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The Question of Enrichment

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Animal Ethics Committees (AEC) around Australia and New Zealand (and presumably elsewhere in the world as well) place great importance on the concept of environmental enrichment and will generally insist that some appropriate form of environmental enrichment is part of any approval that involves holding animals for a period of time. This does of course mean that people will occasionally ask why environmental enrichment is such a priority and is it really relevant to the welfare of the animals or just something that makes researchers and AEC members feel better. It is probably reasonable to assume that it will make the animal care staff, who devote so much time and energy to looking after animals feel a lot happier and that may be an additional benefit. There may also be occasional questions about the relevance of enrichment and whether or not it might be appropriate and/or an impediment to the proposed work.

It is pretty clear that the inclusion of items that enrich the lives of animals can also influence the outcomes of

experiments because of the positive effects they have on those animals. Clearly each case would need to be considered on its own merit, but presumably still with the underlying thought that provision of appropriate enrichment should be the default position.

In order to address this issue, it might pay to ask a few questions such as: "Do the enrichment measures provided actually enrich the animal's life?" "Do they serve any useful purpose?" "Do they help the animals express more normal behaviours?" If we wanted to take it a step further, we might ask an even more fundamental question: If the same measures were provided to them in their natural habitat, would they want to make use of them?

When it comes to common laboratory species like mice for example, the most commonly employed form of enrichment would be ensuring that they are housed in appropriate groups rather than in isolation and the provision of some nesting material. Other forms of enrichment

that are routinely employed include the provision of pieces of wood or other material suitable for gnawing on. Enrichment for rodents also commonly includes the provision of some form of shelter which could be as simple as a section of cardboard roll or a shelter made of coloured Perspex that allows the mouse to feel like it can hide away unseen, even though it may still be visible to research and animal care staff. More complex forms of enrichment may include elevated platforms, marbles or even the archetypical exercise wheel commonly provided to pet mice, which might lead to different enrichment options being divided into two broad categories: functional enrichment (which would include things like dietary supplements, housing and bedding materials for example); and recreational enrichment (including exercise and distracting items that do not serve any essential needs but do provide what might be considered to be 'enjoyment' such as climbing options or other forms of 'play' activity).

The style and number of enrichment options used in a cage perhaps need to be considered logically rather than from an emotional standpoint. An emotionally driven decision may be to provide the mice with as many options as available, while a more logical approach may mean restricting the measures provided to one or two of the most appropriate only, with consideration of any specific requirements associated with the work being undertaken.

I think there has been enough empirical experimentation done with, for example, the provision of bedding material for rodents in animal houses over many years now, for us to be absolutely comfortable that this form of enrichment is not only worthwhile but almost an essential part of animal husbandry. I use the word 'essential' because it does serve a number of fundamental purposes. It would seem pretty clear that this kind of enrichment would qualify as a functional form of enrichment but it is also commonly used as a measure of welfare because rodents who are healthy and happy are generally keen to use this kind of material to build a nest. Such nest building activities are also an important aspect of thermoregulation as the ambient temperature in animal facilities is usually around 22 - 23°C compared to their body temperature of 37°C.

However, when it comes to more elaborate measures that are often suggested, some questions might still remain. One such measure might be the provision of equipment like exercise wheels. The use of an exercise wheel would obviously not be considered part of the normal daily routine for your average wild mouse so it might be reasonable to ask if they would even use one by choice if it were provided. Thanks to some foresight and a very simple experiment conducted by a group at Leiden University in The Netherlands, we

now have the answer to that very simple question. Inspired by questions from animal welfare committees at universities about whether mice really enjoy wheel-running, the two Dutch researchers placed exercise wheels outdoors in a yard and in an area of dunes and monitored the wheels with motion detectors and automatic cameras. The answer they obtained was an unequivocal, yes, they do. However, even with such a simple experiment, it turns out there was more to it than just that, because not only mice, but also rats, shrews, frogs and even slugs also chose to play on it as well. True, the frogs did not exactly run, and the slugs probably ended up on the wheel by accident, but the mice certainly appeared to enjoy it. That, scientists said, means that wheel-running is not a neurotic behaviour found only in caged mice. They like the wheel.



Wild mouse using an exercise wheel outdoors

What these observations do not tell us is whether or not wheel running is an appropriate form of enrichment for laboratory mice. It is certainly going to provide mice with exercise (and the potential metabolic effects that may go with that level of activity) as well as a source of distraction and that may be an additional experimental variable in some situations.

When it comes to the more standard sources of enrichment commonly used for laboratory mice such as hides and bedding material, they too come with true benefits and potential down sides as well - depending on circumstances, experimental parameters and individual experimental requirements. For example, the provision of shelters or hides can be a source of comfort and respite for rodents, or they may be a cause of disputes or even damaging fights. Equally, while one of the key aims of providing enrichment would be the alleviation or elimination of stress – an excellent aspiration in most cases, there may be times where this in itself could be a problem; like when looking at models of stress. So there may be times where applicants may specifically request the exclusion of some or all enrichment measures and these will need to be considered by the AEC. However, basic measures such as the provision of bedding material is generally

regarded as an important part of both productive activity and body temperature conservation, but in situations where dietary restrictions or strict metabolic balance parameters must be met, this kind of material can become an extraneous source of nutrient and if eaten in large quantities, can also be a cause of serious health complications such as bowel obstructions.

While I have tended to focus on laboratory species such as rats and mice, exactly the same logic can and should be applied to other species under investigation. Whether it is the inclusion of hay bale stacks as windbreaks/shelters in sheep or cattle paddocks or clay pots and water weed in an aquarium as a hide for fish, these basic but important forms of enrichment can become a cause of dispute or additional nutrient. So, while any application to use animals should include consideration of appropriate environmental enrichment measures and give careful thought to the type of enrichment that will best suit the animals under consideration, we do need to be open to convincing arguments against the inclusion of such measures when required. Whether the exclusion of enrichment measures needs to be short-term or long-term would also be an important consideration.

Research, testing and teaching amendments to New Zealand's animal welfare legislation

Virginia Williams, Immediate Past Chair of the National Animal Ethics Advisory Committee

New Zealand's Animal Welfare Act 1999 presaged a positive approach to the treatment of animals, with a move away from simply preventing cruelty to placing obligations on those in charge of animals to meet the needs of those animals. However, over time it became clear that amendments were necessary to improve the enforceability, clarity and transparency within the system. A review of the Act, alongside the development of New Zealand's first national animal welfare strategy in 2010, led to the development of the Animal Welfare Amendment Act, which was passed by New Zealand's Parliament in May this year.

The use of animals in research, testing and teaching (RTT) has always been covered by a specific part of

the Act - Part 6 - in acknowledgement that the general obligations imposed by the main part of the Act may not always be met under RTT conditions. However, welfare of RTT animals is overseen by Animal Ethics Committees (AECs), which must be satisfied that the benefits of using animals in a particular research, testing, or teaching project are not outweighed by the likely harm to the animals involved. AECs also have a role in promoting the Three Rs - *reducing* the number of animals used, *refining* techniques to minimise pain or distress, and *replacing* animals with non-living or non-sentient alternatives.

The amendment to the Act has brought in the following changes in the RTT sphere, some of which take effect immediately; some will be introduced later to allow time for RTT organisations and AECs to adjust their processes.

- Taking immediate effect with the passing of the amended legislation is a ban on using animals to test cosmetic products or ingredients to be used exclusively in cosmetics. What's a cosmetic? The Act provides the following definition: "... *any finished product that is used or represented for use for the primary purpose of cleansing, improving the attractiveness of, changing the appearance of, perfuming, moisturising, or deodorising the skin, hair, nails, or other external parts of the human body, human teeth, or the mucous membranes of the human mouth, whether or not the product is or contains any substance, mixture of substances, or thing.*"
- AECs are now required to consider whether a proposal for a project has adequately assessed both the suitability of using non-sentient or non-living alternatives and replacement of animals with such alternatives. Although this is something AECs have done implicitly through application of the Three Rs, the Animal Welfare Amendment Act makes this an explicit obligation.
- From 1 January, 2018, the definition of "manipulation" of an animal will change.
 - First, researchers will now require AEC approval for research on the body parts or tissue of animals killed expressly for this purpose. Previously AEC approval was not required in such cases on the grounds that humane killing in itself was not a welfare issue and fell outside of the definition of RTT. The change will increase the accuracy in the numbers of animals reported as used in the annual statistics.

- Second, any breeding that may result in the birth of a research animal more susceptible to, or in greater risk of, pain or distress during its life (for the purpose of using the offspring for research) will require AEC approval. Animals used for such breeding will also now be reported in animal use statistics.
- These changes will clearly alter the total numbers in the annual animal use statistics. Over the next two years The Animal Welfare (Records and Statistics) Regulations 1999 will need to be amended to reflect the changes. This will include requiring statistics on the numbers of animals killed that were bred but not used for research.

ANZCCART AEC Member of the Year Winner Announced

We were delighted to be able to announce that Dr Ross Matthews from NSW is the ANZCCART AEC Member of the Year Award Winner for 2015. The announcement was made at the conference dinner which was held on the 78th floor of the Gold Coast's Skypoint Tower in July.



L to R: Professor Richard Russell (Chair, ANZCCART), Dr Ross Matthews and Dr Geoff Dandie (CEO, ANZCCART)

A veterinarian by profession, Ross was nominated for his 28 years of service to two AECs in NSW that has involved him serving in a voluntary capacity as a Category A member, an Executive Officer and mentor for researchers and fellow AEC members alike. Ross has also played a key role in the care of research

animals and the training of young researchers in animal care and handling techniques.

Even as a volunteer member, the committees on which Ross serves have come to rely on his knowledge and expertise in areas from animal welfare through to policies and processes associated with the assessment of applications in both research and teaching. Such advice has helped both committees handle complex applications with confidence and consistency. This has helped to build positive and open working relationships between applicants and these AECs that has helped to raise standards in those institutions.

The longevity of Ross's service to both committees is a testament to his commitment and so we were delighted to be able to recognise Ross Matthews as the 2015 ANZCCART AEC Member of the Year.

Recent Articles of Interest:

Welfare breach prompts *Nature* to update policy on publishing animal experiments

It is great to see that top line journals such as *Nature* are serious about ensuring that all work they publish that involves the use of animals is done in a way that is fully compliant with relevant laws, guidelines and (perhaps most importantly) all conditions imposed by the relevant AEC or equivalent.

In this editorial piece, *Nature* editors cite an example of a paper they published in 2011 but subsequently learned that some experiments may have been conducted in a way that was outside the approval guidelines. This led to *Nature* publishing both a retraction and some new guidelines for authors that will help to ensure that all future work with animals must adhere to AEC (or equivalent) guidelines if it is to be published.

<http://www.nature.com/news/welfare-breach-prompts-nature-to-update-policy-on-publishing-animal-experiments-1.18384>

Tasmanian devils thrown a lifeline by facial tumour that threatens them

Researchers suspect that the deadly tumour that has wiped out 80% of Tasmanian devils will evolve to ensure its survival – and devils will do the same.

Evidence shows that the deadly facial tumour disease may be evolving to increase infection rates but allowing devils to survive longer making it unlikely to wipe out the species completely, according to new research.

A study of devils in north-western Tasmania conducted by Australian and British scientists found that the facial tumour disease has been evolving to allow the devils to live for longer, thereby increasing the spread of the infection. The findings of a 10-year project by the University of Tasmania, University of Cambridge and the Tasmanian government found that this evolution in the tumours meant that the threat of extinction was dwindling. The tumour is subject to changes – for its own benefit rather than the devil's benefit as the tumour is also a living organism that wants to do whatever is best for it. When the diploid strain arrived it out-competed the more benign tumour strain, and has caused a severe population decline. The diploid tumour is the older and most common tumour type which is spread over most of Tasmania and has resulted in a sharp population decline after six years of stable devil numbers in the area studied by the scientists.

Competition between the tumour strains provides hope that both the tumour and the devils will evolve to coexist to ensure that neither the tumour nor its host will be completely wiped out.

http://www.theguardian.com/environment/2015/sep/03/tasmanian-devils-thrown-a-lifeline-by-facial-tumour-that-threatens-them?utm_medium=email&utm_source=Today-s-Headlines-One-Health-Tasmanian-Devils-and-&utm_campaign=eclips090315

Aquatic animal telemetry: A panoramic window into the underwater world

Over the last ten years, advances in telemetry have revolutionised the ability to observe and understand aquatic animal behaviour and movement. Previously these observations and data collection were impeded by the vastness and complexity of the aquatic environment.

Today, miniature electronic devices and sensors powered by solar energy can monitor movements of animals for periods, ranging from days to years. Receivers on larger animals such as seals mean they can be followed by independent underwater vehicles, and by using refined attachment methods, regular data in their movements can be recorded. These instruments can communicate with devices on other

animals enabling greater understanding of social and predator / prey behaviour.

Aquatic animal telemetry has grown rapidly over the past 30 years, with numerous studies being conducted and research groups are collaborating to develop a system for sharing resources, expertise and data. This advancement will continue to promote new areas of research and assist with global management of the aquatic environment.

http://www.sciencemag.org/content/348/6240/1255642.full?utm_campaign=email-sci-toc&utm_src=email

'Rewilding' dingoes could help reverse decline of Australia's native wildlife

Since European arrival in Australia over 200 years ago, 29 common mammals - 10% of original Australian mammals - are now extinct. Land-clearing for development and farming is partially responsible, however, the introduction of feral cats and foxes have been recognised as the major cause.

Dingoes are known to deter these predators as well as prey upon kangaroos and feral goats which compete with livestock for food. The number of dingoes, however, has declined through culling and the dingo-proof fence, formerly built as the rabbit-proof fence.

Studies have shown that dingoes can have positive effects on the environment and researchers are suggesting the reintroduction of dingoes to some national parks so that their impact can be monitored and controlled.

<http://www.theguardian.com/environment/2015/feb/17/rewilding-dingoes-help-reverse-decline-australias-native-wildlife>

Bioethics accused of doing more harm than good

Steven Pinker, a psychologist from Harvard University believes that regulations governing bioethics can result in loss of life as the potential treatments are often delayed or withdrawn from patients. He added that new technologies can make it difficult to predict the risk factor and there are sufficient safeguards in place to protect patients.

His opinion piece on bioethics, published in *The Boston Globe*, has fuelled discussion on social media among bioethicists and researchers. Bioethicists have responded with one blogging that they often struggle to decide when they should get out of the way and when they need to put their foot down. He argued that while research is important to lessen human suffering hasty efforts to help may lead to great harm. Another bioethicist agreed with Pinker's main argument although she added that some of the safeguards do not work well as the regulations seem to protect the institution and the risks and benefits are not explained to the patients. Read more of the discussion in the full article at:

http://www.nature.com/news/bioethics-accused-of-doing-more-harm-than-good-1.18128?WT.ec_id=NEWS-20150806&spMailingID=49264556&spUserID=MTC2Njc3MzgzMwS2&spJobID=740990489&spReportId=NzQwOTkwNDg5S0

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