortisol response exhibited when the local anaesthesia wore off (Sylvester *et al.* 1998a; Sutherland *et al.* 2002b). However, without the presence of a local anaesthetic, wound cautery has been reported to increase plasma cortisol to levels only slightly lower than dehorning without anaesthetic (Sylvester *et al.* 1998a).

Non-Steroidal Anti-inflammatory Drugs (NSAIDs) Non-steroidal anti-inflammatory drugs (NSAIDs) are a mechanism of pain control commonly used in companion animal medicine. The registration of a variety of NSAIDs for pain relief in cattle is increasing with classes such as Meloxicam, Flunixin meglumine, Tolfenamic acid and Ketoprofen available in Australia. NSAIDs act by inhibiting the inflammatory response (Barrett 2004). NSAIDs are able to be used in food animals because they have a short half-life and clear the body

quickly, however the NSAID has an affinity for inflamed tissue and can persist at higher concentrations in the tissue for longer periods of time (Faulkner and Weary 2000; Milligan *et al.* 2004). NSAIDs do not offer relief from the acute pain response (Milligan *et al.* 2004) as seen immediately after dehorning, however they do offer relief from more chronic pain; for example, the pain associated with inflammation exhibited in the hours, and days post-surgery.

Local Anaesthetic/NSAID Combination Experiments have been conducted combining the action of local anaesthetics and NSAIDs (McMeekan *et al.* 1998b; McMeekan *et al.* 1999; Faulkner and Weary 2000; Sutherland *et al.* 2002a; Stafford *et al.* 2003; Milligan *et al.* 2004; Stilwell *et al.* 2004b; Gibson *et al.* 2007; Heinrich *et al.* 2007; Stilwell 2008; Heinrich *et al.* 2009; Stewart *et al.* 2009). It has been determined that the plasma cortisol peaks previously reported post-local anaesthesia were reduced, and in some cases, eliminated (Faulkner and Weary 2000; Milligan *et al.* 2004; Heinrich *et al.* 2007). A review by Stafford and Mellor (2005) of published dehorning and disbudding studies concluded that a combination of a local anaesthetic and an NSAID produced the greatest pain relief in young, dairy calves.

Research Gaps

Genotype

The review by Stafford and Mellor (2005) comprehensively covers the numerous studies completed on the dehorning of calves. It was evident from this review that there is a lack of information available on dehorning *Bos indicus* genotypes. Differences have been demonstrated between *Bos indicus* and *Bos taurus* animals in respect to characteristics such as birth weight, ease of handling, flight distance and meat tenderness (Kabuga and Appiah 1992; Frisch and O'Neill 1998; Gazzola *et al.* 1999), so it is therefore not unreasonable to hypothesise that differences may exist between *Bos indicus* and *Bos taurus* in their response to the dehorning procedure. *Bos indicus* breeds have also been shown to exhibit greater behavioural and physiological reactions to handling and restraint than *Bos taurus* breeds (Boissy *et al.* 2005). As handling and restraint occur in conjunction with the dehorning process, it is important that the response of *Bos indicus* calves to dehorning is investigated. In addition, it has been anecdotally recorded that Zebu or Zebu-cross cattle tend to have thicker horn bases (Winks *et al.* 1977), making horns more difficult to remove and that these animals are more prone to blood loss than British breeds when dehorned (Anonymous 1974; Winks *et al.* 1977).

Age

In addition to a deficit of work on *Bos indicus* cattle, a majority of the published investigations have been conducted on calves four months of age or less. Lepkova *et al.* (2007) found a significant increase in plasma cortisol in older animals with local anaesthetic cornual blocks, with and without sedation. This suggests that age may alter responses to various treatments (Lepkova *et al.* 2007). It important that investigations are conducted into the response of animals that are of an age relevant to the northern Australian beef cattle industry (in particular between 3.5 and 10 months of age).

Management Practices

As mentioned previously, the size and

distribution of herds can mean that calves are dehorned and weaned at the same time. It would be of value to the northern Australian beef cattle industry to determine if the time of weaning affects the welfare and productivity of dehorned calves.

Practicality

To improve the welfare of calves dehorned in the northern Australian beef industry, it is important that practical solutions are offered to producers. For example, in *Bos taurus* calves a combination of local anaesthesia and NSAIDs has been demonstrated to be the most effective pain alleviation solution. However, the costs associated with the administration of two products, combined with the double handling of stock to allow time for effective anaesthesia would probably result in a low adoption rate by producers. Stafford and Mellor (2005) concluded that pain alleviation methods adopted need to ensure safety of people and animals and that cost and acceptability of the method must be taken into consideration.

Current Studies

This project combines a series of research studies on *Bos indicus* and *Bos indicus* crossbred animals 2 to 9 months of age in animal house and field investigations. The first animal house experiment investigated pain alleviation techniques including the recommended combination of local anaesthetic and NSAID. The main drawback to this method is that the animals have to be restrained and the local anaesthetic injected (around the horn-base) 10 – 20 minutes prior to dehorning. Therefore, a potentially more 'practical' alternative of an intravenous injection of a NSAID at the time of dehorning was trialled, as although unlikely to provide immediate pain relief, it had the potential to reduce pain later. These treatments were compared with the current industry practice of dehorning without pain alleviation and animals that underwent sham-dehorning (treated the same as the other animals, but the horns were not removed). During dehorning the Local Anaesthetic + NSAID treatment weaners vocalised and struggled less than the other dehorning treatments, indicating effective anaesthesia. Liveweight losses over an 8-week period and physiological responses up to 6 weeks post-dehorning however indicated that the stress and pain experienced by these animals were not reduced as expected. These results therefore suggest that the older, *Bos indicus* animals may react to the pain relief techniques differently to young, dairy calves. Further investigations are required to better understand the responses of *Bos indicus* weaners to handling and administration of a local anaesthetic.

A second experiment has investigated the effects on welfare of administration of a topical anaesthetic (which has been used when mulesing sheep) post-dehorning and cautery of the wound post-dehorning. A field trial at a research station near Rockhampton, Queensland, has investigated the welfare outcomes of dehorning using a dehorning knife, scoop dehorners or hot-iron dehorners in calves aged 2 to 6 months. A second field trial compared the timing of dehorning in the management cycle, with a comparison made between dehorning weaned calves and dehorned calves returned to their mothers. The data from these three trials are currently being analysed.

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AEC military manoeuvres on the field of battle- an alternative model of the best and worst of collateral damage control

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No-man's land is the gap between central AEC command and the scientist in the trenches. This paper explores some key manoeuvres performed across this territory by the AEC in reaching strategic objectives.

Lessons from the military can usefully be applied to the institutional AEC machine. There are numerous parallels that can be drawn including; chain of command, staffing resources, rules of engagement, maintenance of discipline, treatment of prisoners and lines of communication.

A number of common AEC reconnoitre and scouting strategies, along with intelligence gathering, which underpins all well planned campaigns, will also be reviewed. Of course not all engagements are successful and impressive disasters such as the Crimean, Gallipoli or Vietnam campaigns can profitably be used to learn damage control techniques.

Introduction:

In considering Animal Ethics Committee best practice, I would like to offer a different perspective, using a military model. I hope to show some interesting parallels that can be made; however, the model needs to be considered with care, as history confirms some spectacular disasters that have occurred on the field of battle. A particularly gruesome event which occurred on 25th October 1854 was the "The Charge of the Light Brigade", captured in verse by Lord Alfred Tennyson, with the famous lines:

> Their's not to reason why,
> Their's but to do and die:
> Into the valley of Death
> Rode the six hundred.

To send six hundred cavalry armed with sabres against a battery of Russian field artillery, demonstrated absolute military stupidity and a total disregard for human life. Only two hundred survived the charge.

As an institutional veterinarian, one is exposed to "bottom of cliff" misadventure on a regular basis. In my view, the causes for this misadventure include: ignorance, arrogance, stupidity and bad luck. I would doubt that AECs have the same level of exposure. As a result of this exposure, I have become suspicious of many animal users and quite passionate about refinement strategies to improve the welfare of experimental animals.

This paper will cover the concept of animal models, develop some working definitions, explain the military model,

describe some AEC manoeuvres, discuss AEC value-added functions and
intellectual cross-pollination, propose the concept of crash management and offer a challenge to AECs.

The model concept

Animal models are generally specific but have enough common features to be useful, although they have several points of difference. All models need validation and most are subject to improvement and refinement. However, animal models are not well understood by all researchers. For example, a common misconception is often expressed like this: *"We are using outbred Wistar rats <u>because</u> we are modelling a human condition and humans are not inbred".* The logic here is flawed. For on that basis one could argue that rats have long tails while humans don't. Therefore, we should not be using a species with a long tail.

The key issue here is that rats are used to test a hypothesis and to improve the signal/noise ratio, one can use inbred animals, as this strategy removes the genetic variability and the background noise. Hence the quality of the data collected is improved and fewer animals are required. So in this common example the 'heterozygosity argument' is irrelevant. For a comprehensive review of this interesting issue, I commend the book; "The Design of Animal Experiments" by Michael Festing et al, published by Laboratory Animals Ltd 2002.

Why a military model?

I believe it provides a useful alternative perspective and in my experience some situations in universities would be best managed by the military approach. There are some surprisingly useful comparisons that can be made; viz; the rules of engagement, intelligence gathering, reconnoitre and skirmish, communications, chain of command, maintenance of discipline and collateral damage control.

Definitions

The following terms will be familiar to most:

PI = Principal Investigator

AEC= Animal Ethics Committee

AEC protocol = research application

Morbidity = the diseased state

Protocolectomy = surgical removal of a protocol without anaesthesia

Plan of Battle =AEC application protocol

Enemy = ignorance and superstition

Military objectives = the research question being asked

Weapons of Mass Destruction can take several forms such as

- Mouse Hepatitis Virus in an immunological study
- Mycoplasmosis in a lung function study
- Assumptions made without checking or understanding the facts, for example:

  "I <u>assumed</u> that 'SPF' meant the mice didn't have Norovirus and I need Norovirus free mice"

Collateral Damage =compromised animal welfare

Agent Orange = quatricide disinfectants

Coalition forces =Investigators, lab animal technical support staff, AEC and veterinarians

Landmines; illustrated by a Journal Editor's inquiry:

> *"Please confirm that this research work submitted for publication has been approved by the AEC?"*

Top Brass =Animal Ethics Committee

Rules of Engagement

The military equivalent is probably the Geneva Convention. For those working in Australia, this would be the Australian code of Practice for the care and use of animals for scientific purposes. In New Zealand, it would be the Animal Welfare Act 1999 and a series of Codes of Welfare. Most research institutions in Australasia apply similar rules; that all animal use will first be AEC approved, all adverse events reported to the AEC and the veterinarian, humane endpoints will be complied with, personnel will have appropriate training, and site visits will be conducted as needed.

The fundamental rule for all personnel was clearly articulated back in 1805, at the naval battle of Trafalgar by Admiral Lord Nelson who sent a series of flag signals to his fleet with the instructions *"AEC expects that every PI will do their duty".*

Communications

The quality of communications often dictates the outcome of the battle. Regrettably some battle plans (i.e. AEC protocols) appear to be written in code. Fortunately serving on our AECs are the code breakers; these are the "D" or "external" members. One of their duties is to decipher the code. In this respect they function as modern day in-house "Enigma Machines". The Enigma Machine was a device used by the German military and naval forces in the Second World War to transmit secret coded messages. They were very effective, until a device was captured by the Allied Forces from a German submarine and was subsequently used to intercept and translate enemy movements. This deception played a critical role in the Allied success and helped end the war.

Throughout this paper, in the context of AEC practice performance, I will present some examples of what I consider to be good and bad AEC practice.

Example 1:

A student found using animals without appropriate training from their supervisor. The AECs response might be:

> ***Bad practice:*** *"I guess the student misled you, I am sure you intended to train her?"*
>
> ***Good practice:*** *"The student was found to be incompetent. Remedial training must be provided before any further work is conducted"*

Example 2:

An AEC application is full of jargon, poorly justified and with no humane endpoints. No committee member can understand it. The AECs response might be:

> ***Bad practice:*** *"Its hard to follow, but he's a nice guy, he is the expert after all"*
>
> ***Good practice:*** *"Our best code breakers have failed, we don't know what we are being asked to approve. We have decided to defer approval."*

Intelligence gathering

AECs need to engage in some important intelligence gathering activities. They should critically review justifications for animal use that have been presented to them. There should be full disclosure on all procedures to be used. Specified humane endpoints must be included and prior experimental research that is relevant should be detailed. The AEC

should assess the use of outdated models. For example, the use of the mouse ascites model for monoclonal antibody production has been replaced by bioreactors using tissue culture systems. The induction of diabetes mellitus in rats by injection of streptozotocin (STZ) is most effective when given by the intravenous route, rather than the more commonly used intraperitoneal route. The use of stereotaxic equipment for brain surgery involves the use of metal ear bars, which are designed in two basic shapes: pointed tipped bars which perforate the ear drums- to be only used in non-survival surgeries, with blunt tipped bars being used for survival surgeries. An important point to note if animal welfare is to be promoted.

Example 3:
An AEC application requests rats using the justification that the research group can process 10 rats per week and the group works for 50 wks a year, therefore 500 rats will be required. The AECs response might be:

> ***Bad practice:*** *"So this research group can manage 10 animals a week, and overall, this is not a large number of rats, therefore we will approve the 500."*
>
> ***Good practice:*** *"This is not an ethical justification at all! This is a work rate. If we accept this reasoning, then we would have to also accept a work rate of 40 rats a week? Justification denied."*

Collateral damage control

This issue occupies the time of laboratory animal veterinarians in many ways. Institutions should have system to rapidly identify morbidity and mortality of experimental animals and systems to deliver appropriate veterinary care. This should be supported by the enforcement of well defined humane endpoints.

Example 4:
The PI reports to the AEC that his pigs have wound infections and high mortality rates following surgery. He indicates that he has identified the problems. The AECs response might be:

> ***Bad practice:*** *"So you clearly have sorted out the issues. Then you should proceed to resolve them."*
>
> ***Good practice:*** *"What exactly caused the problems? Why didn't you culture the lesions, we want a review of the infection control techniques used, some remedial training in aseptic surgery would appear to be required."*

Example 5:
The PI requests 5 more sheep to replace unexpected losses. The AECs response might be:

> ***Bad practice:*** *"How dreadful to have lost so many. Of course you can have 5 more."*
>
> ***Good practice:*** *"Why didn't someone perform a necropsy and determine the cause of death? Your techniques need a review before more sheep can be provided."*

Reconnoitre and skirmish

Activities around the field of battle undertaken by the AEC to ensure that all is well on the front line should include such strategies as: site visits (often referred to by the Americans as post-approval monitoring), use of pilot studies in the first instance to demonstrate proof of concept, or to validate technical competencies. Under some circumstances it can be useful to have the PI attend an AEC

meeting to clarify issues the committee may have.

At the conference during the presentation of this paper, reference was made to the "short arm parades" used by the military to inspect the troops for the prevalence of any lesions consistent with a diagnosis of social disease. Such STDs do have a research equivalent in my view. These are what I refer to as "Scientist Transmitted Deceptions"; a couple of examples:

1. *A bit of pain is OK, it keeps 'em sore so they don't pull out the sutures!*
2. *We'll just wait and see if they need antibiotics!*
3. *We'll wait and see if they show signs of pain before giving analgesics!*

Example 6:

The PI fails to advise the AEC when about to start a new project and so avoids a site visit. The AECs response might be:

> ***Bad practice:*** *"Yes we know you are very busy. We can overlook it just this once. How about you advise us next time you start a new project?"*
>
> ***Good practice:*** *"Don't blame the student. Please advise us of the next five surgery dates and we will visit at least one of them".*

Chain of Command

There are clear similarities here. The Prime Minister controls the military top brass, which controls the officer corps, which controls the foot soldiers. Likewise, in academia the sequence involves the Vice Chancellor, the AEC, the investigators and the students. The military machine has with centuries of practical experience, managed to deal with the troops. In academia, it can be somewhat different. Consider the following scenario:

Example 7:

An aggressive young house surgeon decides that the rules don't apply to him and he refuses to attend training. The AECs response might be:

> ***Bad practice:*** *"Yes we know you have an MB BS / MBChB, and you can walk on water. Of course you don't have to attend. You probably know it all anyway?"*
>
> ***Good practice:*** *"All users must attend training, because the Code of Practice requires it, and clearly you have no knowledge of the animal welfare legislation. You will attend, or you will not be using animals-you decide?"*

Maintenance of discipline

The military machine has a well developed structure for managing discipline. A range of tactics have been used over the centuries, from the benign (suspension of leave) to the brutal (a prolonged flogging). Ultimate sanctions included Courts Marshall and a dishonourable discharge, or facing a firing squad. The options available in academia are less dramatic.

Example 8:

A student is found performing major survival surgeries on animals without administering post-operative analgesics. The AECs response might be:

> ***Bad practice:*** *"Now look here, you must follow the protocol requirements. Please don't forget the analgesics next time."*
>
> ***Good practice:*** *"Clearly you didn't follow the AEC approved protocol here. This is a serious breach of compliance and animal welfare has been compromised. You will be subject to disciplinary action."*

It has been my experience over the last 30 years that a public disciplinary action is remarkably effective in focusing the minds of graduate students towards compliance. Even more so when the event is documented and used in teaching programmes to remind personnel of their obligations in respect of animal welfare.

Some military lessons

The military machine can teach us that disciplined troops will follow orders. It has shown that a transparent code of conduct, with clear consequences for insubordination, will facilitate compliance. It has also deomstrated prepared and well - maintained equipment will save time and money. However, the military have been responsible for some spectacular disasters. For example, the Gallipoli or Vietnam campaigns.

AEC tactics/issues

It has been my experience that AECs are very reluctant to discipline academics. This may not always be surprising when one considers that committee membership often comprises a majority of academics. I believe that it is useful to have well defined expectations of researchers and it is essential to have non-compliance policies. Finally I think that non-compliance is best managed by agencies other than the AEC. I note that the Australian code of practice has these matters well set out.

Value-added AEC functions

AECs are clearly required to review proposals. I believe that AECs should be able to add value to the protocols they review, in terms of the experimental design, the techniques proposed, the monitoring of welfare and the study logistics. My reasons for this belief rely on the wisdom of the committee. The collective experience of the AEC is greater than any single investigator. Furthermore the AEC has prior knowledge of problems with certain animal models and understands the limits of the resources available within the institution.

Some significant anomalies exist in the scientific literature, to which the young graduate student should be made aware. For example, key experimental details are often omitted from the scientific paper, particularly if cited in the journal 'Nature' with space limitation usually given as the reason. Furthermore, the literature often doesn't publish iatrogenic error, morbidity or mortality figures for animal models and outdated techniques continue to be used.

An important question that young graduates should consider when critically evaluating the literature is: published yes, but are the methods ethically acceptable in Australasia? Publication is no guarantee of ethical treatment of experimental animals.

Over the years I have formed the view that researchers worship the literature. This is not surprising when one considers that they all help write the literature. It is my experience that researchers in general, have great deal of knowledge about the research question they are investigating and the science around it, but they don't always have the technical skills required to establish the answer. Hence institutions need to provide additional resources and expertise to assist scientists with their important work.

In my experience approximately 50-60% of applications can be improved

by the AEC. This begs the question: what if the AEC can't add value to applications? There are two possible explanations. Either the AEC lacks the expertise or the will to tackle the problem; alternatively all protocols are above improvement.

Crash management

At the beginning of this paper I referred to the distressing business of dealing with "bottom of cliff misadventure." I would suggest that a proactive AEC strategy might include a policy to investigate clinical problems with experimental animals. Consider automotive crash events. Serious disasters undergo comprehensive car crash investigations. Similarly, but far more involved, are aircraft crash investigations. Given the limitations of resources, I would propose that the local AEC is probably the most appropriate agency to initiate animal crash investigations within an institution.

The evidence from clinical medicine is clear that pre-emptive use of analgesics can better manage human and animal pain, than to treat the pain after it has been diagnosed. This is a useful analogy, in respect of crash management. I would suggest that AECs should be involved in "cliff top carpentry". By this I mean; AECs should be building fences at the cliff top to prevent animals falling over the edge.

The AEC challenge

Finally I propose a challenge to all AECs. Each committee should be able to add value to a proportion of the research proposals that they review. To strengthen the challenge, I believe that: *"**If AECs cannot add value, they are not doing their job properly."***

Conclusions

In summary I believe that AECs should add value to protocol applications, conduct animal crash investigations, build fences at cliff tops and ensure that PIs do their duty.

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Out-of-session approvals - the good the bad and the very ugly!

Janine Barrett

Biosecurity Queensland, Queensland primary Industries and Fisheries.

Pressure to approve use of animals 'out-of-session' (between quorate meetings) creates potential for procedures that are inconsistent with the Scientific Use Code.

The Scientific Use Code provides for a **quorate meeting of a properly established AEC** to consider and make ethical/values-based decisions in relation to animals used for scientific purposes. Quorate meetings require the "*presence at meetings*" (face-to-face) "*of at least one member for each of categories A, B, C and D*", and in "*exceptional circumstances*" can be conducted using of video- or tele-conferencing (2.2.10(ii) and (iii)).

New approvals (2.2.20), review of Annual Progress Reports,(S2.2.20 and S2.2.38), approval of modifications to projects that are not minor (S2.2.11) must only be considered at a quorate AEC meeting:. Decisions/approval of these matters must not be made 'out-of-session', using email, Wiki or similar. Where a decision on these matters is required before the next scheduled meeting, the AEC must be convened to consider the matter.

Minor modifications to projects can be approved 'out-of-session' by an **Executive established by the AEC** that must include at least one member of the AEC from Category C or D. The decision by the Executive must be reviewed by the AEC at the next quorate meeting (S2.2.11). New proposals and modifications that are *not* minor must be considered for approval at a quorate meeting of the AEC.

The Executive can make 'out-of sessions' decisions/approvals using any means the AEC considers appropriate, including by emails , phone calls, Wiki, courier pigeon etc.

In deciding whether a modification must be considered by the AEC at a quorate meeting or can be considered by the Executive 'out-of-session', the question becomes – what is minor?

Approval of use of animals for scientific purposes must take into account the "*impact on the animal or animals and the anticipated scientific or educational value"* (2.2.1(viii)), and the 3 Rs to determine if it is "*essential and justified*" (2.2.1(viii)). It is proposed that an AEC Executive could consider anything 'minor' if, in comparison to what is already approved, it:

- Has minor or positive impact on animal welfare AND
- Has minor or positive impact on the anticipated scientific or educational value arising from the educational/scientific veracity and likelihood of meeting the activity objectives.

Chairs alone must not decide or approve any new or modified animal use, as section 2.2.11 clearly requires ethical/value-based decisions on even '*minor modifications to projects*' involve at least a C or D member. The AEC or Executive cannot delegate their decision making responsibilities to the Chair alone. The Chair may not decide whether details of a procedure submitted to them alone are appropriate (essential and justified).

It is proposed that for administrative purposes the Chair (or anyone else) could ‘confirm’ finalisation of AEC approval by confirming that requirements, concerns or modifications 'approved' by the quorate AEC meeting or Executive have/or will be met, e.g. confirming other permits have been received or a confirming use of procedures approved by the AEC.

‘Out-of-session’ confirmations by the Chair alone must not be discretionary, the Chair alone must not make ethical, scientific or value based decisions/approvals about what can or cannot be done with animals. Discretionary decisions/approval must be made by either the Executive (if minor) or the AEC at a quorate meeting.

No Formal Paper was received for this presentation

Grievance Resolution – A Fairer Go For All

Peter Maley
Category D member, University of Melbourne and Florey Neuroscience Institute AEC's

Most of the time we are very good in dealing with issues of animal welfare; I would go so far as to say painstakingly careful and diligent. Adverse Incident Reporting in recent times has significantly enhanced everyone's awareness of the need for due care.

Leaving animal issues aside, I want to take the next step and open for debate the matter of internal grievance resolution. In the event of a dispute between a scientist and an AEC, a researcher in dispute with the governing institution or an AEC member in conflict with the Animal Ethics Committee who comes off second best?

I think it fair to say we show more concern for the animals in our care than we do for the people we employ and engage? To my mind we have well done the "hard yards" for the welfare and protection of animals used in our laboratories and we must continue to seek further improvements in that task. That said, I think we have neglected the matter of welfare and protection for research scientists, students, animal techs and individuals who serve as members of an AEC.

The code of practice does afford a degree of protection for the human species in our laboratories and AEC administration but it falls well short of the mark in terms of fairness when dealing with issues of dispute and disagreement. The cards are most definitely stacked against employees and volunteers when push comes to shove, and things turn nasty.

Currently the researcher and any others involved in our system have one basic procedural process to follow when the gloves come off and, bluntly, the appeal process is ridiculous, offering little opportunity for genuine appeal and natural justice. The AEC is ultimately the judge, jury and executioner; this should not continue and is an issue worthy of attention during the current code review process.

We need to develop a protocol which provides fairness to all employed in our industry, including volunteer AEC members; a system without bias. There is a need for a robust grievance appeal process which is fair and transparent; one in which we can have confidence.

It is time to provide a better standard of care for the human species in our labs, animal houses and institutes. What are the options?

I am most grateful for the financial support of the University of Melbourne (Mr Tim Anning) and the Florey Neuroscience Institute (Prof. Geoffrey Donnan). This support has enabled me to attend the conference.

The views I put forward do not, in any way, represent the opinion or policy of the AEC's on which I consider privileged to sit.

My task today is to stimulate discussion on grievance resolution and its relevance to the current code review.

Currently, in the event of a dispute between a scientist and an AEC, or an AEC member in conflict with the rest of the Committee or an AEC in conflict with a scientist, who comes off second best? I think it's fair to say we sometimes show more concern for the animals in our care than we do for the people we employ and appoint – that we may possibly have neglected the welfare and protection that should be afforded to research scientists, students, animal techs and externals who serve as members of an AEC.

The code does afford a degree of protection for the human species in our laboratories and AEC administration - but it falls well short of the mark in terms of fairness when dealing with issues of dispute and grievance when push comes to shove. That said, I make the point that it is incumbent upon the applicant to make sure the AEC is convinced by documentation and data, that the project is scientifically valid, fully justified and the use of animals is appropriate, in other words, t complies with the principles of the 3 R's.

Currently, the researcher and others involved in our system have one basic process to follow when the gloves come off and to put it bluntly, the appeal process offers little opportunity for genuine appeal and natural justice. The AEC, at the end of the day, is ultimately the judge, jury and executioner and I think it's an issue worth attention during the current code review process.

We need to develop a protocol which provides fairness to all employed in our industry; a system without bias - a robust grievance appeal process which is fair and transparent, and one in which we can have confidence.

If it ever hits the fan you may find you are locked into what I consider an unjust arbitration system without an independent court of appeal.

Australian Code (current)

The Code currently addresses the matter in the following way. Operating Procedure 2.2.14 states, "Irreconcilable differences between the AEC and an investigator or teacher must be referred to the governing body of the institution for review of the due process. The ultimate decision of an AEC after such a review must not be over-ridden."

By cross-reference one is referred to Section 2.1 "Responsibilities of Institutions" and in particular sub-section 11 which in referring to an Institutions responsibilities reads, "establishing mechanisms to respond to enquiries or complaints concerning the use of animals within the institution and ensuring that personnel and students may voice concerns without jeopardising their employment, careers or coursework" and sub-section 12, "establishing, and making known,

procedures for the fair resolution of disagreements between AEC members, between the AEC and investigators or teachers, or between the AEC and the institution".

The key words are, "establishing, and making known". In essence, all resolution must occur "in-house".

There must be a more robust appeal process than that.

What are the options?

One option could be a specially appointed arbitration panel from the Bureau's of Animal Welfare AEC Advisory Committees or their counterparts in other states and territories - an appeal panel that is representative of all AEC categories and therefore constituted in a way that allows them to make decisions.

Another option could be a much simpler panel - two people with solid grounding in AEC procedure appointed by the Bureau's and other similar government departments. I suggest a system perhaps similar to the current audit procedures.

Whatever system evolves from a review it should be mandated by inclusion in the code -

- within such systems each party can be assured of total review-independence
- with such an appeal system there can be no perceived conflict of interest or historically based resolution/retribution. By that I mean the settling of old scores, institutional politics or territorial stealth.

As it stands at the moment I can see room for "old score settling", "teaching the buggers a lesson" or "showing just who really is the boss". If personal issues, prejudice or turf wars impinge on the dispute, due process has not run its course.

Let me briefly return to the Code: Operating Procedure 2.2.14 states, "Irreconcilable differences between the AEC and an investigator or teacher must be referred to the governing body of the institution for review of the due process. The ultimate decision of an AEC after such a review must not be over-ridden." In essence, the differences must be referred to the governing body for review of due process but not the decision. If you should be the appellant, you're done like a dinner; rolled by the very system supposed to support you when you most need it. The matter of due process can be reviewed by someone further up the chain of command but not the justice dispensed. I see no fairness in that. The issues of your dispute may well remain unresolved and I doubt any trade union in this country would accept such a position.

The Code fails in that it does not define "due process". How does the "system" manage due process when there is no cogent definition?

An AEC has a responsibility for, and a commitment to, the scientist and the experimental team. This responsibility runs parallel to that of animal welfare. It is only when AEC's and scientists work cohesively together, can we improve animal welfare and scientific results.

The Code needs to provide rigorous safeguards for the protection of the names, reputations and professionalism of individual researchers and research

teams across the board. Until such time as that is done you may well find yourself up the creek without a paddle. Could we possibly have a situation whereby the director of any institute or research facility could say, "do we need to get advice; have we really breached the code? It's an in-house internal dispute let's fix it in-house and not involve the Bureau". Regrettably, should that happen, there is no court of appeal.

Canada is an interesting example.

Canadian Council on Animal Care

5.7 Appeals of ACC Decisions

Senior administrators must encourage animal users and the Animal Care Committee (ACC) to work constructively together to arrive at the most appropriate means of using and caring for animals for scientifically/pedagogically valid ends.

The senior administrator must ensure that there is an institutional appeal mechanism in place, to address the eventuality of an animal user disagreeing with an ACC decision, despite extensive discussions and attempts to find agreement. As defined in the *CCAC policy statement on: terms of reference for animal care committees*, "this mechanism should include appropriate expertise and ensure a separate, fair and impartial process. The CCAC may be called upon for information purposes; however, appeals cannot be directed to the CCAC."

Terms of Reference for Animal Care Committees* (2006)
3. Responsibility

(i) Define an institutional appeal mechanism that can be used by the author of a protocol in the event that animal use is not approved by the ACC. This mechanism should include appropriate expertise and ensure a separate, fair and impartial process. The CCAC may be called upon for information purposes; however, appeals cannot be directed to the CCAC.

The Canadian Council on Animal Care, while it may provide advice in dispute resolution, it makes clear it's protocol – the mechanism must include appropriate expertise and ensure a separate, fair and impartial process. However, it is an "in-house" system and structure.

The English Code of Practice for Scientific Advisory Committee (December 2007)

Dealing with dissenting views
72. Scientific advisory committees should not seek unanimity at the risk of failing to recognise different views on a subject. These might be recorded as a range of views, possibly published as an addendum to the main report. However, any significant diversity of opinion among the members of the committee should be accurately reflected in the report (see also paragraphs 69-71 above). To me the English code is just as vague about dispute resolution as ours. Basically we're back to where we began.

That poses the question of how a governing body determines whether or not they are code compliant. I suggest some may decide it is in their best interests that the issue remains "in-house", thus ignoring the code and the relevant statutory authorities.

I see two ways of dealing with this:

1. Specific direction on protocol by the statutory authorities when institutes prepare or review their terms of reference, or
2. Specific direction within the code.

Whichever way I look at it, the institutes must be told how to define a review; how to conduct a review that is code compliant and independent. I don't think is should be a matter of a CEO's notion of justice and fair play. There is a need for better risk management.

I know each state and territory has its own legislation, but behind all this is the prevention of cruelty to animals. So what happens if the institution decides not to review the decision or, if they have a review that fails to detect Code non-compliance? I believe the solution lies with the various bureaus and their counterparts but with code delegated authority. At the end of the day, if resolution rests with an arbiter that is totally independent of the institute you can say you were heard fairly and reasonably – that you gave it your best shot.

Is it an issue people in the business consider significant, an issue you believe needs to be addressed?

We don't live in a perfect world, and I believe there are three ways of moving forward.

1. Establish an independent grievance resolution panel with terms of reference included in the code.
2. Enabling legislation in all states and territories? This would be extremely cumbersome and take years if not decades to implement and somewhat impractical.
3. Arbitration by the various bureaus and their equivalents in the states and territories?

I believe all three are consistent with the spirit of the code.

There is an alternative - do nothing and hope it never hits the fan.

The worst possible case scenario would be to bring in the lawyers. Let's hope we never reach that point.

Site inspections. Aiming at best practice.

Lex Turner. Paul Kukulies.
Queensland. Primary Industries and Fisheries.

The code states that members of the AEC should regularly inspect field work, all animal housing and laboratory areas and record their findings. In our organisation (Queensland Primary Industries and Fisheries) we have two committees (Staff Access and Community Access Animal Ethics Committees) servicing the needs of staff and external clients working at sites throughout Queensland. Although most of the research facilities in which the AEC's have an interest are located in the south-east corner of the State, some site inspections involve significant travel to the west, north-west and north of the State.

Although site inspections, particularly those involving long distance travel, may be considered as just another task for very busy committee members, such events provide participants with a great opportunity to see where the research is done; to gain a better understanding of the trial procedures, requirements and impacts; and to meet trial personnel. In particular, we have found that our committee members like to meet researchers and teachers in their work environment and to assess their attitude towards their animals. Committee members seem to be more relaxed with projects and future proposals when the responsible researcher is viewed as a gentle, caring person who gives priority to the welfare of the animals. Of course, the reverse also applies.

In addition to their concern for the welfare of trial animals, many members have empathy for wildlife and express concerns regarding the compatibility of wildlife and livestock management practices on our research stations. We note that members often view local staff's approach to wildlife management as an additional indicator of their general attitude towards animals.

Of course, not all members can participate in every site inspection and feedback has to be provided to researchers, site managers and upper management. Accordingly, a meaningful "Site Inspection Report" is an important record and means of communication for the AEC with its institution and clients. The purpose of this paper is to present our methods of recording our findings, concerns and requested actions during site inspections.

Our site inspection reports have progressed from simple reporting of observations/comments to developing and using a structured 11 page template based on code requirements. Photographs are used where possible to support the text document.

Benefits of the template:

The template has been designed to provide prompts regarding key aspects of the facilities during the inspection and to minimise the work required to produce a meaningful report. We take a copy of the last report to the next inspection to check progress and accuracy of the responses that have been provided as a result of previous inspections. This discussion will hopefully demonstrate these benefits.

In Queensland, the *Animal Care and Protection Act 2001* stipulates that the use of an animal for scientific purposes must comply with the *Australian code of practice for the care and use of animals for scientific purposes* (the Code).

Introduction

Monitoring of scientific activities is required by the Code and in Appendix 1 (External review) it states one of the roles of the AEC is monitoring of the ongoing scientific activities.

The Code requires that each AEC develops terms of reference that includes provisions to monitor the acquisition, transportation, production, housing, care, use and fate of animals. The institution (section 2.1) has a responsibility to provide the AEC with the resources required to fulfil its terms of reference.

In addition to monitoring of the scientific activities, the Code requires that housing conditions, practices and procedures involved in the care of animals in breeding and holding facilities of scientific and teaching institutions must be approved and monitored by an AEC. The frequency and timing of inspections (section 2.2.32) will be determined by factors such as the number and accessibility of sites, the amount, type and variety of scientific and teaching activities. As a guide, AECs should routinely inspect animal holding areas at least annually and preferably more frequently.

In our organisation (Queensland Primary Industries and Fisheries) we have two committees (Staff Access and Community Access Animal Ethics Committees) servicing the needs of staff and external clients working at sites throughout Queensland. Although most of the research facilities in which the AEC's have an interest are located in the south-east corner of the State, some site inspections involve significant travel to the west, north-west and north of the State.

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Development of the site inspection template

To cover the inspections and to record information from these inspections a site inspection template was developed. The Code (2.2.29) states that members of the AEC should inspect all animal housing and laboratory areas regularly and record their findings.

The template includes a section to record the names of those who attend any inspection as required by section 2.2.29. Columns recording the AEC category and organisation of those members attending any inspection allow the auditors to easily see if any members external to the institution have participated in the inspection as required in section 2.2.30.

The developed template is comprehensive to try to cover all aspects of inspections regarded as important in the Code. It is organised into four major sections:

- Animals
- Environmental factors

- Documentation
- Staffing and Veterinary support.

Each issue under these broad topics has a section for observations or comments, action requested, officer to complete the action and time frames for this action as required in section 2.2.29. These sections do not chronologically follow the code but have been organised into areas that can be grouped and followed during inspections.

The issues identified for the animals section are:

- Animal identification (section 4.7.1)
- General health and morbidity (section 4.5.3)
- Animal behaviour (section 3.3.2)
- Social contact (section 4.4.21)
- Monitoring (sections 2.2.26 and 3.3.1)

The issues identified for the environmental factors section are:

- Overall state of repair of buildings (sections 4.4.2 and 4.4.7)
- Cages, pens, ponds, tanks, fences, yards and handling and restraint facilities (section 4.4.19)
- Stocking density (section 4.4.21)
- Water supply and equipment (sections 4.4.4, 4.4.11 and 4.4.26)
- Food supply and equipment (sections 4.4.24 and 4.4.9)
- Power supply and equipment (section 4.4.12)
- Shelter and shade (section 4.4.4)
- Lighting (section 4.4.15)
- Ventilation (sections 4.4.6 and 4.4.16)
- Environmental warning systems
- Animal monitoring systems
- Waste management systems (section 4.8.1)
- Security (sections 4.4.4 and 4.4.13)
- Noise (section 4.4.15)
- General hygiene and cleaning (sections 4.4.7 and 4.4.8)

The issues identified for the documentation section are:

- Standard operating procedures (sections 2.2.17, 3.1.10 and 4.5.7)
- Records (sections 4.5.8, 4.5.9, 6.4.9 and 3.1.9)
- Applicant details
- After hours and emergency contacts and details (sections 4.4.12 and 3.1.7)

The issues identified for the Staffing and Veterinary support section are:

- Skilled and experienced staff (section 4.4.2)
- Veterinary services (section 3.3.16)

The template has a section to monitor AEC approval compliance. Each project is assessed for compliance in the categories below:

- Location
- Housing/facilities
- Experimental design (if applicable)
- Number of animals
- Species of animals
- Stocking rate/space
- Routine monitoring & management
- Emergency procedures & contacts
- Procedures
- Animal treatment/withdrawal decisions
- Fate of animals/euthanasia methods/death as an end point
- Personnel involved and procedures
- Reporting adverse events

A section for further comments is then followed by the signature section.

Value of the site inspections

Although site inspections, particularly those involving long distance travel, may be considered as just another task for very busy committee members, such events provide participants with a great opportunity to see where the research is done. They also allow the members to gain a better understanding of the trial procedures, requirements and impacts and to meet trial personnel.

In particular, we have found that our committee members like to meet researchers and teachers in their work environment and to assess their attitude towards their animals. Committee members seem to be more relaxed with projects and future proposals when the responsible researcher is viewed as a responsible and caring person who gives priority to the welfare of the animals. Of course, the reverse also applies.

In addition to their concern for the welfare of trial animals, many members have empathy for wildlife and express concerns regarding the compatibility of wildlife and livestock management practices on our research stations. We note that members often view local staff's approach to wildlife management as an additional indicator of their general attitude towards animals.

Benefits of the template:

The template has been designed to provide prompts regarding key aspects of the facilities during the inspection and to minimise the work required to produce a meaningful report. We take a copy of the previous report to each inspection to check progress and accuracy of the responses that have been provided as a result of previous inspections.

The template was specifically designed for our Department requirements and facilities and may not suit all institutions. It has been presented to stimulate thought and discussion in how to abide by the requirement to report on animal ethics inspections.

Conclusion

Despite the size of the template and sections not relevant to all sites, our committees have found that the use of the template has lots of benefits. It actually saves time as the recording of information is organised and the headings are already in place. It serves as a check list and a great reference of previous inspections. It allows the progression of an issue at a site to be easily followed over time as each reference is in the same area of the report.

As with any form it needs regular modifying to ensure it fulfils the code and committee requirements.

References:

Animal Care and Protection Act 2001 (the Act)

Australian code of practice for care and use of animals for scientific purposes (the Code). 7th Edition 2004. National Health and Medical Research Council.

ANZCCART's Publication Strategy: - Maintain, Update and Expand

Geoff Dandie
ANZCCART

The Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) is a not – for - profit organization charged with the responsibility of maintaining an informed and balanced public debate about the scientific use of animals as well as offering well researched, up to date advice to anyone wanting information. This is a role we have now been fulfilling for 22 years.

The Australian Legislative framework means there are state and territory differences in requirements for AECs researchers and teachers, so the value of the Code as an ethical, educative and advisory document cannot be underestimated and it is this which forms the basis for our involvement in the informed and balanced public debate. Similarly, New Zealand also operates under its own legislative framework and Codes of Ethical Conduct. So the strategy of maintaining offices in Australia and New Zealand has been invaluable in terms of trans – Tasman legislative differences, but still leaves the differences in Australian State – based legislation as a complicating factor.

ANZCCART publishes high quality resource material for use by researchers, teachers and particularly Animal Ethics Committee (AEC) members across Australia and New Zealand. One example of this has been our series of Fact Sheets, which have been published progressively over the past 16 years. Of course times, ideals and attitudes change and during those 16 years, we have also seen two major revisions of *the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* (The Code), with yet another revision currently underway. All of these factors have highlighted the need to institute a programme of regularly assessing the relevance of the material we publish and ensuring that it at least meets if not exceeds current international "best practice" standards. Revised Fact Sheets that are now being progressively published are peer reviewed and evidence based, and like earlier versions of ANZCCART Fact Sheets , we believe will be widely quoted in relevant literature

When we include the various activities of ANZCCART such as the annual conference, publication of monographs, Fact sheets and of course ANZCCART News, it is clear that we have traditionally employed a range of methods to disseminate information, but we have largely concentrated our efforts in the areas of research and tertiary teaching. While these sectors remain essential target areas, it has become increasingly clear that we also need to expand our area of expertise and influence to include the use of animals in both primary and secondary education. The use of animals in schools is also covered by *The Code* but has not traditionally received the same level of support as the tertiary sector in all regions.

The challenge for ANZCCART as well as many of our related organizations around the World is to achieve more, without real hope of additional personnel or genuine increases in our funding base. We propose that the answer lies in the strength of collaboration and formation of strategic partnerships and this is a path ANZCCART has actively begun to explore.

Background:

ANZCCART started out as ACCART and was initially based in Canberra where it was formed in 1987. Denis Daley was the first Executive Officer and he served in this role from the time ACCART was formed until it moved away from Canberra five years later. In 1992 when ACCART decided to move out into the real world, the University of Adelaide won the right to host ACCART as a result of a competitive tender process and has been home to ACCART / ANZCCART ever since with Robert Baker taking on the role of Executive Officer as a part of the move to Adelaide. Initially based out at the Waite Campus (8km south of the city), Robert helped to further develop and establish ACCART as an important player in animal welfare within the research and teaching sector. Robert also ensured a smooth name change to ANZCCART 12 months later when the Royal Society of New Zealand became a member in 1993. Shortly after that, ANZCCART restructured itself legally as well and became a not – for – profit public company in 1994.

Importantly, throughout this period, both Denis and Robert helped to foster a key role for ACCART and then ANZCCART as one of the foremost publishers of high quality animal welfare information in the world – reflective of the high standards that are seen to be synonymous with international best practice, while ensuring that it's goals were also realistically attainable by researchers and teachers alike. This has been a key role for ANZCCART throughout the years and it has meant working hard to ensure that the right information is published in the best and most accessible way possible. This has seen ANZCCART adopting the practice of publishing a book of conference proceedings after each annual conference, the production and publication of some key monographs in the field of animal welfare and perhaps most importantly of all, the establishment of ANZCCART News as a regular quarterly newsletter that has gained and maintained an extremely long list of readers during its lifetime.

Proceedings:

One of ANZCCART's key aims at the end of every annual conference has been the publication of a book of proceedings that covers as many of the papers presented at the meeting as possible. In a few cases, similar publications have also come from special workshops, which have usually been convened to address specific and important issues of the day.

As a general rule, such proceedings have been published annually and have proven popular with conference attendees and presenters, along with others who have an interest in the topic but were unable to personally attend the conference. However, publications of the kind have generally not been seen as high demand publications with sales largely being restricted to these rather select groups. They do however provide an excellent opportunity for the authors to publish their work in a form that is considered valuable but otherwise not achievable.

Because the proceedings of conferences have been published, it has become a tradition to try and assign a theme to each conference so that the resulting publication is a more coherent work that offers genuine and valuable advice about that particular theme. Of course, the greatest advantage of the published conference proceedings in this context is that they present a contemporary, expert

perspective on what may be a difficult or potentially contentious issue.

Monographs:

ANZCCART has a long and fairly distinguished record with many of the monographs that we have published and so we would generally rank these as being among our most significant publications. Historically, this opinion has also been strongly supported by sales, with these publications being the most commonly purchased.

We have been extraordinarily fortunate to have had many experts generously write these manuscripts for publication by ANZCCART and this has undoubtedly been a significant factor in their value. Some of the better known monographs published by ANZCCART address issues of key importance such as the humane euthanasia of experimental animals, optimal housing conditions for laboratory animals, induction of new AEC members, etc. We are currently in the process of reviewing and where appropriate, updating these publications. This has resulted in some being a high priority for revision (such as the Euthanasia Guidelines) while some are seen as having served their purpose and are no longer considered relevant because the field has moved on or possibly even expanded beyond the capacity of a publication of this kind. An excellent example of this would be the *Register of Experimental Cell Lines Available in Australia*. When this booklet was first published by ANZCCART, this was a fairly new and potentially developing area with only a limited number of cells lines being available. Since that time of course, the use of cell lines (often as a replacement for animal based studies) has exploded with new cell lines being produced on demand and faster than an organization the size of ANZCCART could ever hope to catalogue.

It is important that an organization the size of ANZCCART adopt a fairly strategic approach to the allocation of resources and while the temptation to try and publish a series of monographs that cover all the important / interesting areas is very real, it is just not realistic and nor quite frankly is it really necessary. We do well to remember that ANZCCART is just one player in this area (albeit an important one) and there are a number of other like – minded organizations out there that also publish high quality monographs in this area. For example, if we look down the list of NHMRC publications animal welfare, there are a number that are truly excellent and worthy of our endorsement. The recently published Wellbeing Guidelines being an excellent example as this is clearly an excellent and highly valued publication which would be extremely difficult and expensive to duplicate. That said, there may be situations where for one reason or another we do end up publishing a monograph that is addressing a topic which has also been the subject of other publications and the housing guidelines mentioned earlier might be an example. Even though the ANZCCART housing guidelines were published before those produced by the Victorian and NSW governments, the most important consideration here is that the message conveyed by each and all of them needs to be consistent.

ANZCCART News:

ANZCCART News has been a key part of our overall communications strategy for many years now and it is still regarded by ANZCCART as a key part of what we do. It was also nice to learn

(as we did last year when we did a survey of members) that it is also a publication which others value as well.

Having said all that, I would also have to confess that ANZCCART News has been a source of considerable concern for several years with a constant shortage of material suitable to publish, limiting the number of editions we have been able to publish each year. While ANZCCART News has traditionally been published quarterly and our stated aim is still to publish four editions every year, recently we have struggled to get enough copy to publish two editions a year. This of course, further perpetuates the problem with fewer editions meaning it drops off the radar when people want to publish articles in the area, when it many cases it would be the best publication for them. This all means that we are at risk of ANZCCART News continuing in a downward spiral and that is something we are very keen to avoid.

One way we plan to reverse this downward trend for ANZCCART News during the next year or two, is to reformat ANZCCART News so that it is more compatible with modern standards of electronic publishing (e-publishing). But this is a topic I will come back to shortly in a broader context.

Fact Sheets:

The first of our FACT Sheets was published in July 1993 and in those days they were produced as a lift out section in the middle of ANZCCART News. Since then, we have produced 15 Fact Sheets that describe animal models and a further 12 Fact Sheets, which focus on aspects of experimental design. The Fact Sheets describing animals models cover various animal species that are commonly used in research and teaching – ranging from rats and mice, through to Australian natives, rabbits, guinea pigs and sheep to name a few. These Fact Sheets have covered everything from basic physiological and haematological parameters of the various species, right through to anaesthetic and analgesic use, care and housing information and even details about appropriate euthanasia techniques. The second major cluster of Fact Sheets are generally described as covering 'Experimental Method', but include information about experimental design, statistical analysis of data and even occupational health and safety in animal laboratories.

The dilemma now facing ANZCCART is that none of them has been checked or updated since the day they were first published – in some cases, over 15 years ago. Historically, there has been a lot more interest in expanding the repertoire of these Fact Sheets rather than ensuring that they are still current, and bearing in mind that at least two versions of the Australian Code of Practice have been published since some first appeared within the pages of ANZCCART News, this is a real concern. It is equally true, that a number of technical advances such as the development of newer and safer anaesthetic drugs, analgesic agents, antimicrobial therapies, etc all now need to be incorporated into many of these Fact Sheets if they are to continue serving their intended purpose.

The combined effect of these revelations has recently meant that the Board of ANZCCART has now as a matter of policy, assigned a five year maximum lifespan to ANZCCART publications like these before they have to be at least reviewed, if not revised. Because there are only a few Fact Sheets that are now less than five years old, this will mean that the great majority of them are about to be withdrawn from circulation – pending review and where it is

considered to be appropriate, updated. This will be a massive undertaking that is going to require tracking down the original authors and assuming they are willing and able, getting them to go through each Fact Sheet to ensure that the information presented is both current and representative of what we currently believe to be international best practice. Of course, there is a very high likelihood that some or possibly many of these authors may no longer be working in the area or they may be too busy or no longer willing to undertake such a review, so we may find ourselves desperately seeking alternative experts to assist with this process - so yes, you should feel free to interpret this as a call for help!!

The other aspect of this review which we feel is essential will involve putting the revised version of each Fact Sheet through the process of rigorous peer review. As a part of the preparations for taking this on, it became clear that many of the original Fact Sheets were not routinely subject to peer review. Of course, in many cases there are multiple authors involved, so the collaborative writing process has frequently offered a pretty good approximation of such a review. Once again, when this was considered, it was decided that this would be an important process to follow so that we can be assured of the quality and relevance of the material that we publish. It will however place an additional burden on our resources as this will obviously require both identification of suitable reviewers and the inevitable need to chase up reviews as required. So once again, please feel free to interpret this as a plea for help with volunteers being most welcome.

As I have said, our plan is to implement a system that ensures a five year life cycle for publications of this type, after which they may be reviewed and deemed to be still current, revised and republished, or simply withdrawn from circulation. You will be able to monitor our progress by (hopefully) seeing them progressively return to the website and when they do, you will note that they should have an initial publication date and a re-issue date (or equivalent) listed on them.

Having just told you how important it will be to complete the process of review and revision of our Fact Sheets during the next few years, we do of course also have a wish-list for new Fact Sheets that includes:
The Zebrafish
Assessing External Applications
A Guide to Seeking AEC Approval
Training New AEC Members
Training New Investigators
Working with Reptiles
Imaging Technologies

So, yet again, if any of you are in a position to help out with the preparation or (eventual) review of these Fact Sheets, we would be most grateful.

Hard Copy versus e-Publishing:

Those of you who have had a long-standing relationship with ANZCCART will remember the good old days when ANZCCART News was posted out as a glossy, high quality newsletter that would be thoroughly read by the recipient before it was left on the tea room table for everyone else in the Department to read before it was eventually archived by whoever was in charge of overseeing animal use within the department.

While I think everyone would agree that this was a fantastic way to ensure that each edition of ANZCCART News reached a lot more people than those on the mailing list and so probably

influenced the attitudes and decisions of many researchers we would not realistically expect to sign up as subscribers, the harsh reality of life was that this became far too expensive to be sustainable. Accordingly, the decision was made some years ago now to adopt a strategy of virtual publishing – or as it has now become known, e-Publishing. This means that every time a new edition is published, we send an email to everyone on our list that includes a link to the part of the ANZCCART Web Site that houses ANZCCART News.

A key question for any organization like ANZCCART is: "Has this been a positive or a negative step?" If we are being completely honest, I think we would have to acknowledge that there are both positive and negative aspects to this change. There can be no doubt that it has saved ANZCCART a small fortune in publication, printing and postal costs that quite frankly would have been unsustainable. It has also probably sped up the process of distribution by a week or more and also readily allows us to take on new subscribers without a second thought. On the other hand, there is a perception that this change has diminished the value of ANZCCART News and possibly reduced the number of people who read it each year. We also hear stories that indicate people used to find it a lot easier to check details of something they had read in ANZCCART News by going back to the tea room rather than having to search on line. It is however difficult to assess the accuracy of such statements.

I think the reality is that many of us miss the fact that publications like ANZCCART News no longer appear in the original "glossy" form, but equally modern communication and the internet are now a fact of life and the most popular form of communication for many people. It is also true that we all need to adapt to change and so we do learn to read papers and soon even books on line or on eBook readers. The other consideration, at least from ANZCCART's perspective, is that our mailing list for ANZCCART News has continued to grow – both within Australia and overseas as well.

New Roles of ANZCCART:

While the great majority of all ANZCCART publications will continue to focus on the use of animals in research and teaching within Universities, Research Institutes and the Commercial environment, we have recognised an increasing need to address some of the issues that arise within what I will refer to as pre-tertiary education, by which I mean primary and secondary schools predominantly.

The reason we have identified this as an area of increasing importance for ANZCCART is quite simply because this is an area where there have been some difficulties experienced when schools have tried to work within the Code. The Australian Code of Practice for the Care and Use of Animals for Scientific Purposes, applies to pre-tertiary education in exactly the same way as it does to tertiary teaching institutions, BUT (and it is a big but), the Code has really not been written in a way that is particularly applicable to the pre-tertiary setting. Realistically, when you stop and think that the Code has really evolved from a voluntary Code written by a group of concerned medical researchers that has progressively expanded to cover work done with fish and wildlife it has essentially grown out of the laboratory environment and into the real world. Yet at the same time, that process of evolution has really been

limited to the world in which the authors of the Code feel comfortable and can draw on their experience – tertiary level institutions. As we begin the process of revising the Code once again, this will hopefully be something the authors take time to consider.

In some states and NSW is possibly the best example here (although many others are making progress), the relevant State Government agencies have helped to produce information that is appropriate for distribution in schools, but overall we still have a very long way to go here. The other aspect that I don't think we can afford to ignore is that other organizations and pressure groups with a strong and one sided agenda to push, have already recognised this gap and started to work hard to fill it. We are already seeing some interested groups develop very sophisticated, fully integrated teaching packages for schools that portray the scientific use of animals as evil and strongly advocate banning the use of animals in research and teaching altogether.

I might suggest that it would in fact be far better to see the production and distribution of more balanced material that still highlights the potential concerns and welfare issues that might be associated with such animal use, but also explores some of the vital safeguards we have in place as well as the potential benefits that may come from such work (and have in the past). While I do not consider it is appropriate to try to dictate children's attitudes, I do think it is important to make them aware of the fact that there is more than one perspective that needs to be considered. My hope would be that making them more aware of some of the issues associated with the scientific use of animals in an age appropriate and balanced way, might help empowered them to formulate their own opinions.

The imperative here, it that any such information distributed to schools really must be prepared in a way that is age appropriate. So it will require both multiplication of effort and resources to produce versions that are suitable for senior secondary students, junior secondary, senior primary and potentially even junior primary level students as well. We do not want to be giving children nightmares or treating them like they are incapable of independent thought, so the need to produce a number of different versions of each document, pamphlet, poster or whatever we produce will also require partnering with teachers to achieve this aim. This may mean starting out with some very basic material aimed at pet care for use in junior class rooms and then progressively ramping up the content to a point in year 11 & 12 classes where the issues at the core of the ethical debate that surrounds the scientific use of animals is covered.

As mentioned, we will need to enlist a fair bit of outside assistance if we are to make any progress in this area as we may have a good fundamental grasp on the key issues within ANZCCART, but like almost everyone else in this sector, the expertise with communicating these messages to children of various age levels is somewhat limited.

The fact that ANZCCART has been able to produce and distribute a document that outlines the important principles associated with the scientific use of animals that has become incorporated into almost all relevant laboratory manuals produced within Australian Universities (and possibly New Zealand as well) is an excellent model, which shows what can be done. It is now a matter of producing the appropriate material and ensuring it is good enough for schools to want to use it.

Summary:

I see both a lot of work and a very bright future for ANZCCART in this area and while we will need to work hard and rely quite heavily on the expertise of a number of interested volunteers, I am very optimistic about what we can achieve.

Of course, being a small organization, we have limited resources and a defined pool of expertise that is immediately available, so we will need to identify and work with some new partners if we are going to be able to move forward as planned. This will be particularly true of the work planned with schools and school age children.

It is also true to say that our efforts to reinvigorate some of ANZCCART's more traditional publishing activities such as the production of Conference Proceedings will require more effort from speakers and our hopes for ANZCCART News will require a reasonably constant supply of material that is suitable for publication. Hopefully, reformatting ANZCCART News as a true electronic newsletter will also help here.

Clearly, the new policy of reviewing and updating all our factual publications every five years will help to ensure that ANZCCART remains as relevant in the future as we have ever been during our history. We have also identified some really important areas for expanding our services and I think we can all look forward to a very busy, but valuable future.