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Do fish feel pain?

Can fish experience pain? This review summarises the findings from neurological, pharmacological and behavioural studies which suggest that fish can feel pain. Much remains to be learned about the mechanisms of pain perception in fish and, in particular, about the types of stimuli that fish find painful.

It is important to know whether or not fish can experience pain because that influences our views on how we should manage these animals. The anatomical, physiological and behavioural evidence that has contributed to our understanding of pain perception in fish is reviewed. Its implications for the marine fishing and fish farming industries have already been described (Farm Animal Welfare Council, 1996; Gregory, 1998).

Do fish experience pain?

There are three ways of trying to determine whether or not fish can experience pain.

It is necessary to establish whether or not fish possess the neurotransmitters, neurone types, and brain structures which are known to mediate or influence pain in other species. This approach does not give a precise answer, but if the conventional pain pathways are absent, it can be concluded that pain perception does not occur through those routes.

A second method is to inflict on fish stimuli thought to be painful, assess their physical responses, and determine whether those responses can be suppressed with analgesic drugs which in turn are blocked with analgesic inhibitors. A practical difficulty lies in determining, beforehand, the appropriate doses of analgesic and anti-analgesic likely to be effective in fish.

The third way is to condition fish to a potentially painful stimulus and examine whether they show aversion to the conditioned stimulus. One difficulty lies in distinguishing between pain and other forms of unpleasantness. This difficulty can, however, be overcome by examining whether the response is absent when the fish is pretreated with an analgesic which specifically inhibits pain without affecting motor control.

By collating observations from all three approaches, it should be possible to decide whether or not fish can feel pain.

Neuroanatomical evidence

Central nervous system

LaChat (1996) argued that, since the brains of fish do not have structures comparable with the human neocortex, they are unlikely to be able to consciously experience pain. This assumes that the neocortex is essential for pain perception and that the equivalent structure in fish and birds, the telencephalon, does not and cannot participate in pain perception. The basis for that assumption is not clear. There is little doubt that the telencephalon has sensory and higher functions such as learning and thinking. For example, Overmeir and Papini (1986) showed that avoidance learning in fish depended on a functional telencephalon. The absence of a true neocortex does not, therefore, mean that fish cannot perceive sensory and nociceptive stimuli.

Peripheral nervous system

In mammals two types of neurone relay nociceptive signals to the brain; those with myelinated axons and large cell bodies (A fibres), and those which are unmyelinated (C fibres). During evolution there has been a progression towards myelination of sensory neurones in vertebrates. This is important because it probably influences the type of pain that different species can experience. The initial sharp pain that occurs during an injury is mediated by the rapidly conducting myelinated A fibres , whereas, delayed aching pains are mediated by the slower unmyelinated C fibres. Neurones in the skin and viscera mediate pain signals and connect synaptically with ascending spinal neurones in the dorsal horn of the spinal cord. These are one of the first relay sites for a pain-provoking signal. The axons in the dorsal horn neurones are arranged in laminae. The outermost laminae (lamina I and II) include unmyelinated and myelinated neurones which respond to algogenic stimuli and project to the thalamus.

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These laminae are two of the more important paths that convey potentially painful signals to the brain.

The peripheral nervous system of fish differs from that of mammals and there is variation between types of fish. In lampreys, all peripheral nerve fibres are unmyelinated, and all the sensory nerve endings in the skin are free nerve endings (Martin and Wickelgren, 1971). However, elasmobranch species differ in the degree of myelination of their peripheral nerve fibres. Stingrays have virtually no unmyelinated fibres in the nerves of the outermost lamina of the dorsal horn, whereas in black-tip sharks about 16% of those neurones are unmyelinated (Snow *et al.*, 1993). The layer equivalent to lamina I is poorly represented in elasmobranchs, but its function may be served by one or more of the other laminae, and in particular by the substantia gelatinosa (Cameron *et al.*, 1990). Although elasmobranchs have relatively few unmyelinated preganglionic sensory neurones, they do have second order neurones within the dorsal horn (Cameron *et al.*, 1990), and these are either unmyelinated or finely myelinated. These second order neurones are concentrated within the substantia gelatinosa layer within the dorsal horn. That layer is relatively large in elasmobranchs, and it corresponds in mammals to lamina II, which is rich in C fibres and is partly responsible for mediating pain-provoking signals to the brain.

Neurotransmitters

In mammals, unmyelinated neurones contain a wide variety of neuropeptides which act as neurotransmitters and neuromodulators. In stingrays, rays, and black-tip sharks, substance P, serotonin, calcitonin gene-related peptide, neuropeptide Y and bombesin are present in the outer part of the substantia gelatinosa in the dorsal horn, and in the shovelnose ray met-enkephalin is concentrated in the lateral part of the substantia gelatinosa (Cameron *et al.*, 1990). This distribution is similar to that in the mammalian dorsal horn. To date, of these neurotransmitters, only substance P has been detected in afferent neurones in the elasmobranch substantia gelatinosa (Ritchie and Leonard, 1983). It is not possible to say which neurotransmitters are responsible for relaying nociceptive signals in elasmobranchs, but their presence suggests a potential for that function.

The μ opioid receptor is present in animals more primitive than vertebrates. One of its main functions in mammals is to suppress pain. Teleost fish possess at least six different opioid receptor-like proteins, and these may fulfil the same role.

Humans have specific regions in the brain which can attenuate the perception of pain. These include the periaqueductal gray matter in the mesencephalon, specific relay nuclei in the thalamus, and the rostroventral medulla in the brainstem. The raphe nucleus in the rostroventral medulla activates axons which project to the dorsal horn of the spinal cord, where they inhibit the relaying of afferent nociceptive signals through a variety of neuropeptide receptors. One group of pain modulating neuropeptides is the enkephalins, which are opiatelike compounds. The enkephalins help to reduce pain perception, and they appear to serve a number of other roles in reproduction, vision and chemosensory systems. Enkephalins have been discovered in a range of brain regions in teleost fish, but as yet their presence in pain-related pathways has not been adequately tested. This area of neuroscience is complicated by the fact that we do not know the functional piscine homologues for the periaqueductal gray and the raphe nucleus. Attempts at locating enkephalin-containing cell bodies in the dorsal horn of lamprey and trout have been unsuccessful (Vecino *et al.*, 1992). This suggests that either descending inhibition of nociceptive stimuli is mediated by another neuropeptide or that this method of pain control does not exist in these fish.

Physiological and behavioural responses

Physical responses to potentially painful stimuli are often used to determine whether an animal can perceive pain. This approach, however, can have limitations if the stimulus provokes a spinal reflex or a subconscious brainstem reflex. Some fish show sensitive spinal reflexes which could be confused with conscious behaviour. For example, in decapitated lampreys the dorsal fins move briskly to one side when the ventral abdominal skin on the same side is stroked. Similarly, pricking the skin below the dorsal fin with a needle, pinching the skin, or electrically stimulating the skin elicited the same fin reflex in the decerebrate fish (Birnberger and Rovainen, 1971). Similar responses have been described in higher fish species. It is important, therefore, to examine behavioural responses which are not spinal reflexes to potentially painful stimuli when investigating pain perception in fish.

Notwithstanding this, fish show many physical responses to tactile and noxious stimuli which do involve conscious perception. This has been shown in a number of experiments which involved a learning process to elicit a particular response. For example:

- In Japanese carp, applying a 50 msec 7 mA DC shock across the fish produced suppression of opercular (respiratory) activity when the fish was trained to expect the shock using a pre-shock light stimulus (Woodward, 1971).

.• Paradise fish avoided a black compartment within their tank after they learnt that they experienced a mild electric shock when they were in the black compartment (Brookshire and Hognander, 1968). They also learnt how to activate an escape hatch in order to avoid the shock.

- In goldfish, fear of an imminent electric shock can be blocked by pretreating the fish with the anterograde memory blocker MK801, which is an N-methyl-D-aspartic acid antagonist (Davis and Klinger, 1994). Similar effects have been observed in rats.

Jansen and Greene (1970) used a mild electric current in goldfish to provoke an agitated swimming response, which consisted of a sudden, pronounced, increase in frequency and amplitude of fin and opercular movements. When morphine was added to the water, analgesia was achieved. Repeated electric currents in the non-morphine controls were not associated with a change in threshold stimulus. This is one of the most important studies demonstrating that fish can experience pain. The analgesic effect of morphine in goldfish has since been shown to be reversed by naloxone Ehrensing *et al.*, 1982)

Tactile stimuli are detected either by Merkel cells or by free nerve endings in the epidermis. In the lamprey, they innervate three types of sensory fibre within the spinal cord. There are two types of touch fibre which respond to indentation of the skin, and a population of nociceptive fibres which respond to very strong deformation of the skin or to excessive heat (Martin and Wickelgren, 1971). This is regarded as good evidence that lamprey have nociceptors which are triggered by potentially painful stimuli, and that these project a signal to the spinal cord.

As a non-experimental observation, carp show the following behaviours once

they are hooked during angling: rapid darting movements; coughing and spitting; head shaking; fleeing; belching gas from the swim bladder; sinking and lying on the bed of the tank. If, after hooking, the line is played out so there is no line tension, the fish do not show escape behaviour. Instead, the main behaviours are coughing or spitting and head shaking, then a resumption of feeding within a few minutes. This implies that playing the fish is more aversive than hooking the mouth. The observation that the fish soon resume feeding has also been used to argue that hooking in the lip is not in itself particularly painful for fish.

Summary

The neuroanatomy of fish, and their complement of neurotransmitters suggests, rather than precludes, the possibility that fish can feel pain. The appropriate question appears not to be *do fish feel pain ?* but rather, *what types of pain do fish experience?* It is not surprising that fish possess the peripheral anatomical and chemical prerequisites for pain perception. Simpler life forms, such as gastropods, also share these features and, like fish, they show nociceptive responses which are analogous to those in vertebrates (Kavaliers, 1989). These responses, which can be inhibited with conventional analgesics, are particularly convincing evidence that fish and lower life forms have the capacity for feeling pain. There is, however, room for substantial improvement in our knowledge about pain perception in fish, and in particular we need to know more about which types of stimuli appear to provoke pain responses in fish.

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Editor's note
This article was published in *Surveillance* **26:** (3), 1999.

More on animal pain

For a detailed summary of the assessment, alleviation and avoidance of animal pain, see the Facts Sheet in this issue by Professor Paul Flecknell.

Offprints are available free of charge from ANZCCART.

Notes from Professor Flecknell's Australian workshops held last July are now available from ANZCCART's website -

www.adelaide.edu.au/ANZCCART/

Minimising the harm and maximising the benefits of animal use in science

In his book entitled *Animal Experimentation: A Student Guide to Balancing the Issues*, published by ANZCCART, Vaughan Monamy (1996) summarised aspects of the "Reverence for Life" philosophy of Albert Schweitzer (1875-1965). "Reverence for Life" emphasises the mystical awe felt when life forms, from the simplest to the most complex, reveal their exquisite elegance and their inherent will-to-live. People, when acting naturally, honestly and with wonder at the mystery of life, recognise their own will-to-live. They also feel compelled to give to every other life form with a will-to-live the same reverence for its life as they give their own.

"Reverence for Life" does not mean that causing pain or the death of another creature is wrong. Rather, it is causing pain or death when it can be avoided that is wrong. People guided by "Reverence for Life" will only cause suffering or the death of an animal in cases of necessity, never from lack of care.

This has particular relevance to the use of animals in science. "Reverence for Life" means that there should always be misgivings when a life is taken or other harm is done to an animal which has a will-to-live, no matter how great will be the expected benefit. Schweitzer thought that in each and every case these misgivings should motivate animal-based scientists to make sure that there is a very real need to use an animal for the particular purpose if that purpose involves taking the animal's life or causing it other harm. Moreover, scientists must take the utmost care to keep any harm they do as low as it can be.

I consider that there is value in combining elements of the "Reverence for Life" philosophy with the Utilitarian philosophical justification for the use of animals in science. Utilitarians consider that what counts above all other things is the consequences of actions. But they also say, and this is important, that actions can be judged as good *only* if they bring the *greatest* good to the *greatest* number. The use of the word *greatest*, instead of the weaker word *greater*, reduces the risk that this way of thinking can be used to justify getting the greatest good at the expense of a small number of victims. Achieving the *greatest good* therefore also means causing the *least harm*. This means we must consider *all* the good outcomes and *all* the harmful outcomes, not just those that provide a balance which spuriously justifies what we want to do.

The rigorous form of utilitarianism, which James Battye called *strong utilitarian - ism* (Battye, 1994), retains ethical credibility only if the separation between all of the good and all of the harm is the greatest that can be feasibly achieved (Mellor, 1998). If we add to this the humane restraint that arises from the misgivings scientists should have when taking a life or causing other harm, emphasised in Schweitzer's "Reverence for Life" philosophy, we have both ethically rational (Utilitarian) and humanely empathetic ("Reverence for Life") motivation to minimise the harmful consequences of the use of animals in science.

But what harm and what good (or benefit) should be included in these calculations? The rest of this paper deals with this question.

Minimising harm

We need to consider harm to animals and other harms.

Minimising harm to animals

The Three Rs principle is available to assist us to minimise the harm: *replacement*, use of non-animal alternatives to animals or the use of non-sentient or less sentient animals; *reduction*, keeping the number of animals used to the minimum required to achieve the objectives of the work; and *refinement*, minimising the noxiousness of the procedures applied to the animals used.

A dedicated, comprehensive and rigorous application of the Three Rs is an essential prerequisite for this approach to command respect. Thus, we must apply the Three Rs at every appropriate step during the design and execution of experiments. We must seek ways to demonstrate that we have done so, and we must also actively attempt to expand the options available for replacement, reduction and refinement in our own fields of interest.

Anything less than a conscientious commitment to this approach can be justifiably criticised as a mere facade designed to avoid criticism of what would then be indefensible actions. The growing international emphasis on seeking alternatives to the use of animals in the life sciences, and the successful development of many genuine alternatives via application of the Three Rs tenet, are therefore heartening and ethically *nec - essary* developments (Abstracts, 1993, 1996, 1999). Examples of the Three Rs have also regularly been provided in ANZCCART News (e.g., Mellor and Bayvel, 1998).

Minimising other harms

There are other possible harms which must be recognised and minimised. Some of them focus on the scientists and animal care staff and include the following.

- The need to suppress our natural inclination to care for animals which become ill or injured during the purposeful imposition of illness, injury or distress as part of some scientific investigations.
- The grief experienced by some scientists and animal care staff who have bonded with study animals, when and if the animals are killed at the end of an experiment.
- The potential for callousness to be the outcome of the distancing process that is often a part of coping with our thwarted impulse to care for animals and the grief we experience for those which die or are killed.

We clearly need to be aware of these possibilities and have procedures in place to deal with them.

Other harms include the following.

- The negative impact on animals and people of what are eventually shown to be errors in scientific reasoning which have arisen during the early stages of understanding particular body processes.
- The possible use of the discoveries of animal-based science for irresponsible, callous, malign or other purposes which harm animals or people.
- The genuine concern, offence or outrage caused to those who adopt different ethical positions from animal-based scientists and who sincerely oppose the use of animals in research, teaching and testing.

We need to remain aware of such possibilities and attempt to minimise them.

Maximising the benefits

There are two main issues here: our attitude to achieving the anticipated benefits, and what those benefits are and how they can be assessed.

Attitude to achieving the anticipated benefits

We must be resolute and vigorous in our attempts to maximise the benefits of our work.

This requires the following.

- A careful choice of the questions our work is designed to address to ensure that they are answerable scientifically.
- Ensuring that those questions can be answered with the methods that are currently available.
- Evaluating the relative importance of the perceived animal or human need the proposed work is designed to address in relation to other known needs, *and* assessing the chances of success in addressing them.

"Strong utilitarianism" *also* demands an ethical commitment to seeing the process through to its completion. Thus, leaving the outcomes of soundly-based animal work unpublished or otherwise not effectively disseminated is unethical. Merely publishing our findings is the minimum requirement, because we have a further ethical obligation to promote the beneficial application of those findings as widely as can be feasibly managed. Such application, for new fundamental knowledge, should at least include updating tertiary-level course material with the latest established information. For applied research outcomes, it should include ensuring that the findings are actually used to minimise the problems the research was designed to address.

As few animal-based scientists individually are likely to possess all of the skills required to successfully manage the full spectrum of these activities, we need to ensure that current and future networks of scientists have members who collectively cover the required skill range.

What are the benefits?

I want to divide these into primary and secondary benefits.

Primary benefits include the following:

- Knowledge itself — the knowledge of life processes and its incorporation into educational programmes.
- The outcomes of applying or using that knowledge:
  * to improve the health and well-bring of people by among other things, improving the prevention, diagnosis, and treatment of illness and injury, by aiding healthy lifestyle decisions, and by enhancing sports performance and recreational enjoyment;
  * to improve the health, welfare and productivity of food, fibre and draft animals, and of companion, recreational, sporting and service animals;
  * to contribute to the successful conservation and management of endangered, exotic or wild animals;
  * to help maintain an appropriate ecological balance by the humane control of pest animals,
  * and other similar outcomes.

Secondary benefits include the following:

- For the organisations which employ the scientists: the contributions the conduct of animal-based science make to the reputation and success of those organisations.
- For individual scientists and their support staff: the enhancement of career prospects, earning power and the capacity to provide for their own and their family's needs.
- For the wider community (the city, region or country): the economic, educational, social and other contributions made by the organisations, scientists and support staff who are part of it.
- In the intellectual arena: the exercise of our creative imagination, rationality and problem-solving skill in the pursuit of the animal-based wing of science which is part of our culture.
- In the ethical arena: the stimulus and, especially now, the requirement to explore the value context, content and implications of human-animal interactions in science and in all other areas.

As with the harms, the benefits of animal-based science are wider than may be obvious at first sight. But against this last point must be placed a constraining caveat. *We must apply just as much energy to searching for and min - imising the potential harms of animal-based science as we do to identifying and maximising its potential benefits.* Giving less attention to the harms than we do to the benefits, simply to get approval for something we want to do, weakens utilitarian ethical support for it, and our behaviour can then be *justifiably* criticised as questionable. There is another stimulus to conscientious, honest and rigorous exploration of *all* harms and benefits. It is the serious misgivings, highlighted by Schweitzer's "Reverence for Life" philosophy, that we should retain while we still need to use animals in science.

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The new Animal Welfare Act 1999 and conducting animal-based science in New Zealand

The Animal Welfare Act 1999 focuses attention on meeting the wider needs of animals, not just the avoidance of cruelty. It reaffirms public support for the conduct of animal-based science, but only when strict and clearly defined conditions are met, and it provides for heavy penalties for breaches of the Act.

The Animal Welfare Act 1999 binds all of us in New Zealand to a "duty of care" towards animals, whereby we are required to meet the physical, health and behavioural needs of the animals we own or control. Our duty of care covers a much wider spectrum of behaviour towards animals than merely defining, preventing, catching and punishing cruelty, which was the major focus of the 40-year-old legislation the new Act replaced. The details of how we can exercise our duty of care appropriately in different areas of animal use are provided in Codes of Welfare developed, with public consultation, by the National Animal Welfare Advisory Committee. These Codes are specific to particular industries or circumstances which involve animals and are to be updated regularly to take account of new scientific knowledge and changing public expectations regarding animal welfare. Maximum penalties for breaches of the Act are a $50,000 fine and/or three years imprisonment for individuals and a $250,000 fine for corporations or institutions. Instant fines of $400, and other fines of $1,200, can also be imposed for minor infringements.

The Act, which received almost unanimous support in Parliament, also provides the legal framework for the conduct of animal-based science in New Zealand. It is clear that many of the restraints and intrusions imposed on animals during their use in research, teaching and testing contravene our defined duty of care and, if done outside the laboratory, would attract penalties under the law. However, most members of the New Zealand public want the benefits of animal-based science, and, via the appropriate part of the Act, have given permission for research, teaching and testing involving animals to be conducted, but only if stringent conditions are met. These conditions include the following:

- a national body, the National Animal Ethics Advisory Committee (NAEAC), must have oversight of all matters regarding the use of animals in research, teaching and testing;
- each institution undertaking such activities must have a Code of Ethical Conduct, reviewed by NAEAC and approved by the Director General of the Ministry of Agriculture and Forestry (MAF), which defines the ethical and practical obligations of the organisation when engaging in animal-based science;
- each institution must have a properly constituted Animal Ethics Committee which includes three independent members (a member of a recognised animal welfare organisation, a layperson nominated by the local authority, and a veterinarian nominated by the New Zealand Veterinary Association) as watchdogs on behalf of animals and the public;
- the Animal Ethics Committee must consider and, only if it is satisfied, approve all research, teaching and testing procedure before they begin, taking into account the anticipated benefits of the work and how those benefits will be maximised, the likely harm that will be done to the animals and how that harm will be minimised, whether the benefits outweigh the harm sufficiently to justify the work, the quality of the science proposed, whether the qualifications of those involved are appropriate, the standards of animal care and the lines of responsibility for those involved in the work;
- every person wishing to conduct a research, teaching or testing procedure must first apply to, and receive approval for the proposed work from, their institution's Animal Ethics Committee, by providing that Committee with all the information just noted;
- each Code of Ethical Conduct has a tenure of no more than 5 years and can be renewed only if the institution demonstrates to an independent reviewer, accredited by MAF, that its animal ethics processes, procedures and culture have to that point conformed with its Code and acceptable national standards. This review procedure is likely to be similar to that devised by the New Zealand Board of ANZCCART (Jolly, 1998).

Breaches of these conditions, when operating within the Codes of Ethical Conduct and Animal Ethics Committee system, attract fines of up to $25,000 and/or six months imprisonment for individuals and fines of up to $125,000 for corporations or institutions. Any individual prosecuted successfully and penalised by the Courts for a serious breach of their institution's Code of Ethical Conduct would presumably also be dismissed or banned by the institution from conducting animal-based procedures. In very serious cases an institution's Code of Ethical Conduct can be suspended or revoked, which would stop all of its animal-based science activities covered by that Code, not just those that led to the revocation. This penalty, the most severe from the institution's viewpoint, would presumably be used sparingly, but it earns its place by assuring the scientists and the public that all other disciplinary measures will be conducted rigorously.

Engaging in animal-based science outside the Codes of Ethical Conduct and Animal Ethics Committee system removes the protection of the part of the Act which deals with animal-based science and can therefore attract the much harsher penalties mentioned earlier.

A central feature of the regulation of animal-based science in New Zealand is the emphasis on individual scientists and their institutions accepting ethical responsibility for their own behaviour within the legally devolved framework of the Codes of Ethical Conduct and Animal Ethics Committee system. For this system to engender and retain public trust, animal-based scientists must not only conform to the letter of the law, but they must also manifestly operate according to the spirit of the law. The latter will only be convincing if animal-based scientists not only operate within the law, but also exhibit exemplary behaviour, altruistic purpose, engagement with values and the highest standards of animal care.

Surveillance in the animal-based science arena is already achieved in several ways in New Zealand. The three independent members of each Animal Ethics Committee have a pivotal role at the animal-use coalface. In recognition of this, ANZCCART, NAEAC and their nominating organisations [including the Royal (NZ) Society for the Prevention of Cruelty to Animals and the New Zealand Veterinary Association] all provide support and advice to help them fulfil this function.

Colleagues of the animal-based scientists who actually conduct the work also have a role as watchdogs, but their credibility in that role to a critical public will depend on the respect they engender by exemplary behaviour. Surveillance is now also achieved via a 5-yearly mandatory independent review of the processes, procedures and activities of all Animal Ethics Committees (Animal Welfare Act, 1999) and, as before, by continuing NAEAC oversight of the whole system.

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Newly published

Humane endpoints in animal experiments for biomedical research

This 150-page publication contains the Proceedings of an international conference held in Zeist, The Netherlands, from 22 to 25 November, 1998. They are edited by Coenraad Hendriksen and David Morton and were published by the Royal Society of Medicine, London (ISBN 1-85315-429-6).

There are moral, legal, social and economic reasons for implementing humane endpoints in medical research (e.g., cancer, transplantation, development of new medicines), toxicity testing, and studies on infection, as well as vaccine quality control. The purpose of this conference was to bring together persons with expertise in these areas to present their latest research results, with an emphasis on the practical implications. Important issues relating to the recognition and assessment of endpoints in areas of animal experimentation where animal well-being may be adversely affected and the determination, validation, implementation and acceptance of humane endpoints were addressed.

New techniques, new approaches and new strategies using non-invasive methods were discussed, as well as the training of observers and the use of recently developed remote sensing devices.

This conference was intended for those with responsibility for the use, care and welfare of research animals, such as regulators, scientists, veterinarians, technicians, animals welfarists and members of animal ethics committees.

Copies are available from:

David B Morton,
Centre for Biomedical Ethics,
University of Birmingham,
Edgbaston, Birmingham,
B15 2TT, UK
Tel: +44 (0) 121 414 3616/4517
Fax:+ 44 (0) 121 414 6979/6842
Email:
d.b.morton@bham.ac.uk

or

Coenraad Hendriksen, RIVM,
Central Animal Laboratories,
PO Box 1, 3720 BA, Bilthoven,
The Netherlands.
Tel: + 31 (0) 30 2742503
Fax: + 31 (0) 30 2744408
Email:
coenraad.hendriksen@rivm.nl

or ANZCCART's Adelaide office (3 copies only).

New ANZCCART publication -

The use of wildlife for research

Proceedings of ANZCCART's 1999 Australian Conference have been published and are available from our Adelaide and Wellington offices for $A20 or $NZ35, including postage (ISBN 0 9586821 2 7).

The 128-page Proceedings was edited by Professor David Mellor and Dr Vaughan Monamy and contains 20 very interesting papers covering a diversity of topics.

An order form was inserted in the September, 1999 issue of *ANZCCART News*.

Animal Welfare - Special issue on genetics and animal welfare

Guest editors: Professor L.F.M. van Zutphen, Utrecht University, The Netherlands and Professor P.G.C. Bedford, The Royal Veterinary College,London.

The November 1999 issue of *Animal Welfare* was published as a special issue, devoted to the topical subject of genetics and animal welfare. Papers cover issues ranging from the welfare implications of extreme breed types in farm and companion animals, to the effects of strain on the behaviour of poultry and laboratory animals. The practical and ethical implications of advances in genetic technologies are also discussed in a range of authoritative and thought-provoking papers.

Animal Welfare (ISSN 0962-7288) has established itself as an objective, international forum for quarterly publication of peer-reviewed papers on all aspects of farm, laboratory, zoo, wild and companion animal welfare science. It ranks among the top 25 per cent of all veterinary/zoological journals covered by the Science Citation Index, attesting to the quality and impact of its contents.

Individual copies of the Special Issue are priced at £15/US$30.00 and are available from -
Universities Federation for Animal Welfare,
The Old School,
Brewhouse Hill,
Wheathampstead,
Herts, AL4 8AN, UK.

Fax: 44 0 1582 831414 or
Email: ufaw@ufaw.org.uk.

Book review

Management and Welfare of Farm Animals, UFAW Farm Handbook, 4th Edition.

Edited by R. Ewbank, F. Kim-Madslien, C.B. Hart.
Universities Federation for Animal Welfare, 1999.

ISBN 1 900 63000 1

Price: £17.00 or $US40.00

I was interested to review this book as I have had the 3rd edition (published in 1988) on my bookshelf for a number of years. The first edition was published in 1971 with the title *UFAW Handbook on the Care and Management of Farm Animals.* In spite of having the previous edition, in reality I made little use of it (I may have looked at it about four times in eight years), and I thought it would be interesting to see why this was the case and whether the new edition was potentially more useful. The fourth edition of 308 pages is about 18% longer than the previous edition and most of this is due to four new chapters covering red deer, quail, guinea fowl and fish.

The structure of the latest edition is similar to the previous one in that there is an introductory chapter on animal welfare including definitions, stress, legislation (in the UK) and the science of animal welfare. This is followed by separate chapters for each species, with each chapter written by a different author. The other species covered are dairy cattle, beef cattle and veal calves, sheep, goats, pigs, rabbits, laying hens, broiler chickens, turkeys and ducks. Each chapter has a generally similar structure including sections on the structure of the relevant industry in the UK, breeding and genetics, natural history and behaviour, reproduction, production, nutrition and feeding, environment and housing, health and disease and "the way ahead". However, there are variations in chapters with the shorter chapters omitting some subsections and the health and disease sub-heading changing to health and welfare in some later chapters. The text is clearly written and contains a considerable amount of information. The only typographical error I noticed was a change in print size on the last page of text on red deer.

In reading the book I focussed on those species that I was more familiar with (dairy cows, beef cattle, laying hens, broilers and pigs) and although having read the other chapters I have insufficient expertise to comment on the detailed information they contain. My comments on this book are that:

i) it is totally UK-focussed, which dramatically limits its use internationally;
ii) the chapters vary considerably in the depth of information and this is reflected by chapters of varying length such as 3 (quail), 7 (turkeys), 35 (sheep) and 41 (laying hens) pages;
iii) it is unclear who the audience is; and
iv) the focus is definitely on management rather than welfare and it takes considerable effort to determine what the welfare issues are for each species.

However, these criticisms must be tempered by the expectations of the reader - as the UK focus and the focus on management of each species may not be a concern to some. Also, with welfare in the title, my expectations were raised and unfortunately unfulfilled. A better title would have been as in the first and second editions that used the word "Care" rather than "Welfare". The UK focus means that a number of chapters are less relevant to other countries e.g., the details on indoor housing of dairy cows during winter and management of "hill" sheep are of no relevance in Australia and without some expertise (in which case one may not need the book) there is nothing in the text to allow the reader to determine what was common in management and care of farm animals in the UK compared to other countries. Similarly, in pigs there is considerable information on feeding methods but the use of electronic feeding stations and trickle feeding were dismissed in less than a sentence. Perhaps these methods are neither widely used nor of interest in the UK.

I got the impression from the preface that this book took a considerable time to complete. It is an unfortunate act of timing that the July 1999 European Union Directive on banning conventional cages for laying hens was just too late to be included as this Directive has far-reaching consequences for egg production systems in Europe and would probably have resulted in some different comments in the chapter on laying hens.

While the target audience is clearly stated in the preface to the third edition (veterinary and agricultural students), it is missing from this new edition. In fact, the wording on the back cover is "the overall aim is to promote a humane attitude in all those responsible for the care, management and use of farm animals". I interpret this as meaning to at least include those people caring for animals on a day-to-day basis e.g., farmers and stockpeople. If this is one of the target audiences, I imagine most of the chapters would not be relevant. To reach this audience, consideration should be given to having the chapters separated into booklets for each species.

While the welfare issues are within the text it would be more useful for those readers more interested in welfare if they were either listed separately or highlighted in the text. Also, while different housing systems are described, there is often little discussion of the arguments for and against individual systems.

While the *UFAW Handbook on the care and management of laboratory animals* is used as the "bible" of laboratory animal management and care, unfortunately the same cannot be said for this book on farm animals, because farming practices vary so much around the world. In spite of the above criticisms, the book contains a lot of interesting information. I would recommend it as source material for secondary schools and universities, and that these organisations' libraries and public libraries have a reference copy. I would recommend students and others interested in animal welfare read it, but the content is not of sufficient value to recommend they buy a copy.

John Barnett,
Animal Welfare Centre,
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Werribee
Victoria 3030.

Letter

The development of standard operating procedures for the use of livestock in teaching

In the section on *Care and use of livestock for scientific and teaching activities*, the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* provides for the development of standard operating procedures (SOPs). These can be referred to in AEC project proposals, thereby simplifying AEC applications while still providing the required information on techniques.

In this institution, the publication of the new code coincided with a major restructure in the teaching of agriculture. The Institute of Land and Food Resources was formed when the Faculty of Agriculture and Forestry amalgamated with the six colleges of the Victorian College of Agriculture and Horticulture. The teaching activities of this new entity are far broader than they were for any of the parent bodies – they span vocational education and training, higher education and postgraduate education. Concomitant with these organisational changes have been new arrangements for the AEC. There is now a single committee for the institute instead of a separate AEC for each campus.

The development of SOPs for teaching has been one of the first initiatives of the new AEC in conjunction with the University's Research and Innovation Office. The SOPs are being developed specifically for teaching because of the degree of commonality across the range of Institute courses and the potential to reduce repetition and duplication. By comparison, research applications are much more focussed and involve more specialised procedures. SOPs will have advantages for both the AEC and for teaching staff, but most importantly they will help to promote and maintain high standards of animal welfare. Expected benefits are:

- standardisation of routine procedures. The SOPs will foster a common understanding across campuses, teaching sectors and discipline groups of what is required and why those requirements are stipulated;
- simplification for the AEC. Because of the number of campuses and the many industry-oriented short courses, the AEC has to review a large number of teaching applications involving routine management procedures. SOPs will enable the AEC to easily identify applications which deviate from standard practices; and
- simplification for teaching staff. Reference to SOPs in applications will simplify the preparation of applications and reassure applicants that the proposed procedures conform to the AEC's preferred practices. The SOPs will also be of more general assistance to teaching staff. They give guidance as to how students should be introduced to the procedures, suggestions for preparing and debriefing students on animal welfare matters and indications of the levels of supervision necessary for particular procedures.

Separate documents are being produced for each of the main species or industries covered in teaching: sheep, poultry, horses, pigs, dairy cattle and beef cattle. These cover not only individual procedures, but also: how to handle animals safely; handling facilities; housing, feeding, maintenance, inspection and transport of animals; how soon after arrival they may be used in teaching; quarantine and occupational health and safety considerations; and emergency procedures. There is also an over-arching document which covers the purpose of the SOPs, a general statement on animal welfare in teaching, and the responsibilities of the course coordinator, class coordinator and demonstrators.

The process of writing the SOPs has entailed drafting documents based on current teaching activities and relevant codes and guidelines, then circulating drafts to a representative group of teaching staff for discussion. Once approved by teaching staff, draft SOPs are reviewed by a reference group comprising the Chair of the AEC, the Animal Welfare Officer and a senior scientist from the Animal Welfare Centre.

The relevant State and SCARM codes have been a useful source of information, but it is important the SOPs also describe how to undertake certain procedures, how students should be taught about them, what pitfalls to avoid, and the level of supervision required. Issues of supervision are especially important in competency-based training, where students have to make the transition from observers to operators without risk to animals or humans. The AEC and teaching staff believe that the University should be taking a lead in animal welfare matters. In certain cases, procedures are not acceptable for teaching although they may be standard in industry, and the SOPs reflect this.

A number of important issues have become apparent:

- Teaching staff should be included in the early stages of the consultation process;
- The expectations of the AEC and teaching staff should be defined at the outset;
- SOPs should not intrude into curriculum areas;
- There must be a mechanism for regularly reviewing and revising SOPs.

Many institutions will be undertaking similar exercises. My own enquiries, both in Australia and overseas, before starting the SOPs were not especially fruitful, although a number of colleagues expressed interest in hearing how we progressed. Clearly, SOPs must be developed with teaching staff and AECs to meet the needs at their institution. Equally, there is a need to avoid duplication and to learn from others. Perhaps there is a role for ANZCCART to act as a point of contact?

Ann Hargreaves
Office of Research
University of Melbourne
Parkville
Victoria 3052

Changes to the Board of ANZCCART Australia

New Chairman

Professor Roger Holmes is the new Chairman of ANZCCART Australia. His appointment by the Board at its meeting on 20 November follows the retirement (effective from 20 November) of Professor Mike Rickard, Chief of the CSIRO's Division of Animal Health as Chairman. Professor Rickard, who served two years as Chairman, will continue to represent CSIRO on the Board. The Board thanked Professor Rickard for his considerable contribution as Chairman.

Professor Holmes, who is the representative of the Australian Vice-Chancellors' Committee, is the Vice-Chancellor of the University of Newcastle, NSW. A biochemist, he has many years research and administrative experience.

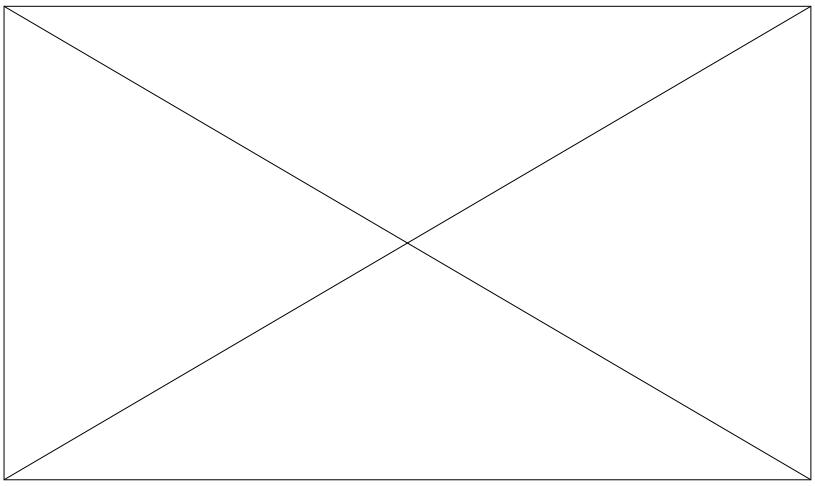
Retirement of Professor Mellor

The Board at its meeting on 20 November accepted with regret the retirement of Professor David Mellor, who has been the representative of the Royal Society of New Zealand since 1 January, 1993. Professor Mellor is a physiologist whose research interest is improving the welfare of production animals. He holds the Chair in Animal Welfare Science and Bio-ethics at Massey University. He has also retired from the Board of ANZCCART New Zealand, where he represented the New Zealand Vice-Chancellors' Committee.

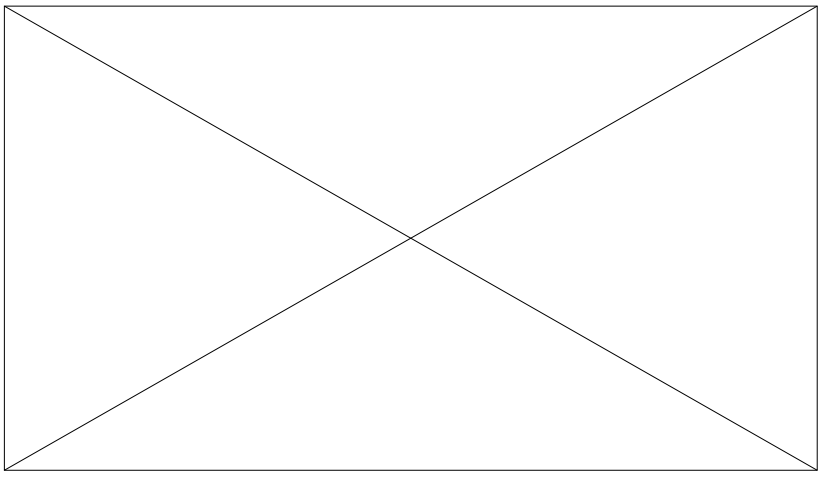
Professor Mellor has been a very active supporter of ANZCCART, and has contributed many papers to ANZCCART Conferences and to *ANZCCART News*, including two in this issue.

At the recent ANZCCART Conference in Wellington, Professor Mellor was thanked for all of his work for ANZCCART by Professor Rickard, who presented him with a special plaque bearing the logos of ANZCCART and the Royal Society of New Zealand (see photograph).

Dr Mark Fisher, an animal physiologist with AgResearch, succeeds Professor Mellor as the representative of the Royal Society of New Zealand on the Board of ANZCCART Australia.



The new Chairman of ANZCCART, Professor Roger Holmes



Professor David Mellor receiving his plaque from Professor Mike Rickard at the ANZCCART Conference in Wellington on 19 November 1999

ANZCCART's 2000 Conference

The theme will be "Farm animals in agricultural research - how to meet the conflicting demands of ethics, welfare, science and industry".

The two day conference will be held at the Roseworthy Campus of the University of Adelaide on Thursday 30 November and Friday 1 December.

Roseworthy is the site of agricultural research facilities of the South Australian Department of Primary Industries and Resources and the University of Adelaide.

The conference is likely to be preceded by a one-day workshop for Animal Welfare officers on 29 November, on a theme related to that of the conference.

There will be a post-conference tour of the Barossa Valley wineries on Saturday, 2 December.

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

A report on ANZCCART's 1999 New Zealand Conference

ANZCCART and the National Animal Welfare Advisory Committee (AWAC) held a very successful conference at Te Papa Tongarewa - Museum of New Zealand in Wellington on 18 and 19 November 1999. The conference theme was *Innovation, ethics and animal welfare: public confidence in science and agri - culture.*

This conference addressed how the application of knowledge has affected the welfare and productivity of farm animals during the past century and how it might affect the livestock industry in the future.

Farming animals in 2020: issues and options was the focus of the first day of the conference. Papers included *Pastoral farming of animals in 2020 — a committed scientist's view and caveats* by Dr Paul Hemsworth from the Animal Welfare Centre in Melbourne, *Intensive farming of animals in 2020* by Dr Neville Gregory from MIRINZ, and *"Green" animal farming* by Sue Kedgley, Convener of the Safe Food Campaign and Health Spokesperson for the Green Party.

Science and trust: innova - tion on the edge, was the focus of the second day. Speakers explained innovative technologies such as cloning and transplantation in lay terms and considered how science and technology create ethical dilemmas, excitement and fear, and place obligations of trust on scientists, the media, and regulatory authorities. Papers included *A beginner's guide to gene technology* by Dr Sue Galloway from Agresearch Invermay, *Developing public policy on xeno - transplantation* by Dr Stewart Jessamine from the Ministry of Health, *Choosing a future - who will decide?* by Dr Barbara Nicholas from the Christchurch of Medicine, and *Making a profession of science: public trust and concern for public good — a two-way street* by Professor David Mellor and Mr James Battye from Massey University.

Dr Jean Fleming of the University of Otago presented the Cam Reid Oration for 1999. The title of her paper was *Science, scientists and trust.*

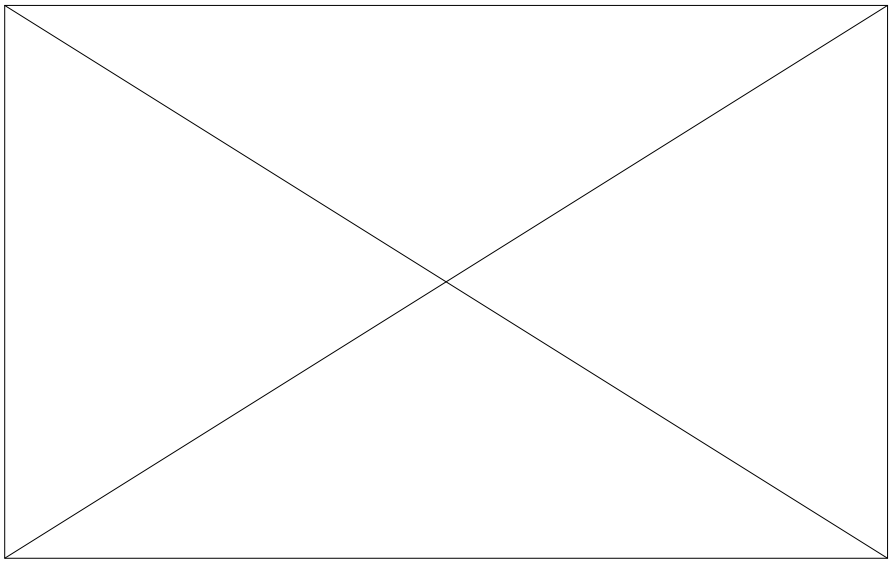
During the two days of the conference a small group of animal activists, who are supporters of Wellington Animal Action, NZ Anti-Vivisection Society and Animal Liberation Front (ALF), and who are opposed to the use of animals in research and teaching, staged noisy protests outside Te Papa from time to time. A bomb scare, believed to have been instigated by the animal activists, necessitated all people visiting Te Papa to clear the building at one stage. Thankfully no damage was reported to the building or injury to any individuals.

Earlier in the week, a small group of ALF supporters also targeted the Royal Society, Victoria University, the Wellington School of Medicine, and the Malaghan Institute of Medical Research.

The attendance of nearly 200 people was the best ever for an ANZCCART conference.

The Proceedings will be published in March - April, 2000

Gill Sutherland
ANZCCART,
Wellington.



Conference Centre - Te Papa Tongarewa - the National Museum of New Zealand, Wellington

Coming up

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

website:
www.emac2000.org

Consciousness, cognition and animal welfare UFAW symposium
11-12 May, 2000
London

Contact: Dr Stephen Wickens, UFAW

Tel: 44-01582-831818
Fax: 44-01582-831414
email:wickens@ufaw.org.uk

Australian Veterinary Association conference
25-30 June, 2000
Perth

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

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

International Conference on Animal Science and Veterinary Medicine towards the 21st century
(ICA SVM 2000)
12-15 August, 2000
Beijing, China

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

XXI World Buiatrics Congress
4-8 December, 2000
Punta del Este, Uruguay

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

Fax: 598-2-916-8902
email: grohr@rohrsa.com;
or
rjsu@adinet.com.uy

News

Animal experimentation in Europe

The European Commission this year published the second set of EU statistics of animals used for experimental and other scientific purposes. The first set of statistics was published in 1994 and covered 1991 and this second set, with one exception, covered 1996.

The 1996 figure was 11.65 million animals used, compared with 11.79 million for 1991. This covers 15 member countries, two of which did not provide data in 1991. According to the report in the newsletter of the Research Defence Society (October, 1999), the real reduction in animal usage over the five year period is probably about 24%. Countries with well-established data recording systems all showed decreases e.g., the UK (18%), Netherlands (25%) and Germany (37%).

Proctor and Gamble eliminates animal tests on broad range of products

On 30 June 1999, Proctor and Gamble announced that, effective immediately, it will end the use of animals in safety tests for their current beauty, fabric and home care, and paper products, except where required by law, in all countries where the company operates. According to a press release, animals will no longer be used in safety tests for "roughly 80 per cent" of finished Proctor and Gamble products including cosmetics, shampoos and hairstyling aids, skin care, tissue and towel products, laundry and dishwashing detergents and household cleaners. "Science and technology have advanced to the point where we can confirm the safety of these finished products through non-animal alternatives," said the company. Over the past 15 years, Proctor and Gamble has invested nearly $100 million dollars in the study and development of alternative research methods. Their decision to end animal testing was reached after confirmation that human safety for these products can now be determined using non-animal methods.

(Source: NABR Update, 1 July, 1999)

Training courses for animal technicians

While a number of universities and research institutions provide training courses in the ethics, legislation and practical issues associated with animal experimentation, there are many which do not. Such courses are intended for honours and post-graduate students, new researchers and members of animal ethics committees. While varying in content, they provide a useful introduction to animal use in research and teaching.

ANZCCART has discussed with the NSW Animal Research Review Panel the need to coordinate and facilitate such courses and wishes to know which institutions currently offer such courses and what is their content, so that they can be made more widely available. Institutions which do offer such courses are asked to provide details to ANZCCART's Adelaide office.

Alternatives in education video

EuroNICHE has released a 33 minute video on alternatives to traditional animal experiments and dissections. Products featured include computer simulations and learning packages, computer-linked human self-testing apparatus, waste organ surgical training apparatus, high-resolution videos, and a veterinary training model.

The film also gives examples of classical experiments in which conventional animal use has been replaced by a range of alternative methods.

Copies of the video are available from Animals Australia for $A30.

To order a copy, contact:

Animals Australia
PO Box 1023
Collingwood
Victoria 3066

Fax: 03 - 9329 6441
Email:Animals@melbpc.org.au

Alternatives website

Sheffield BioScience Programs was established in 1986 and offers a range of high-quality, interactive computer-assisted learning (CAL) programs aimed at enhancing the teaching of physiology and pharmacology to undergraduate medical and science students.

Details are available from:

Dr David Dewhurst
Director of Learning Technology
Faculty Group of Medicine and Veterinary Medicine
The University of Edinburgh
Hugh Robson Link Building
15 George Square
Edinburgh
EH8 9XD, UK

Email: d.dewhurst@ed.ac.uk

http://members.aol.com/Sheffbp/sbp.htm

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

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

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

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

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

or

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