ANZCCART NEWS

Australian and New Zealand Council for the Care of Animals in Research and Teaching

The use of pigs for research with examples of research on housing and handling

The number of pigs used for research in Victoria in the four years prior to 1994 is shown in Table 1. The definition of research is broad and encompasses animal experimentation, demonstration and teaching. In comparison, the approximate annual usage of mice and rats is 200,000 and 45,000, respectively. This information is published annually by the Bureau of Animal Welfare, Agriculture Victoria. In the 1993/94 report, 48% of pigs were used 'to study or demonstrate normal or abnormal body structure or function' or 'to study behaviour in animals' and 9% were used to 'study infection and/or immunity' or 'develop or improve surgical techniques'.

Table 1 Numbers of Pigs Used for Research in Victoria

1990/91	4011
1991/92	3443
1992/93	2303
1993/94	4366

As ANZCCART newsletters have a focus on animal welfare I thought it appropriate to review some of the research undertaken at the Victorian Institute of Animal Science (VIAS) that is particularly relevant to welfare, namely housing and handling of pigs, both of which have been extensively researched over the last 16 years. However, pigs are used for a variety of other research purposes, on pig production and diseases and for basic research in nutrition, reproduction, cardiovascular and other systems, immunology and genetic engineering. Useful source references that encompass worldwide research on pigs are the Index of Current Research on Pigs and Pig News and Information, both published by CAB International.

Housing

To provide some background, an issue of concern to industry is what will happen if sow stalls are phased out, as is due to happen in the UK by 1998. In responding to this type of issue it is important to state at the outset that there are no definitive answers. All systems of housing, whether individual or group, have different inherent problems and these have to be weighed against factors such as producer capabilities and time commitments. A role for researchers is to provide producers with the best options for their particular enterprise.

The most common types of housing for pregnant pigs in Australia are individual housing in stalls, which are basically open-topped and open-sided crates in which pigs can move backwards/forwards but are unable to turn around; and group housing in which pigs are housed in pens of various dimensions and varying group sizes (commonly between 6 and 40). Less common types of housing include tether stalls in which the housing is a partial stall and the pig is prevented from moving out of the stall by a neck collar attached by a chain to the stall. Pigs can be kept in group housing outdoors or in various modifications of indoor group pens, in which individual feeding places can be provided by incorporating stalls into the pens or in which individual feeding can be guaranteed by an electronic feeding system in which pigs with electronic implants or tags are individually given a prescribed amount of feed on entry to a feeding station.

The simple response to any possible phasing out of stalls is that about half of the Australian herd is housed in groups, with no period of individual housing except during farrowing (the period around parturition) and lactation. Group housing, by default, will be the option of choice for the entire herd. However, a decision of this nature is not straightforward, as both systems have advantages and disadvantages. For example, advantages of stalls are that the most costly item in pig production, the feed, can be individually provided and feeding behaviour (as an indicator of "health") can be more easily monitored while disadvantages are that movement and social behaviours are restricted. In group housing, perceived advantages are that pigs have more space and can socially interact with other pigs while disadvantages are the aggression that occurs when grouping (unfamiliar) pigs, the reduced control of feed intake and the perception of increased skills/time required to monitor health/welfare.

Housing is a contentious issue for the pig industry. There are some sectors of the community opposed to animal production, particularly intensive animal production, and there are other sectors that are concerned about the constraints that modern production systems impose on animals. In relation to pigs, the issue was thoroughly aired during the Senate process inquiring into intensive animal production and readers are referred to the report (Anon., 1990) for further information and recommendations. In part, because of concerns for welfare by the pig industry and also because of the advent of the Senate inquiry process, the Pig Research and Development Corporation has funded research at VIAS for a number of years to evaluate the welfare-related responses of pigs to

Elsewhere in this issue ...

different housing designs. This research originally concentrated on individual housing, but since 1990 has included aspects that are more relevant to group housing. The major research outcome on both individual and group housing is the finding that "it is the design of the housing system that is important to welfare rather than the system *per se*". The justification for this statement is provided below.

In the experiments I will review, the assessment of welfare is largely based on the concept of biological fitness and includes both providing evidence of a chronic stress response, based on physiological criteria (i.e. a sustained elevation of plasma free cortisol concentrations), as it is a reasonable belief that if stress increases then welfare decreases, and demonstrating adverse consequences of any observed stress response (i.e. adverse effects on metabolism, production or the immune system). The approach used is described in Hemsworth *et al.* (1996). A typical experiment to examine some aspect of individual housing would have involved 32-40 pregnant pigs, introduced into several stall treatments about three weeks after mating; neck-tether and group housing treatments would have been included as negative and positive control treatments, respectively. After about four weeks in these treatments all the pigs would have been catheterised via the cephalic vein, under full surgical anaesthesia, to enable subsequent blood sampling over the following six weeks. Behavioural measurements would have included aggression around feeding and lying position (front or back) in the stall. Physiological measurements would have included daytime free and total cortisol profiles (from hourly samples between 0800 and 1700 h, as these have been shown to correlate with more frequent samples taken over a 24 h period); the cortisol response to an injection of adrenocorticotrophic hormone (as this response can be higher in chronically stressed pigs); and a measure of cell-mediated immunity.

Using these criteria, research indicated that tether-stalls should have stall partitions covered with steel mesh, rather than open vertical bars, to reduce unresolved aggressive interactions between neighbours (Barnett *et al.*, 1989), while full stall divisions should be of vertical rather than horizontal bars (Barnett *et al.*, 1991). These recommended designs result in levels of stress similar to those found in pigs housed in groups with the current recommended space allowance of 1.4 m^2/pig (Anon., 1994). A common criticism of full-stalls is the restricted movement of the pig. An innovative design of individual housing is the Moorcomfort® gestation stall. The stall is of similar dimensions to conventional stalls but the sides are hinged to create a swing partition between the rear two-thirds of adjacent stalls which allows a pig to "borrow" space sufficient to turn around. The level of stress in a turnaround stall is similar to that in group housing and lower than that found in some designs of tether stalls (Barnett and Taylor, 1995).

If pigs are housed in groups they should not be overcrowded, as this results in a chronic stress response (Hemsworth *et al.*, 1986). There are also some advantages of incorporating individual feeding stalls into group pens, as recommended by the Senate Report on Intensive Animal Production (Anon., 1990). These reduce aggression around feeding and contribute to lower plasma cortisol concentrations (Barnett *et al.*, 1992). However, including either full or partial stalls means that additional space per pig is required. There should be a minimum of 1.4 and preferably 2.0 m^2/pig, excluding the stall area (Barnett, unpublished data).

One problem of housing pigs in groups is aggression that occurs when unfamiliar adult pigs are grouped (e.g., sows at weaning and after mating or selected/purchased young female pigs prior to mating). Some recommendations (Anon., 1994) are very general and provide a dilemma for producers as they do not indicate to which age or class of pig they apply. Behavioural experiments on the efficacy of pen size/shape and design, chemical intervention techniques and time of day of group formation and the presence of feed on aggression and skin lesions have been undertaken to evaluate the recommendations (Barnett *et al.*, 1993a, 1993b, 1994). These experiments have shown that small rectangular pens (1.4 m^2/pig) reduce aggression around grouping by 40% during the initial 90 minutes of grouping; (Barnett *et al.*, 1993a). The inclusion of partial stalls also reduces aggression around feeding by 65% (Barnett *et al.*, 1992), at least in the short term, compared to larger pens. In subsequent experiments, using rectangular pens as a control treatment, aggression was reduced by 83% using an anti-aggression drug*, (Barnett *et al.*, 1993b), and grouping 30 minutes after sunset led to a 35% reduction (Barnett *et al.*, 1994). However, the reduced aggression found following treatment with Amperozide was associated with a near maximal acute stress response which may be accompanied by an indication of malaise in the pig. Thus Amperozide may not be an appropriate treatment to reduce aggression in unfamiliar adult pigs, particularly if injected as in the experiment described (Barnett *et al.*, 1996).

Handling

In modern pig production there is frequent and often intense contact between humans and pigs, particularly young pigs and breeding pigs and a human-animal relationship develops. Commercially produced pigs may be highly fearful of humans (Hemsworth and Barnett 1987) and research on both experimental and commercial pigs has shown that high levels of fear of humans may markedly reduce the growth and reproductive performance (Hemsworth and Barnett, 1987; 1991). As well as these production losses, there are obvious welfare implications. The mechanism involved appears to be a chronic stress response, on the basis of a sustained elevation of free cortisol concentrations. The results of these experiments have more implications for the breeding pig than the grower pig, since the former is likely to receive more human contact. The importance of high levels of fear of humans to production is demonstrated by one study in which fear of humans by sows accounted for about 20% of the variation in reproductive performance between sows on commercial farms (Hemsworth *et al.*, 1989) and subsequent experiments have shown that this is a cause and effect relationship (Hemsworth *et al.*, 1994).

In a study of the human factors that influence commercial pigs' fear of humans, the stockperson's behaviour was a good predictor of the level of

Stockperson				*Pig*	
Attitudes	→	Behaviour	→	Fear *Stress*	→ Productivity and Welfare

Figure 1. Human-animal relationships in pig production

fear of humans by pigs (Hemsworth *et al.*, 1989). A high proportion of physical interactions of a negative nature was consistently and strongly associated with a high level of fear of humans. Most of these negative interactions were hits, slaps and kicks and most were applied with only slight or moderate force. The positive interactions were mainly pats, strokes and hands resting on the back of the pig. One of the factors controlling human behaviours towards pigs was the attitude of the stockperson towards pigs and tasks associated with pigs (Hemsworth *et al.*, 1994). The model (for which there is considerable experimental evidence) showing the influence of stockperson behaviour on pig behaviour and welfare is illustrated in Figure 1.

There are of course a number of other characteristics of stockperspons that may exert marked effects on welfare. For example, the attitude of the stockperson towards pigs may affect such job-related characteristics as work ethic, motivation to learn new skills and knowledge about pigs and job satisfaction, which in turn may affect work performance of the stockperson. Some recent research has indicated clear relationships between the stockperson's attitude and job-related variables (Coleman *et al.*, 1996).

Based on the above research a computer-based training package has been developed for the pig industry to determine individual stockperson's attitudes towards pigs and to modify attitude and behaviour to maximise pig production and welfare. This training package, titled Professional Pig Handling, has recently been released to licensed trainers by the Pig Research and Development Corporation and it is expected that both Australian, and at a later date, overseas stockperspons will attend the course (one whole day and subsequently half a day) to the benefit of piggery enterprises and pig welfare.

Conclusions

This brief review demonstrates that both housing and the attitudes and behaviours of stockpeople are important for pig welfare and production. An interesting aspect of this research that I anticipate will be pursued in the near future is to determine the relative importance of housing and handling to the welfare of pigs. This review also demonstrates that using pigs in research in this manner is important in developing a good understanding of some of the factors contributing to their welfare and the provision of recommendations to industry. It is through the adoption of these types of recommendations by industry that pig welfare will continue to improve and concerns by the community will be alleviated.

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* Amperozide — Hogpax Vet, Pherrovet, Sweden.

An improved method for housing laboratory frogs and toads using a miniature ecosystem

Introduction

There is growing recognition of the need to meet the specific behavioural and physiological requirements of amphibian species used in research, to ensure long-term health in captivity. The most sophisticated housing enclosures provide a choice of diet and microhabitat e.g., basking, hiding and hydration sites within the enclosure to assist metabolism (Buttemer, 1993).

Although developed specifically for the housing of wild-caught cane toads for behavioural research, with very few modifications the methods outlined below would be appropriate for many species of frog. The housing features cheap, low maintenance enclosures including high quality recycled water (using biological filtration), flushing and humidifying sprinklers, areas for swimming, hiding and burrowing, and separate live prey breeding systems (crickets, mealworms and compost worms). Compost worms and peat moss form the core around which the semi-natural housing environment is managed ecologically.

Design of the housing enclosure

A main characteristic of the housing design developed here is the recycling of filtered and conditioned tap water to minimise the deleterious effects of chlorine and other compounds. A balance is achieved between both beneficial and harmful effects of chlorine — chlorinated tap water showers the enclosure in brief periods to help reduce pathogenic infections, and is subsequently dechlorinated and aerated as it travels through the various stages of the enclosure and recirculation system.

Figure 1 illustrates the main features of a typical enclosure which may accommodate up to 20 small toads.

The enclosure is constructed from rust-resistant metal sheeting with dimensions 80 cm square and walls 58 cm high. The metal enclosure is cheap, light and easy to clean. The top of each wall is folded to form a two centimetre wide ledge to support spray-irrigation tubing, the "rain machine" (Mattison, 1993). The floor of the enclosure is pitched from the mid-line to form two slopes 15 degrees from the horizontal. The inclines assist run-off from the irrigation system, and help to flush away accumulated waste products. Slots in the base of the walls drain the run-off into a catchment tray, but are small enough to prevent the escape of most prey species. This arrangement reduces the otherwise daily necessity to remove excreta and undigested food (Buttemer, 1993).

The enclosure sits on a shallow square catchment tray on a stand which is fed into a 75 L plastic bin. The bin serves as the water conditioning tank where water quality is controlled before being pumped back into a waterfall system in the enclosure. A commercially available "wet and dry" filtration unit is also used, incorporating a series of mechanical, chemical and biological (bacterial) filters and a water pump. Under normal operation the filtration unit recirculates more than 850 L of water per day through an enclosure.

Irrigation tubing is used to recirculate the filtered water to the waterfall system in the enclosure. Water is first sprayed from small holes in the tubing, to cascade down and over light mesh (for traction for the animals) which covers the floor of the waterfall, a removable metal tray 24 cm wide. The tray edges are angled so that a deep end is formed to provide a pool area. An outlet near the top of the pool edge diverts excess water into the catchment tray outside of the enclosure, and back into the conditioning tank as run-off. The permanent supply of moving water serves to keep the whole enclosure moist and humid, essential for the long-term survival of frogs and toads (Nace, 1974; Mattison, 1993).

Hides provide varying levels of light, moisture and temperature. A large hide is provided beneath the waterfall tray. Gridded plastic matting is buckled and hollowed to provide additional hides, also providing surfaces to climb over. Natural materials are also used — clean, small hollow logs are ideal, and also serve as hiding places for insect prey.

Horticultural peat moss is used for a range of functions within the enclosure and in other parts of the system. A peat moss tray is provided for burrowing and "form" construction — shallow cavities made by many amphibian species digging with the hind feet into leaf litter or soil. The peat moss trays are metal troughs with drainage holes drilled along the bottom, and filled with dry peat moss. Although the peat moss requires bi-weekly changing, it is a practical alternative to leaf litter or soil. Soil is not recommended for captive amphibian housing due to its potential for causing infection (Welch, 1987). Peat moss pillows are also used — nylon stockings filled to provide moist surfaces for the amphibians to rehydrate, bask or hide beside.

Artificial turf (2-5 mm high) provides traction and avoids bone deformities in amphibians. It retains water to keep the humidity high, and provides a temporary home for compost worms and small insects. Importantly, the turf is easy to wash clean and can be kept relatively hygienic.

Rectangular plastic tubs containing gravel and sand are also provided for burrowing purposes. Both gravel and peat moss are spread over the enclosure floor by the activity of the toads, providing a natural filtration matrix and occasionally blocking drainage holes to create temporary pools of water.

A spray watering kit with an electronic timer is used as a rain machine to provide daily misty showers of three minutes at each dawn and dusk of the light cycle. The spray saturates the turf, digging and basking substrates in the enclosure and helps flush away waste material. Although tap water is used quite successfully for cane toads, the use of a separate pump system instead to drive the rain machine from the water conditioning tank and avoid exposure to chlorine is strongly suggested for other amphibian species (Odum, 1984; Buttemer, 1993).

Diet and living prey systems

As a general rule, live prey must be available at all times, must be as varied as possible and should be fed on a daily basis (Mattison, 1993). Three different species of live prey have been bred easily within the housing room.

Compost worms are used due to their manageability in breeding and their utilisation of waste products from other breeding colonies. A small worm factory was purchased within which the worm population doubles every few months. The worms are immersed in a small container of water to remove dirt and assist their sticking to the inside walls when tossed into the enclosure.

Crickets not only provide protein and roughage naturally acquired in the wild, but also enable stalking and foraging behaviour (Mattison, 1993). The crickets are released into the enclosure after dusting them with powdered vitamin/mineral supplements (dicalcium phosphate and Vitamin D), to avoid

nutritional problems (Nace, 1974; Mattison, 1993). If some crickets manage to hide they are later preyed upon when emerging during night or rain periods. The cricket breeding and rearing box described by Frost (1982) is used with great success. The cricket box requires checking only every second day to clean and replace water trays and monitor hatching from breeding trays of peat moss.

Mealworms are bred in plastic breeding tubs containing two to three layers of unprocessed bran and hessian (Welch, 1987). These colonies are extremely low maintenance and require additional bran only every fortnight and total replacement with new bran every two months.

Summary

Although frogs and toads have been valuable teaching resources for nearly two centuries, their value to biomedical research is comparatively recent, but of increasing importance. Ironically, waning populations of frogs and toads world wide is acknowledged as a barometer of dramatic environmental changes caused by industry. Improvements to laboratory housing of these animals may therefore assist both the production or testing of new drugs, and the conservation of endangered species. Emphasis is placed on providing conditions experienced in the wild to assist the maintenance of the health of captive frogs and toads — controlled water quality, a range of microhabitats and substrates to encourage natural behaviours and a variety of prey. Water is provided automatically in small showers, flushing waste products from the housing enclosure which are then mechanically and biologically filtered from the water. The water is recirculated back to the enclosure as a permanent source for the animals to swim in. Peat moss provides substrates for digging and basking behaviours in the enclosure and a breeding medium for a cricket colony. Used peat moss and waste products from cricket and mealworm colonies are fed to a worm factory, the compost worms from which provide an additional source of prey. We have found that an ecological approach to amphibian housing for research purposes can not only offer an improvement on established methods of housing, but after an initial outlay, can also be maintained economically.

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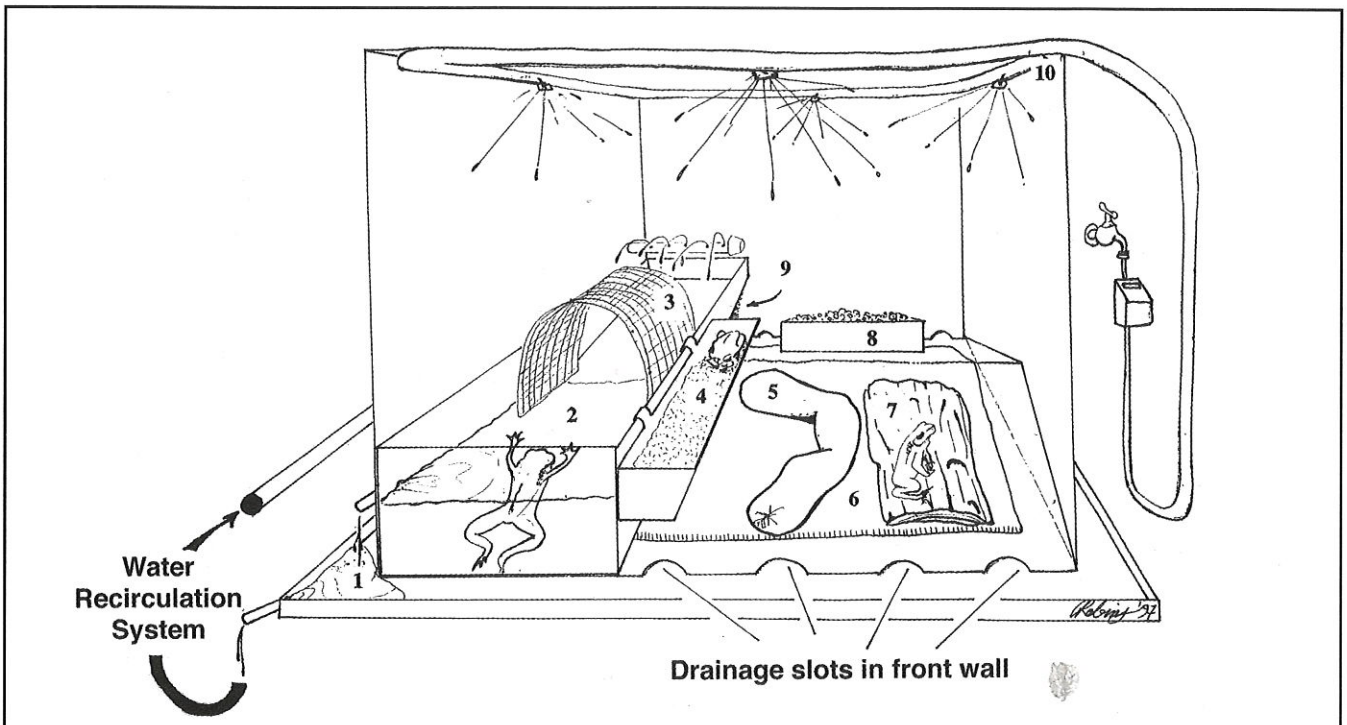

Figure 1.
A typical enclosure arrangement in full operation, with water irrigation systems, inclined floors, hides and substrates for habitation. Up to 20 cane toads have been housed. The front wall has been made invisible for clarity, as has a floor section to illustrate the inclines. The enclosure features are as coded: (1) catchment tray - water drained to recirculation system (not shown); (2) waterfall tray; (3) plastic matting; (4) peat moss tray; (5) peat moss pillow; (6) artificial turf; (7) log piece; (8) sandpit; (9) hide area (underneath rear half of waterfall tray); (10) rain machine with electronic timer.

Modular bioreactors as an alternative to ascitic fluid production of monoclonal antibodies

In order to facilitate milligram to gram scale production of monoclonal antibodies, a core facility was established at Memorial Sloan-Kettering. During the subsequent three years, we have evaluated a number of bioreactor-type devices for this purpose. We have found two bioreactors that function very well in our hands, one of which has proven to rival the efficiency of monoclonal antibody production in ascites fluid.

These modular bioreactors differ from conventional fermenter-type bioreactors in that the production compartment (containing 10 - 30 ml of cells and antibody) is separated from the nutrient compartment (containing 300 - 500 ml of medium) by a microporous membrane that excludes antibody, but allows the exchange of nutrients and waste products.

Modular bioreactors of this type require minimal dedicated equipment, the only unique requirement being a small roller apparatus. The bioreactor which functions best in our hands is also the easiest to use, requiring little more than a good understanding of tissue culture technique and theory. Using a combination of these small bioreactors and a commercially available synthetic serum-free medium, an initial evaluation of fifteen hybridomas gave the following results.

Antibodies were produced at an average concentration of 2.9 $\pm$ 1.4 mg / ml of bioreactor harvest. The average purity of antibody in the harvest was 65 $\pm$ 10 per cent; the remainder of the protein consisted largely of dead cell debris. An average of 31 $\pm$ 11 mg of antibody was produced for each litre of nutrient medium consumed. The production rate for each bioreactor, including the initial lag of 9 $\pm$ 2 days before the first harvest, was 5.8 $\pm$ 3.7 mg / day. The average amount of antibody produced in the first harvest, was 40 $\pm$ 13 mg; production levels generally remained constant thereafter, but subsequent harvests were made more frequently, approximately once every four days.

Each bioreactor required approximately 20 minutes of hands-on time per day, resulting in the production of approximately 20 mg of antibody per hour of hands-on time. There is apparently no upper limit on the amount of antibody which can be produced.

Based on our costs, the production of monoclonal antibodies in these bioreactors is approximately three times the cost of production of ascites. However, animal costs at our Center are extremely low; based on a national average of animal costs. Bioreactor production in modular bioreactors provides many distinct advantages over production in ascites fluid.

One clear advantage is the absence of biologically active contaminating proteins, such as endogenous antibodies, inflammatory proteins, or cytokines, which may be present at high levels in ascitic fluid. Together with the high overall purity of antibody production in serum-free medium (see above), this may eliminate the need for further purification in many applications. An additional advantage is the ability to monitor and evaluate production levels in real-time. Since the contents of the bioreactor can be sampled at will, variables such as cell viability, antibody concentration, or total antibody production can be constantly monitored, allowing bioreactors to be harvested or terminated at the ideal time.

In summary, we find modular bioreactors to be a simple and effective alternative to ascites fluid for the production of monoclonal antibodies on both the laboratory and institutional levels, with advantages that easily outweigh a marginal increase in cost.

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Editor's note: Dr Petrie attended the 1996 Conference of the Federation of Immunological Societies of Asia-Oceania (FIMSA) in Adelaide last December, where he gave a short paper on "Antibody production without using animals". His visit was sponsored by the NHMRC.

This talk and the subsequent demonstration of equipment to produce monoclonal antibodies *in vitro* generated considerable interest, both within the scientific community and the animal rights movement. Following his paper at FIMSA, Dr Petrie visited Melbourne to give a seminar at the Walter and Eliza Hall Institute (WEHI), where he had previously worked for a couple of years.

WEHI utilises *in vitro* technology for production of monoclonal antibodies and Dr Catheryn O'Brien from WEHI will be providing some comments on its efficacy, cost and applicability in Australia in a later issue of *ANZCCART News*.

Readers may obtain more information about the equipment required from Ms L Wilde, of Radiometer Pacific, 19 Walkers Rd, Nunawading, Victoria. Tel. 03-9894 8722; fax. 03-9894 8362.

Further information can also be obtained from the paper by Dean Hewish, "Ascites and alternatives", published last year in *ANZCCART News* (**9**(2): 8-10).

More on *in vitro* production of monoclonal antibodies

ECVAM Workshop Proceedings

The European Centre for the Validation of Alternative Methods (ECVAM) has published the Proceedings of its Workshop 23, on *Monoclonal Antibody Production*. The Report was published in the journal *ATLA* **25**: 121-137 (1997) and is available free of charge from ECVAM as an offprint (with minor amendments).

Participants of the Workshop (held in November, 1996) believed that there are already several scientifically satisfactory *in vitro* methods available. As these are of moderate cost and can be shown to be either better than, or equal to, the ascites production method in terms of antibody quality, they concluded that the *in vivo* production of monoclonal antibodies is no longer necessary, except in rare cases where it is already approved for clinical applications.

A proposed set of European guidelines is attached to the Report as Appendix 1.

Letters

The point of lay descriptions

An abiding problem for all Animal Ethics Committees (AECs) is that lay descriptions are, often, not lay at all. Yet any member of a human experimentation ethics committee knows that complex experiments can be well described in lay terms. In fact, they must be so described in order that subjects are adequately informed about what the experiment will submit them to. So a human ethics committee always rejects an information sheet unless it fully, and intelligibly, informs subjects about why the experiment is being performed at all, and what will happen to them as subjects of it. In any case, subjects who don't understand what they are in for are less likely to enrol as subjects. So the pressure to make things plain in lay terms comes partly from the subjects themselves. Subjects are frequently naive readers. Having long chaired one human ethics committee, I have seen ample evidence that excellent lay descriptions of complex experiments are frequently written for subjects with no very advanced reading age.

I sometimes think that, with animal experiments, the device of imagining that one has to explain to the subject of the experiments its aims, the value of its results and just what is to be done to the subject may be a helpful fiction in generating good lay descriptions. One or two of my expert colleagues think so too. Pretend that the lay description is an information sheet! I include the suggestion for whatever it may be worth and without claiming much novelty for it.

The need for good lay descriptions in the human context is clear and researchers usually give it a high priority. What are the needs for lay descriptions in the area of experiments on animals? Lay members of AECs must make informed judgements, obviously, but why not meet this by discussion between lay and expert members in committee?

A diet of barely intelligible technical descriptions tends to disempower lay members in the long term. Each member should be in a position to form a clear view of the ethical issues posed by an experiment before the meeting. Lay members may well revise their judgment in the light of discussion; so may expert members, one hopes. But the paper work should allow each member to arrive at the meeting with clear reasons, or well formulated doubts, justifiable at least in the first instance, for which the documents must provide. If lay members have no clear idea why the experiments are being done, or what is to befall the animals, then they are under pressure in committee to decide, without time for serious reflection, on what their expert colleagues have just told them. They become gradually less confident of the independence of their contributions; gradually they come merely to echo their expert colleagues. This erodes the autonomous, independent, external kind of critique envisaged by the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

So much may be obvious. But lay descriptions don't aid only lay members; they help ethical appraisal for every member. The submission of a protocol to an AEC ideally obliges the researcher to step back from his absorption in the clinical details of his work and the ambitions that may be driving it, to adopt a new stance, in which he is engaged with, or attached to, the subject of his work; he is obliged to think about the value of the experiment in a broader context. The new stance is an ethical one.

The phrase "clinical detachment", is a cliche for good reason. Clinical language is designed for detachment as well as for precision. The value of detachment in science is well understood. It would be absurd to insist that it is impossible to appraise an experiment ethically which is (wholly or in large part) clinically described. But it is not absurd to claim that ethical appraisal is fostered for all AEC members and for researchers themselves when an experiment is couched in language which lends itself to moral concerns and values. We must all draw our ethical conclusions by thinking them out in lay language. The language of science is not an apt mode of expression for ethical thought; it cultivates a distance from pressures of emotion and evaluation, and that for the best of scientific reasons. So the researcher should not see the lay-language part of the submission as requiring him to unbend from normal rigour and precision so as to be loosely intelligible to "ignoramuses". Part of the exercise is to enable him to come to grips, himself, with evaluative issues on which, in most cases, he is no expert at all.

That points to another problem: failure to give a good lay description is failure to take an ethical stance — on the face of things, anyhow. Shouldn't the committee ask, not just whether or not the researcher is conducting an ethically acceptable experiment, but also whether or not he has considered it thoroughly enough, ethically, to understand what is needed for anyone else to consider it ethically, too. Of course, the AEC has to judge the experiment, not the researcher, but, in practice, the line between these judgements may be rather fine.

Lastly, there is the question of record. Perhaps it is another useful fiction to imagine the protocols and the minutes of meetings as being later perused and evaluated. But perhaps not! In any case, I find it sharpens my attention on lay descriptions to suppose that the record may well be a matter of careful, perhaps litigious, scrutiny. I ask myself: under such an examination, are you confident that an impartial observer would have good reason to think that you understood what you were judging to be ethically acceptable? That your judgement really was informed, comprehending and properly scrupulous? If such questions can't be answered positively, then there has to be a question whether the record shows that the committee and the researcher have acted with proper responsibility.

Graham Nerlich
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University of Adelaide

Standard Operating Procedures (SOPs)

Workloads and expectations of AECs are increasing progressively; applications are increasingly complex in their experimental protocols and techniques, and more detailed consideration of applications is expected with the new Code of Practice. One means of streamlining AEC procedures is the adoption of "Standard Operating Procedures" (SOPs). This has already occurred to varying degrees in several Institutions and AECs. Almost any procedure or technique can be defined as an SOP. They may be relatively simple, such as a procedure for taking a blood sample or more complex such as a protocol for monitoring near term ewes carrying instrumented foetal lambs.

The advantage of SOPs is that an AEC can approve a specific procedure and whenever that procedure appears

in an application it will not have to be reconsidered in detail on each and every occasion. It has benefits for investigators as they can cite a SOP rather than having to explain a standard procedure on every occasion they wish to use it. SOPs would be approved by an AEC for one, two or three years. Obviously the SOPs adopted by a particular AEC will vary according to the nature of the discipline and the type of research undertaken.

Clearly, ANZCCART could play a significant role by establishing a "bank" of SOPs. This would assist AECs who would otherwise have to start from scratch and develop each and every SOP. An AEC would have an opportunity to review a SOP approved by another committee and adopt it or modify it for local conditions

It is suggested that Institutions and AECs forward copies of their approved SOPs to ANZCCART for collation. These can be listed periodically in the Newsletter and copies provided on request.

Tony Luff
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Monash University, Melbourne

How many is just right? Getting the correct number "n": a point for consideration for ethics committees

The necessity for *justification* of sample size should be standard procedure in experimental studies. However, the casual observation of the author suggests that on a few occasions, experimenters may be nominating animal numbers on a subjective basis. This article argues against such practices and raises the issue for statistical justification of "n" as a mandatory issue for ethical consideration.

The childhood story of *Goldilocks and the Three Bears* is perhaps our first encounter of a scientist at work. Alone in the wilderness the researcher attempts to establish the most appropriate temperature of breakfast cuisine. Not too many degrees, and not too few, but getting it just right was the goal. The story goes on to show a variety of situations where making a decision between too little, or too much, became increasingly difficult, and even involved specimen destruction. Has this yarn left us with an unconscious reserve for decisions that involve finding the right figure between too much or too little?

Why should a particular "n" number of subjects used in experiments be a front line ethical issue? Casual witness of ethics approvals by the author raises questions on how much importance is currently given to justification of "n". The numbers chosen mean something to the experimenter, but that meaning is not always articulated. This tends to suggest that the numbers selected may be "feel good" numbers and gives tacit approval to the thought that ethics is not associated with justification of sample size.

After all, why should anyone be concerned with the numbers chosen by the experimenter? The reasons for concern lie in the resources granted to the experimenter by the community to carry out the procedure, as well as the more traditional concern for the animals' welfare. So, by implication, ethical concern here has both an economic and a welfare perspective.

How can economics have an ethical dimension? In the simplest case, it is unethical to approve an experiment where too many animals are used. It is self evident that it is unethical both from the point of view of the welfare of the animals, and equally unethical from the obvious waste of research dollars used in procuring the excess animals.

The reverse is also true, as it is unethical to give support to an experiment where *not enough animals are used.* Scientifically and ethically, this can give rise to the worst possible outcome, where the data cannot be published, which effectively means that all animals, and all of the research dollars for the experiment, were wasted.

Using "n" that is too small can mean the we have failed to reject the null hypothesis, when that null hypothesis is not correct. Called a type II error, it occurs when the null hypothesis is accepted when the alternative hypothesis is true. This can occur when the experimental design did not have enough *power* to find a small, but important difference. This is where lack of justification of sample size "n" gives rise to a profound scientific risk.

Ethicists look to Goldilocks's number - "Gn"

How then, do ethicists draw a line in the sand and say, "for a given situation the number of animals required will be "Gn". This is a number that is not too many, not too few, but just right, in other words, Goldilocks's "Gn".

The answer must come from the experimenter. It should be mandatory for the experimenter to articulate how the number of animals to be used was derived. At present this is not always the case for ethics approval. It is extremely important that the experimenter be able to specify the statistical basis for "Gn", with both the alpha (usually at 0.5), and the power set (usually at 80 per cent), also being justified by the experimenter. A third element, that of the estimate of variability should also be articulated. It is most likely that individuals sitting on an ethics committee can help with these issues. Researchers should use their ethics committee as a resource and not just as a rubber stamp.

Unfortunately, on some occasions, this statistical justification is not occurring as part of ethics approvals. This fosters suspicions that the numbers represent convenience. If that is the case, is this not bad science? A solution is to set a mandatory requirement for statistical justification of "n". Ethics and good science are one and the same.

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Wodonga, Victoria

Editor's Note

For an interesting discussion of the question of optimal animal use in experimentation, readers are referred to a recent "Protocol Review" on this topic in the journal *Lab Animal* (March, 1997, pp. 20 - 22). One of the primary responsibilities of an animal ethics committee (AEC) is to ensure that the number of animals proposed for use is the minimum necessary for the study. This is one of a regular series of short case studies on issues of interest to AECs. Each case study is a hypothetical situation at the "Great Eastern University", somewhere in the USA. Evaluations of the case study follow, together with comments by one or two persons with experience of the particular situation described. In this case, the AEC at the Great Eastern University was challenged by a new veterinarian arriving at the University, who claimed that a standard operating procedure utilised by the AEC violated the US Animal Welfare Act. This procedure allowed investigators to be exempted from submitting a full protocol if they wished to use organs or tissues from animals to be euthanased in unrelated studies. This also applied to tissues or organs to be obtained from an abattoir. The problem was difficult and revealed a number of "grey areas" regarding interpretation of the legislation and the appropriate procedure to be followed by an AEC.

Newly published

❖ *The human / research animal relationship*

ANZCCART's US counterpart, the Washington-based Scientists' Center for Animal Welfare (SCAW), regularly holds workshops and conferences on issues associated with the welfare of animals used for scientific purposes. SCAW publishes a quarterly newsletter and its publications are available from ANZCCART's Adelaide office. SCAW markets ANZCCART's publications in the USA and vice versa.

This, the latest SCAW publication, tackles a difficult but important subject — the bonding that inevitably occurs between the animals and their caregivers and / or the research staff who work with the animals. SCAW sponsored three workshops between 1992 and 1994 on this topic and this publication represents their Proceedings. In publishing this 104 page monograph, SCAW hopes to heighten the awareness of those who work with laboratory animals about the human / animal bond in the research setting and to foster an open approach to discussion.

The monograph includes eleven papers, opening with a keynote paper by Arnold Arluke on 'The well-being of animal researchers' followed by a paper by Richard Simmonds on 'History of the human / animal relationship'. The remaining papers cover human and animal perspectives of this relationship, as well as the effect of experimental factors on the animals. It concludes with two papers on staff — 'Coping with burnout in the human / research animal relationship' by Bonnie Mader and 'Personnel considerations: hiring, training, attitudes' by Timothy Mandrell.

Copies are available for $A60 from ANZCCART's Adelaide Office.

❖ *Transgenic animals as human disease models*

The use of animal models to study human diseases was briefly discussed in *ANZCCART News* **9**(2):11 (June, 1996), following the publication of four papers on this topic by the journal *Lab Animal* in its February, 1996 issue (**25**(2)).

The development of transgenic animal models of human disease was recently featured by the journal *Laboratory Animal Science* in its April, 1997 issue (**47**(2)). The first of these, 'Practical development of genetically engineered animals as human disease models' is by Tatsuji Nomura, who specialises in this field in Japan. His paper is an overview of the production of transgenic animals since 1980 and describes how best to establish genetically engineered animals as valid animal models. The development of transgenic mice carrying the polio virus receptor gene is used as an example. These mice were produced by the introduction of the human polio virus receptor gene into the mouse genome, mainly to study the molecular mechanisms of pathogenesis of the virus. These mice mimic human and non-human primate susceptibility to polio virus infection and thus serve as a model for the study of the disease and for the assessment of polio virus vaccines. They may be able to be used as a replacement for non-human primates in the neurovirulence testing of oral polio virus vaccine.

The other three papers in this special section of the journal cover specific examples of the use of transgenic animals as human disease models. They are;

- 'Development of a neurovirulent testing system for oral polio virus vaccine with transgenic mice' (I. Levenbook and T. Nomura);
- 'Rapid carcinogenicity testing system with transgenic mice harbouring human prototype c-HRAS gene' (S. Yamamoto *et al.*);
- 'Activated and inactivated renin-angiotension system in transgenic animals: from genes to blood pressure' (A. Fukamizu and K. Murakami).

❖ *Investigating vertebrates*

This is a practical guide to the ethics and study of vertebrate animals in secondary schools. It is designed for senior biology classes and includes sections on planning science, the ethics of animal study, practical study of domesticated animals and science in society. The 74-page guide and 22-page student workbook were written by Dr Peter Davie, from the Faculty of Veterinary Science at Massey University, Palmerston North, New Zealand. A description of the guide was given in the paper by Dr Davie at the 1996 ANZCCART Conference, and is included in the published Proceedings. Copies of the guide are available from Dr Davie at $A50 per set, including postage. The guide can be copied for use in Australian and New Zealand secondary schools.

❖ *Using the Internet*

The November, 1996 issue of the journal *Lab Animal* included two useful papers on how investigators, AEC members and others can utilise the Internet.

The first paper, "A laboratory animal Internet primer" (*Lab Animals*, **25**(10): 23 - 29), is by Ken Boschert from Washington University, St Louis. Dr Boschert attended the Monash University Animal Welfare Conference in Melbourne in 1995 and spoke on a similar topic. This article is a basic introduction to the Internet for laboratory animal scientists and concludes with information about some of the main electronic mailing lists available in this field. These include "RAT-TALK" and "COMPMED".

The second paper "A World-Wide Web-based method of organising ongoing research", by Norbert Myslinksi and Calvin Hisley (*Lab Animals*, **25**(10): 32-35), describes how to use the Web to obtain information. It uses a hypothetical research project as an example and shows how to find available information by using key word searches.

❖ *UFAW Proceedings on Veterinary Behavioural Medicine*

UFAW has recently published the Proceedings of the First International Conference on Veterinary Behavioural Medicine held by the European Society of Veterinary Clinical Ethology in Birmingham in April, 1997.

The Proceedings include 32 papers, two workshops and poster presentations. The emphasis is on behavioural problems, principally in dogs and cats, but with some reference to rabbits, horses and birds. The 242- page Proceedings have been edited by DS Mills, SE Heath and LJ Harrington and are available from ANZCCART's Adelaide office for $35.00, including postage within Australia.

Hot topics

ANZCCART intends to feature controversial hot topics for discussion in its letters column. Two topics are highlighted here — cloning and the use of pound dogs and cats for research and teaching. Each of these raises difficult ethical and social issues and generates strong feelings in many people Your comments on these are invited and a selection of responses will be published in the September issue. Please forward your comments to ANZCCART's Adelaide office by no later than 1 September.

As the third objective of ANZCCART is to generate informed discussion and debate within the community regarding the use of animals in research and teaching, ANZCCART looks forward to a stimulating and informed debate.

The use of pound dogs and cats for research and teaching — What are your views?

The recent publicity in NSW regarding the supply of pound dogs for research and teaching has again brought this topic into the public arena (*Sydney Morning Herald*, 10 April, 1997, page 3). The number of dogs and cats euthanased each year in Australia and New Zealand by local councils and animal welfare organisations is not known, but could be as many as 100,000.

In the past, a small number of these were supplied to universities and research organisations, where they were used either for research or for teaching. The five veterinary schools in Australia and New Zealand have traditionally used dogs for teaching veterinary anatomy and dogs and cats for teaching surgery.

In recent years, many local councils have stopped supplying dogs and cats, as have all animal welfare organisations. Arguments in favour of their use have been put by universities and research bodies, but have met with increasingly strong resistance from the public and from animal welfare and animal rights organisations (see *Animals Today*, February - April 1997, pp. 14 - 15).

What are researchers and teachers doing? How can this sensitive and emotive issue be handled?

Cloning — What are your views?

The publication in February this year of the paper by Wilmut *et al*: (*Nature* **385**: 810-813) on cloning of sheep has generated enormous media coverage around the world. There could hardly be a person in Australia or New Zealand who has not read about it and wondered about its implications.

There have since been a number of reports from other groups on cloning macaque monkeys, sheep, cows and of course there has been much discussion of the practicalities and legal and ethical implications of cloning humans. A detailed discussion of the scientific and ethical issues relating to cloning was published in *The Bulletin* (11 March, 1997). An interesting discussion ('Weighing up the rules against more of the same'), by Associate Professor Loane Skene, former Chairman of ANZCCART, was published in *The Age* (27 February, 1997).

Professor David Morton to visit Australia

Professor Morton, who holds the Chair of Biomedical Science and Ethics at the School of Medicine, University of Birmingham, UK, will be visiting Australia and New Zealand in September this year. He will be a keynote speaker at ANZCCART's Conference in Auckland on 19 and 20 September, where he will give two papers:

- *Recognising animal pain and suffering during experiments*; and
- *Death as an end point*.

Prior to this Conference, Professor Morton has accepted ANZCCART's invitation to speak in Melbourne, Adelaide and possibly also in Sydney. The tentative title of his seminars will be *The recognition and relief of pain in experimental animals*. His itinerary (to be confirmed) is:

- University of NSW, 14 or 15 September;
- University of Adelaide, 15 September;
- University of Melbourne, 16 or 17 September.

After the ANZCCART Conference in Auckland, Professor Morton will be speaking at the ANZSLAS Conference in Brisbane from 22 to 24 September. For further information, please contact ANZCCART's Adelaide office.

ANZCCART to participate in other Societies' conferences

This was one of the recommendations of the 1995 Review and is now being implemented. The objective is to raise ANZCCART's profile in the research community and to provide stimulating speakers on topics relating to ANZCCART's sphere of interest. Five conferences have been targeted so far, four this year and one in 1998. The conferences, speakers and topics are:

- Australian Mammal Society, Clare, SA. 7 - 9 July, 1997. Mr Vaughan Monamy will speak on "The revised (1997) Australian Code of Practice for the Care and Use of Animals for Scientific Purposes: issues for wildlife biologists".
- Australian Physiological and Pharmacological Society Annual Conference, Adelaide, SA. 29 September - 1 October, 1997. Professor David Mellor will speak on the topic "Discovering and expressing ethical integrity as an animal-based scientist".
- Australian Society for Medical Research, Annual Conference, Adelaide, SA. 23 - 26 November, 1997. Professor Andrew Brennan from the University of WA will speak on the topic, "Trust, integrity and animal research".
- Australasian Society for Clinical and Experimental Pharmacology and Toxicology (ASCEPT), Annual Conference, Canberra. 1-3 December, 1997. ANZCCART will host a careers session and will be represented by Associate Professor Rosemarie Einstein.
- ANZCCART-sponsored Animal Welfare Workshop at the FAOPS / FAONS Conference, Brisbane. 27 September - 10 October, 1998.

Listserver — please use it!

This listserver was established last year following the 1995 Review of ANZCCART and a resolution from the Board. Its purpose is to provide a forum to raise and discuss interesting and topical issues relating to the use of animals for scientific purposes. It presently has about 30 members, but needs many more. If you are interested in joining this listserver, please email ANZCCART's Adelaide office with the following message:
SUBSCRIBE anzccart-request@waite.adelaide.edu.au. Once registered with the list mail must be addressed to: anzccart-list@waite.adelaide.edu.au.

1996 Conference Proceedings now available

ANZCCART's 1996 Conference was held in Canberra and addressed the theme *Animals in Education: Value, Responsibilities and Questions.* There were 16 papers in five sessions, which covered the following topics:

- human-animal interactions and education;
- animals in schools: responsible use and questions;
- the use of animals in tertiary education: challenges, benefits and needs;
- alternatives to animal use in education; and
- legal, moral and ethical obligations.

In addition there was a discussion session involving secondary school students. This and other discussion sessions were recorded and edited transcripts are included.

Copies of the proceedings are available from ANZCCART's offices in Adelaide and Wellington for $A20 or $NZ25. An order form is enclosed with this issue.

ANZCCART's 1997 Conference

Don't forget to register for this year's conference, to be held in Auckland on 19 - 20 September. The theme is "Ethical approaches to animal-based science". The program is interesting and stimulating and includes two speakers from the UK, as well as many from New Zealand and Australia.

There will once again be a one day workshop for Animal Welfare Officers on the day before the Conference (Thursday, 18 September). This will be held in Auckland and is open to interested persons from universities and other scientific institutions in Australia and New Zealand. There is no registration fee, but persons interested in attending are asked to contact Ms Kate Horrey, MAF, Wellington, as soon as possible.

Email: horrey@ra.maf.govt.nz; fax: 64-4-474 4133.

Coming up ...

ANZCCART 1997 Conference
19 - 20 September, 1997
Auckland, New Zealand
"Ethical approaches to animal-based science"
Contact: Mrs Gill Sutherland
PO Box 598, Wellington, New Zealand
Tel: 64-4-472 7421
Fax: 64-4-473 1841
Email: anzccart@rsnz.govt.nz

Twenty-first Annual ANZSLAS Conference*
22 - 24 September, 1997, Brisbane
Contact: Dr Ivor Harris, CABH.
University of Queensland, PO Box 125
Kenmore, Queensland 4069
Tel: 07-3365 5725
Fax: 07-3365 5784
*** Note change of dates**

Electronic Media and Application for Research Facilities Conference
25 - 26 September, 1997
St Louis, Missouri
Sponsored by SCAW, OPRR of NIH and Washington University in St Louis
Contact: SCAW, 7833 Walker Drive, Greenbelt MD 20770, USA
Tel: 1-301-345 3500
Fax: 1-301-345 3503
Email: scaw@erols.com

ANZAAS 1997 Conference
28 September - 2 October, 1997, Adelaide
Contact: ANZAAS 97
The University of Adelaide,
Adelaide SA 5005
Tel: 08-8303 4540
Fax: 08-8224 0464
Email: anzaas@geology.adelaide.edu.au

Endocrine Society of Australia and Australian Society for Reproductive Biology Conference
28 September - 1 October, 1997, Canberra
Contact: Ms Patricia Tart, C/- ACTS, GPO Box 2200, Canberra ACT 2601
Tel: 06-257 3299
Fax: 06-257 3256

Genetics Society of Australia Conference
28 September - 1 October, 1997, Perth
Contact: GSA Conference, Dept. of Botany, University of WA, Nedlands WA 6907
Tel: 08-9380 1862
Fax: 08-9380 1001
Email: GSAConf@cyllene.uwa.edu.au

Australian Physiological and Pharmacological Society Annual Conference
29 September - 1 October, 1997, Adelaide
Contact: Dr Dan McHolm,
Dept of Physiology, University of Adelaide, SA 5005
Tel: 08-8303 4732
Fax: 08-8303 3356
Email: dmcholm@physiol.adelaide.edu.au

41st Australian Society for Biochemistry and Molecular Biology Conference
29 September - 2 October, 1997, Melbourne
Contact: Convention Associates
13 Jeffrey St, Mt Waverley Vic 3149
Tel: 03-9887 8003
Fax: 03-9887 8773
Email: ca@netwide.com.au

Australian Institute of Medical Scientists and Australasian Association of Clinical Biochemists Conference
6 - 10 October, 1997, Perth
Contact: Ms Barbara Fry, PO Box 278, Mt Lawley WA 6929
Tel: 08-9370 5224
Fax: 08-9370 4409
Email: aacb@perth.dialix.oz.au

Australian Society for Medical Research Annual Conference
23 - 26 November, 1997, Adelaide
Contact: Ms Jenny Blanchard
PO Box 153, Nairne, SA 5252
Tel / Fax: 08-8388 6164
Email: dleaver@medicine.adelaide.edu.au

Australasian Society for Clinical and Experimental Pharmacology and Toxicology Conference
1 - 3 December, 1997, Canberra
Contact: Dr Margaret Hartley,
ASCEPT Secretary, 145 Macquarie St, Sydney NSW 2000
Tel: 06-289 7444
Fax: 06-289 7222
Email: margaret.hartley@al.cbr.hhcs.gov.au

14th Australasian Biotechnology Conference
"Food and Health for the 21st Century"
19 - 23 April, 1998, Adelaide
Contact: PO Box 153,
Nairne SA 5252
Tel / Fax: 08-8388 6164
Email: Biotech.Conf@flinders.edu.au

News from overseas

PRIM&R and ARENA — San Diego, USA March 16-18, 1997

The ARENA conference, with approximately 400 registrants, was entitled "Implementing the Regs: An ARENA Primer "Back to Basics" . ARENA (Applied Research Ethics National Association), was founded in 1986 and has a practical focus on "how to do it". PRIM&R (Public Responsibility in Medicine and Research) has a more philosophical focus and raises the issues of "what needs to be done." The initial goals of the association focussed on advancing science while protecting human subjects, but it incorporated animal research into its objectives in 1983. Registrants included veterinarians on Institutional Animal Care and Use Committees (IACUCs), administrators, scientists, government and regulatory representatives.

The goals of US legislation appeared very similar to those in Australia and New Zealand. Much prerogative is left with investigators and the institution in interpreting the regulations. The law is not prescriptive and responsibilities rest with individuals — the "spirit of the law rather than the word of the law is the key". IACUCs are grappling with the same issues, except the magnitude of protocols reviewed is significantly greater. Another significant difference is that an animal welfare representative is not a mandatory membership category on IACUCs. Corresponding to the Australian Categories C and D is an unaffiliated member category. I was left with the impression that our requirement to include welfare representatives on our committees has resulted in an increased harmony between the scientists and the community and a more collaborative approach to animal welfare.

The Prim&R Conference, attended by 500 registrants, followed the ARENA Conference and was entitled "Animal Care and Use in a Changing Research Environment: Ethics, Technology, Accountability and Efficiency"

A 400 page book incorporating educational materials was provided and included selected published papers and editorials, including some ANZCCART publications, as well as original contributions. The educational material was grouped under the major themes of the conference.

Of interest was a talk given by Dr J Macarthur Clark, a member of the UK Advisory Group on the Ethics of Xenotransplantation (Kennedy Committee) which is reviewing the acceptability of xenotransplantation and the development of an ethical framework. Some of the very real problems associated with xenotransplantation including its significant costs, community health risks and animal ethics, were highlighted. The emergence of xenotransplantation will require very close collaboration between Institutional Biosafety Committees, Human Research Ethics Committees and Animal Experimentation Ethics Committees, a structure not currently in place in Australia but more evident in the USA.

The conference included panel presentations and workshops covering a range of issues such as IACUC roles and responsibilities, training, Occupational Health and Safety through to research non-compliance, NASA's Life Sciences Program, difficult protocol review issues and international trade issues. Certainly with 10-11 concurrent workshop sessions there was adequate choice to cover a range of interests. An added bonus was the Conference resource room which displayed computer and audio-visual aids as well as information pamphlets and booklists available from various agencies.

Conference proceedings will be available later in the year. For further information contact Joan Rachlin 132 Boylston Street, Boston MA 02116, USA. Facsimile: 1- 617-423 1185.

Julie Ferguson
Garvan Institute of Medical Research
Sydney

Europe

In the February 1997 issue of *EBRA Bulletin*, published quarterly by the European Biomedical Research Association, Dr Mark Matfield discussed the proposal by the European Commission in 1992 to halve the number of animals used each year in experiments across Europe by the year 2000. This is being challenged by the European Commission. The matter is currently under discussion to try to reach an acceptable compromise.

This issue of *EBRA Bulletin* includes a double-page "issue tracker" table. The issues here are primates, the number of animal experiments (see above), transgenic animals, alternatives, accommodation and husbandry, and status of animals. A number of parameters affecting each issue are considered, including focus, history, target, actors (organisations concerned) and next event (i.e., future time frame).

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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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E-mail address: anzccart@waite.adelaide.edu.au
http://www.adelaide.edu.au/ANZCCART/

or

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PO Box 598, Wellington, New Zealand

Tel. 64-4-472 7421: Fax. 64-4-473 1841
E-mail address: anzccart@rsnz.govt.nz
http://webtwo.rsnz.govt.nz/anzccart/anzccart.html

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