ANZCCART

2023 Conference

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ANZCCART Conference 2023
Conference Proceedings

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Enhancing the Behavioural Repertoires of Rats Through Use of Novel Outside the Box' Housing

Pat Turner, Charles River

Abstract

Standard rat housing may limit the ability of rats to engage in species-typical behaviours and postures, which could impact their health and welfare, as well as study outcomes. The objective of this study was to compare behavioural and physiologic measures of rats in standard cages (C: 24.1 cm L X 45.7 cm W x 20.3 cm H; 733.9 cm2; 3 rats/cage) versus modified primate cages (T: 81 cm L x 83 cm W x 93 cm H; 10,416 cm2; 5-6 rats/cage) while incorporating gentle handling to habituate rats to restraint. Sprague Dawley rats (n=70, 34M, 36F; 5 weeks old) were randomly assigned to housing treatment. Rats were video recorded for 18 days. To the study period, rats were assessed for levels of anxiety (elevated plus maze (EPM)) and response to humans (novel human approach test) before/after restraint for blood collection. Blood glucose levels were measured to assess response to restraint and body weight was also monitored. Behaviours and postures were scored daily. Data were analyzed using linear mixed models. Treatment, sex, and time were included as fixed effects and cage was the random effect. There were no weight differences between C and T rats ($P>0.05$), no differences in blood glucose levels in response to restraint ($P>0.05$) and no difference in latency to touch novel human before/after blood collection ($P>0.05$), suggesting regular gentle handling was effective habituation for restraint regardless of housing type. T rats visited the open arms of the EPM more frequently ($P=0.039$), suggesting less anxiety-like behaviour. T rats were less inactive ($P<0.0001$), spending more time on locomotion ($P<0.0001$) and resource exploration ($P=0.0003$). T rats also spent less time lying ($P<0.0001$) and sitting ($P=0.0006$). The results suggest that more complex housing is beneficial to rats, allowing more active behaviors and postures than standard housing. In a follow up study looking at the long-term effects (90 days) of the modified primate housing on rat behaviour (48 SD rats, 24M, 24F, 7-8 wk old), rats became more inactive over time ($P<0.0001$) and spent less time actively moving ($P<0.0001$) and exploring resources ($P<0.0001$) after the first 30 days. Rats spent significant time on the elevated shelves, which increased throughout the 90 days ($P<0.0001$) suggesting a preference for higher resting spaces unavailable in standard housing.

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Standard rat housing may limit the ability of rats to engage in species-typical behaviours and postures, which could impact their health and welfare, as well as study outcomes. The objective of this study was to compare behavioural and physiologic measures of rats in standard cages (C: 24.1 cm L X 45.7 cm W x 20.3 cm H; 733.9 cm2; 3 rats/cage) versus modified primate cages (T: 81 cm L x 83 cm W x 93 cm H; 10,416 cm2; 5-6 rats/cage) while incorporating gentle handling to habituate rats to restraint. Sprague Dawley rats (n=70, 34M, 36F; 5 weeks old) were randomly assigned to housing treatment. Rats received gentle handling for 15s, every other day throughout the study period. Rats were assessed for levels of anxiety (elevated plus maze (EPM)
and response to humans (novel human approach test) before and after restraint for blood collection. Blood glucose levels were assessed to evaluate response to restraint. Body weight was also monitored. Rats were video recorded for 18 days. Behaviours and postures were scored daily for 10min. Data were analyzed using linear mixed models. Response variables were assessed for normality and transformed as needed. The response variables included: body weight (g), latency to touch human (s, log10+1 transformed), duration of contact with human (s, log10+1 transformed), EPM anxiety-like behaviour (duration of time spent in open arms (s)/total time spent in open and closed arms (s)), EPM locomotory activity (total number of arm entries into open and closed arms), blood glucose (mg/dL, log10+1 transformed), and general behaviour and posture (duration of time (s) for inactive, locomotion, grooming, social, cage exploration, vertical posture, lying posture: square root transformed; ingestion, aggression, sitting posture: log10+1 transformed; resource exploration, horizontal posture). Treatment, sex, and time period were included as fixed effects and

cage was the random effect. There were no weight differences between C and T rats, although there was a trend for T rats to weigh less at day 14 (day 14: $F(1,3)=3.283$, estimate: -15.442, se: 8.522, $P=0.094$). There were no differences between the housing treatments for blood glucose levels in response to restraint ($P=0.166$). For the human approach test, there was no difference in latency to approach between the housing treatments before ($P=0.966$) or after blood collection ($P=0.501$). Rats from both groups were quicker to approach the novel human before blood collection compared to after ($F(1,4)=7.025$, estimate: -0.215, se: 0.081, $P=0.009$) and T rats spent less time interacting with the human during both human approach tests compared with C rats ($F(1,4)=7.143$, estimate: -0.139, se: 0.052, $P=0.009$). These data suggests that regular gentle handling was effective habituation for restraint and human interaction regardless of housing type. For the EPM, T rats spent more time in the open arms compared to C rats ($P=0.039$), suggesting less anxiety-like behaviour. For general behaviour in the housing, T rats were more active ($F(1,4)=31.865$, estimate: -3.569, se:0.632, $P<0.0001$), spending more time moving ($F(1,4)=171.002$, estimate: 8.868, se:0.678, $P<0.0001$) and exploring resources ($F(1,4)=21.433$, estimate: 59.893, se:12.928, $P=0.0003$). There were also differences in posture, with T rats spending less time lying ($F(1,4)=70.068$, estimate: -5.873, se:0.701, $P<0.0001$) and sitting ($F(1,4)=20.879$, estimate: -0.631, se:0.138, $P=0.0006$), although there was no difference in time spent in vertical posture between the treatment groups ($P=0.167$). The results suggest that more complex housing is beneficial to rats, allowing more active behaviours and postures than standard housing. However, data did show a decrease in active behaviours towards the end of the study period, especially with resource exploration for T rats, suggesting habituation to the housing environment. A follow-up study was conducted looking at the long-term effects (90d split into 3 time periods. P1: wk 1-4, P2: wk 5-8, P3: wk 9-13) of the modified primate housing on rat behaviour (48 SD rats, 24M, 24F, 7-8 wk old). Behaviour was scored using instantaneous scan sampling every 30s for the first 10min of the hour, then summarized by week. Linear mixed models were used to look at behaviour over time and behaviours were square root transformed. Rats in the modified housing became more inactive over time (P1-P3: estimate: -0.348, se: 0.027, $P<0.0001$) and spent less time moving (P1-P3: estimate: 0.220, se: 0.021, $P<0.0001$) and exploring resources (P1-P3: estimate: 0.164, se: 0.164, $P<0.0001$). Throughout the study, rats increased the amount of time they were spending on elevated shelves (P1-P3: estimate: -0.282, se: 0.031, $P<0.0001$) suggesting a preference for higher resting spaces unavailable in standard housing. These results suggests that while the rats' activity patterns decrease over time, the rats continue to use the in-cage resources provide by the modified housing. Additionally, the behaviour of rats in the modified housing were compared with colony rats of similar ages in standard housing (n=12, 6M and 6F; 6 weeks old). Response to EPM and human approach test were compared between rats in different housing using Mann Whitney U test. When compared to colony animals housed in standard housing, T rats continued to show reduced anxiety-like behaviours ($P<0.0001$). T rats had a longer latency to approach the human ($P<0.0001$) and spent less time in contact with the human ($P<0.0001$) compared with colony rats, even though they received regular gentle handling and colony rats did not, suggesting an influence of housing on behaviour towards humans that should be explored further. There was no difference in blood glucose between the groups ($P=0.801$). Despite a trend towards a lower body weight for rats in the modified housing in the first study, no difference in weights were observed over 90d ($P=0.829$). Overall, the results of this research suggest that more complex housing is beneficial for rat welfare, and further studies should investigate the relationship between housing and response to humans, and examine the feasibility of using the housing for rats on study.

Weight Loss in Laboratory Animal Science

Lewis Vaughan, Flinders University

Abstract

Weight loss in animals is frequently an ethical concern in many research projects and is addressed in the NHMRC 2008 Guidelines to promote the wellbeing of animals used for scientific purposes. However, some have expressed concern that using weight loss by itself as a welfare tool is problematic since it is a blunt and inaccurate measure of clinical and welfare status, Ullman-Cullere and Foltz, 1999.

This presentation will explore the factors involved in weight loss associated with food and water deprivation and that caused by sickness. The complexity of weight loss will be highlighted in different research models. The severe welfare impact of weight loss due to disease in cachexia will also be explored. Some surprising aspects of rodent physiology such as torpor, which enable animals to adapt to short term food deprivation, will be discussed and will be shown to further compound the challenges we face in assessing the wellbeing of animals in metabolism studies.

Reference:

Ullman-Culerë M H and Foltz C J, 1999, Body condition scoring: a rapid and accurate method for assessing health status in mice, Laboratory Animal Science, Vol 29, No 3.

First Steps Towards Developing a Welfare Assessment Framework for Stranded Cetaceans

Rebecca Boys, **Ngaio Beausoleil,** Stuart Hunter, Emma Betty, Bethany Hinton, Karen Stockin, Massey University, New Zealand

Abstract

Live strandings of cetaceans (whales and dolphins) are increasingly common. Human interventions aim to safeguard the welfare of stranded animals and to support species conservation. However, there is limited empirical evidence to inform management decision-making. This research reflects a structured approach to developing a welfare assessment framework for stranded cetaceans. The approach is based on the Five Domains Model which focused on the animal's own experiences of its internal state and external environment i.e. mental experiences.

A key step is identifying and scientifically validating observable/measurable indicators of animals' mental experiences relevant to welfare state. A list of potential welfare indicators for stranded cetaceans was developed by an international panel of experts. The next step involves validating some indicators by looking at associations between externally observable measures (e.g. behaviours) and internal state (e.g. evidence of disease, damage or disorder).

A preliminary evaluation of these kinds of associations was undertaken at a stranding of pygmy killer whales (*Feresa attenuata*) in New Zealand. While both whales were in good body condition and uninjured, both showed declining responsiveness over the observation period, and one showed abnormal respiration and body posture. Fluttering movements of tail and fins, head lifting with breathing and simultaneous head/tail arching became more common over time. These indicators are consistent with the post-mortem (PM) findings – congested, fluid-filled lungs and muscle breakdown – suggestive of a compartmental-type syndrome due to prolonged stranding.

Together, the behavioural and PM findings support inference of multiple negative experiences including breathlessness, pain/discomfort and exhaustion leading to poor overall welfare state. Along with the poor survival likelihood, this information confirmed the decision made to euthanize these animals. More generally, the PM results help validate specific behavioural indicators that are easily recognizable in the field and can be used in future to inform decision-making for stranded small cetaceans.

Non-extractive Technologies in Fish Research Z (exact title TBC)

Rich Little, CSIRO

Abstract

The marine waters of southeast Australia are warming at 4 times the global average. As a result, species are shifting their distributions and marine habitats are changing rapidly. The region is home to a range of important economic activities such as fisheries, oil and gas production, and emerging renewable energy industries. It also contains nationally important amenities such as marine parks. The Southeast Australian Marine Ecosystem Survey (SEA-MES) is conducting an ecosystem survey using RV Investigator by revisiting sites sampled in the 1990's to understand what has changed in the ecosystem and why. It will use 8tandardized gear and methods that have been used historically to allow unbiased comparison through time. It will also sample in sensitive Australian Marine Parks (AMPs) which constrains extractive sampling methods such as demersal trawl that have been historically used. There is a need to develop new non-extractive sampling methods so that inferences can be made of ecosystem change that may have occurred in AMPs over the past 30 years, and to establish new methods for future surveys. I will discuss both old and new non-extractive methods we will be testing in the SEA-MES voyages, and efforts to calibrate them against methods that have been used historically. The methods include video and automated analysis of it using machine learning and artificial intelligence techniques, acoustics and environmental DNA (eDNA).

Decapod Crustacean Welfare- considerations for an emerging field

Sarah Berry, CSIRO

Abstract

Welfare of decapod crustaceans is an area of growing interest in the context of animal ethics, production, and research. The prevailing literature suggests decapod crustaceans are sentient and demonstrate a “pain-like” experience, with research spread across a diverse range of crabs, lobsters, and freshwater shrimp. These studies consistently highlight the lack of knowledge on pain, nociception, sentience and stress in decapod crustaceans, and the paucity of novel methods that quantify stress or assess welfare of decapod crustaceans. These knowledge gaps make it difficult to provide science-based recommendations regarding the welfare of crustaceans, however, there is growing sentiment to treat decapod crustaceans with care, provide optimal handling and minimise their stress and suffering. The increased scrutiny and concern for welfare in crustaceans provides an opportunity to develop objective measures of welfare to validate, improve practices in a range of settings ensuring recommendations rising from the research are objective and based in science. This presentation will discuss the crustacean behaviour and welfare, highlight knowledge gaps and future research opportunities to improve welfare of farmed crustaceans. An overview of the project work being undertaken in the field of crustacean welfare at CSIRO Agriculture

Reviewing and Rethinking the Role of the Veterinarian in Animal Research

Mandy Errington, EthiQualia & Shari Cohen, University of Melbourne

Abstract

The 2022 NSW enquiries into the use of animals for scientific purposes has highlighted the need to review, promote and provide clarity on the roles and responsibilities of veterinarians in industry. Veterinarians undertake a diversity of roles and responsibilities which can appear to overlap causing confusion, conflicts of interests or gaps in animal welfare and care. The specific roles and titles are diverse such as Category A or C members, Facility Veterinarians, Animal Welfare Officers, and other variations on theme. While we are required to provide veterinary care and oversight, regulations may not provide clarity or support for institutions in meeting these obligations and some may appear contradictory. It remains critical for institutions to meet animal welfare, 3Rs, ethical, regulatory, and social license obligations when working with animals for scientific purposes. During this interactive session we will discuss the critical roles of the veterinarian required to fulfil regulatory, animal welfare, and ethical frameworks as well as explore areas for improvement and future consideration. We will look at ways institutions and veterinarians can work together to fulfil regulatory requirements and the expectations of our social license as well as the potential future of veterinarians across our industry.

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The recent 2022 NSW inquiry into the use of animals for scientific purposes has highlighted the need to review, promote and provide clarity on the roles and responsibilities of veterinarians throughout the industry. Currently, veterinarians are engaged in a wide variety of roles and with various responsibilities when working with animals for scientific purposes. The specific roles and titles are diverse such as Category A or C AEC members, Facility Veterinarians, Animal Welfare Officers, and other variations on theme. Many of these roles and responsibilities appear to overlap causing confusion, inadvertent conflicts of interests or even gaps in animal welfare and care. Often there is an assumption that one veterinarian is responsible for all aspects of animal care and use, and without sufficient contingency planning and professional support they can become overworked and overwhelmed. Constructing an effective, best practice, animal care and use program requires methodical consideration of all the responsibilities, and other related tasks a veterinarian may be assigned. Regulatory obligations mandate an effective program of veterinary care, animal use must be consistent with current best practice, and veterinarians have their own professional standards they must adhere to. There is also no doubt the social licence is conditional on appropriate veterinary care and oversight. Such regulations and expectations may not always provide clarity and support for institutions in meeting these veterinary obligations, and there can be differences in standards and expectations between organisations. At times they may even appear contradictory. During this interactive session we will discuss the critical roles of the veterinarian required to fulfil regulatory, animal welfare, veterinary and ethical obligations, and what a best practice framework must consider. We will also explore opportunities for improvement and future consideration. Finally, we will look at ways institutions and veterinarians can work together to fulfil regulatory requirements and the expectations of our social licence as well as the potential future of veterinarians across our industry.

A new platform to replace animal models in brain cancer research: A 3D printed microplate insert for high-throughput and ultra long-term high-resolution imaging of live human brain organoids.

Guillermo Gomez, Centre for Cancer Biology, SA Pathology & the University of SA

Abstract

Glioblastoma is the most common and aggressive type of primary brain tumour associated with an abysmal prognosis. Cancer cell invasion, whereby cancer cells invade healthy brain tissue, is a central characteristic of glioblastoma and significantly correlates with poor patient prognosis. Preclinical animal models are used to test and evaluate the efficacy of drug therapies for glioblastoma. However, these animal models do not accurately recapitulate the human brain tumour microenvironment and are unsuitable for studying glioblastoma invasion. In contrast to animal models, human brain organoids replicate the architecture and neuronal composition of the human brain, which helps study human brain development and disease. Brain organoids derived from healthy donors are used as scaffolds to grow patient-derived glioblastoma cells. This provides an opportunity to study cancer cell invasion in a physiologically relevant tumour microenvironment. However, current human brain organoid culture methods are low-throughput and unsuitable for long-term high-resolution imaging, which is required to study invasion in clinically relevant time scales (i.e. days, weeks, months). Here we demonstrate the utility of 3D-printed microplate inserts, which enable the scaling up of brain organoid culture using multiwell plates and the growth of brain organoids in fixed positions close to the bottom of the multiwell plate. Together, these innovations facilitate high-resolution and high-throughput imaging of brain organoids over long periods (up to 2 months). We applied this technology to visualize the growth and migration of patient-derived glioblastoma stem cells as tumours within healthy brain organoids. Overall, this new bioengineering platform constitutes a significant advance that permits high-throughput studies of cancer cell invasion within the brain and high-content phenotypic imaging, thereby replacing the use of animal models in brain cancer research.

A viable replacement for animal models of epilepsy: combining human data with computational modelling.

Isabelle Harris, Michaela Vranic-Peters & Andre Peterson, University of Melbourne

Abstract

Epilepsy is a debilitating disease characterised by seizures (abnormal electrical activity). It is an umbrella term where both diagnosis and treatment are highly patient-specific, ie there is a significant variation of seizures both between and within patients. The overwhelming majority of neuroscience research in epilepsy uses animal experiments. Animal models (typically mice and rats) are used to test hypotheses by artificially inducing seizures via drugs, invasive electrical stimulation, and genetic modification. Frequently with animal models, although there is much data generated, the added new knowledge can be unclear as the mechanisms underlying seizures are poorly understood. In fact, there is much controversy on how comparable seizure-like behaviour generated from an animal model is to that generated in a human brain.

Purpose: We propose a scientifically viable alternative to animal models of epilepsy by combining voluntary human data and computational modelling. Specifically, we study a type of epilepsy (photosensitive epilepsy) in humans where an abnormal seizure-like response is triggered by a non-invasive stimulation, in this case a strobing light source. This ubiquitous procedure is routinely performed in hospitals for epilepsy diagnosis and is quite safe. The abnormal electrical response is captured using electroencephalography (EEG), which measures the brain's electrical signals. From these recorded signals, this seizure-like response is mathematically indistinguishable from a seizure, ie the recorded electrical signals are visually and quantitatively similar to an actual seizure and have the same mathematical properties, as will be demonstrated. By mathematically analysing and computationally modelling the brain's electrical response to non-invasive stimulation, we gain clinically relevant insights into the nature of seizure transitions in humans. This is performed without resorting to animal models that typically use more invasive techniques such as implanted electro-stimulation. Within this framework we are able to examine changes in the human brain before, during and after a seizure occurs, as well as quantify the variability within and between epileptic patients. This novel multidisciplinary approach moves away from traditional neuroscience research paradigms and aims to minimise and ultimately replace animal models with a combination of computational modelling and non-invasive human data.

Developing a 3D chronic wound model using animal-free products

Rachael Moses, University of Melbourne

Abstract

Chronic wounds are scenarios where the acute wound healing response is impaired, inducing a burden to both the patient and the healthcare system. In order to replicate the human wound repair process, animal models are often used, to provide a greater wealth of information on the wound healing potential of novel therapies. These models are typically rodent models, including the diabetic mouse model, demonstrating chronic wound healing scenarios. However, these rodent models have limitations in their translation to human wound healing scenarios due to differences in healing manner. An alternative to animal models involves the use of 3D organotypic in vitro models, representing more closely the complex in vivo scenario than the widely performed 2D monolayer cultures. This novel 3D organotypic model comprises human chronic wound derived fibroblasts and epidermal keratinocytes, cultured at the air-liquid interface, resulting in the differentiation of the various epidermal layers, including the protective cornified layer. This 3D organotypic model is cultured over 14 days, before subsequent H&E staining, along with immunostaining for key components of the epidermal and dermal layers, including keratin 10, keratin 14, involucrin and fibronectin. The majority of cell-based research utilises animal-derived products, whereas this model is cultured using synthetic, animal-free products, resulting in a better consistency in the studies, due to the batch variability associated with animal products. Many industries and funders are already expressing an interest in replacing animal use in research, but a viable option is required to sufficiently replace these models. This 3D model is a more cost-effective option than animal models and without the ethical considerations associated with their use.

AEC Consideration of Breeding Projects; Application of the 3Rs

Mandy Errington, EthiQualia

Abstract

This presentation is an introduction into the key principles of breeding, both core strains and genetically modified, and the critical elements of considering application of the 3Rs.

Large numbers of animals are bred every year to provide animals for research projects, however many are not used for this purpose and are excess to requirements. For example, in Victoria in 2020, over 900 000 mice were bred and not used in research projects. Appropriate oversight of animal use in breeding colonies represents a significant opportunity in implementation of the principles of reduction and refinement. However, this is an area where some AECs are unsure about what to consider. Using mice as the primary example but touching on other species commonly used the following will be discussed with the aim of equipping AECs to be better informed when considering such animal use. As applicable, relevant resources to further enhance awareness will be referenced.

What to look for in an application

- Competency of the person with overall responsibility, applicable to breeding
- Justification for breeding and animal numbers
- The difference between inbred and outbred strains, and why it is important
- Breeding inhouse vs sourcing from a commercial supplier
- Genotyping, why, when, how
- Cryopreservation and rederivation – what is it, why is it important, when should it happen
- Managing genetic integrity
- Animal monitoring and common issues
- Planned and humane endpoints
- What to look for in reports
- Phenotype reports
- Animals bred vs animals used
- 'Tick-over' colonies
- Anticipated impact on animal wellbeing, compared with unexpected adverse event – how and when to report

Reduction of Animal Use by Maximising Statistical Power

Tony Rowe, CSIRO

Abstract

This presentation will discuss how experimental design is a reduction method because it can provide more information per animal used. A well-designed experiment avoids bias and is sufficiently powerful to be able to detect effects likely to be of biological importance. Power indicates the signal-to-noise ratio of an experiment. One way to increase power is to increase the sample size. Any signal will eventually become statistically significant with a large enough sample size. However, this increases animal use. A superior approach is to reduce noise or variability via improved experimental design. This is a good scientific practice which meets a governing principle of The Code (The 3Rs) while saving time and money.

Addressing the 3Rs through a Holistic Approach to Research Animal Behavioural Management

Pat Turner, Charles River

Abstract

In the 21st century, the twin goals of improving the welfare of research animals while increasing the validity and reproducibility of scientific outputs attained from working with animals in science requires an updated and broadened approach. Use of simple environmental enrichment programs typically have only an incremental impact on improving research animal lives. A more holistic consideration of research animal behavioural management programs uses an outcome-focused approach and encompasses social needs of animals, animal training, optimization of housing and husbandry, provision of choice and control in the environment, minimizing pain and distress, promoting positive human-animal interactions, provision of food and manipulable resources, behavioural assessments, and other considerations of the animal's environment and experiences. The program should be comprehensive, employing thoughtful consideration of the significant factors that may impact a research animal's behavior and welfare. This is grounded in a care-based ethical approach that not only the mitigates negative experiences that might cause distress but emphasizes positive animal welfare states. Enhanced behavioural management programs are promoted for diverse species worked with in science and education. This session will cover components of a behavioural management program with suggestions and examples for how to move institutions in this direction, to promote institutional uptake of the 3Rs.

Learning outcomes:

After attending this session, participants will be able to:

a) describe necessary components of behavioural management programs that should be considered for all species
b) understand how to better prepare research animals for scientific procedures, and
c) describe how addressing behavioural management improves overall animal welfare, scientific outcomes, public concerns, and employee satisfaction.

Animal Facility Management and Ethics Review Processes Implemented During the Pandemic

Sashika Naidoo, QIMR Berghofer

Abstract

The COVID-19 pandemic has led to extraordinary global responses to manage the challenges posed by this upheaval. It has affected every facet of society. This presentation deals with efforts of pandemic proportions: the collapse of order as we know it, the disruption of systems and a re-orientation. This presentation will discuss changes in animal facility management and ethics review processes implemented during the pandemic and look at the lasting impact of this disruption. It will explore the lessons learnt, the potential to work differently and look to the future.

Ensuring Compliance, Protecting Animals: Animal Welfare Victoria's Comprehensive Approach to Regulating Animals used in Research and Teaching

Department of Energy, Environment & Climate Action, Victoria

Abstract

Under the Prevention of Cruelty to Animals Act 1986 (the Act), Animal Welfare Victoria as the regulator of animals used in research and teaching in Victoria monitors compliance of institutions with their obligations under the Act and subordinate legislation, including the Australian code for the care and use of animals for scientific purposes. This conference presentation will explore the legislative framework in Victoria that provides Animal Welfare Victoria with the authority to regulate the sector, the reason for regulation, and the regulatory approach implemented in Victoria. The regulatory approach seeks to educate and promote voluntary compliance in the first instance and apply a graduated compliance approach leading to enforcement for repeat offences and/or those that are unwilling to comply. The presentation will also emphasise why it is important that organisations operating within this sector uphold their obligations through effective proactive self-regulation to ensure high animal welfare standards are maintained. This presentation will explain why Animal Welfare Victoria's role is so vital in ensuring compliance and protecting animals from harm.

The Code: A Case for Review

Rachel Smith, Humane Research Australia

Abstract

In Australia, the use of animals in research and science is regulated by a Code of Practice. The current edition of the Australian Code of Practice for the Care and Use of Animals for scientific purposes (the Code) was issued on 21 June 2013.

Given that this Code is the principal form of protection for millions of sentient individuals used in research, it is extremely important to understand what the Code requires and what its limitations are. Between 2019-2021, an update was developed to insert an additional section on cosmetics testing. While a positive step, this update did not review any existing parts of the Code. The content has not been reviewed since 2013, despite the rapid development of science, technology and community attitudes to animal use over the last ten years.

This presentation will critique application of the Code's governing principles, consider the concept of public license and the Code, and provide HRA's suggestions for urgent and necessary reforms.

The Contribution of Animal Research

Annabella Lear, Understanding Animal Research Oceania

Abstract

Understanding Animal Research Oceania, VIC, Australia
The use of animals in research has made substantial contributions to the life sciences, and the professional practices that rely on the knowledge they provide such as human and veterinary medicine and ecology. The world we know has been shaped by scientific understanding made possible by animal research. From the source of malaria's transmission and the development of insulin for diabetes, to the refinement of advanced surgical techniques and life-saving vaccines, studying animals has helped to make the lives of countless humans and animals healthier, longer and easier.

In the 21st century we are finally realising the potential of the technologies based in the basic science of the 1980s and 1990s. New approach methodologies are supporting more refined animal-based methods to provide answers to key scientific questions across the life sciences.
Animals are used in four areas of scientific study in the life sciences:

- To advance scientific understanding
- As models to study disease
- To test medicines, medical devices and treatments
- For the protection of people, animals and the environment

In this presentation I will look at contemporary examples of animals being used in research to make a direct and tangible difference to the world and society that we live in.

The contribution of animal research is not merely historic The science is far from over. The biological and life sciences still have an enormous amount to tell us about ourselves and the world we live in, and how we can better provide for people and animals, using the best methods and the best minds to solve the toughest problems

What does the Australian Public think about Animal Welfare Regulation and Priorities for Species Protection?

Alex Whittaker, The University of Adelaide

Abstract

As sentient beings, animals are given legal protection through animal welfare legislation. Underpinning this protection are societal values which deem that animals' interests in avoiding pain and suffering are morally relevant and worthy of consideration. Whilst we understand that animal welfare is an issue of concern for the public, it is less clear what the level of public concern is for individual species and what they think about animal cruelty laws, and the enforcement of them. In this presentation, I will discuss some of our recent research using survey and focus group methods to explore the Australian public's attitudes and beliefs on animal welfare law, and species that should be protected. Where available I will contrast these findings with those from other countries.

Epidemiology of Cat Flu at RSPCA Queensland Shelters

Uttara Kennedy, University of Queensland

Abstract

Feline upper respiratory tract infection (FURTI) is a severe problem in animal shelters. A risk factor analysis to better understand the epidemiology of the disease is needed, however, it cannot be done without case ascertainment from veterinary records- a major challenge because records are not consistently structured.

Using natural language processing and machine learning, we obtained case recognition with an accuracy of 0.95 (95% CI 0.92, 0.97) from retrospective electronic veterinary records from the Royal Society for Prevention of Cruelty to Animals, Queensland. We were then able to conduct Bayesian analysis for stratifying FURTI by admission (source, gender, age) and environmental (season and shelter occupancy) variables. Prior assumptions were represented by a direct acyclic graph.

We analysed 43,431 feline entries over eight years. Females were only 0.8 (95% CI 0.76, 0.84) times as likely as males to get infected, while already desexed animals were only 0.68 (95% CI 0.61, 0.75) as likely compared to those not desexed on entry. Kittens were 0.5 (95% CI 0.48, 0.53) times as likely as adult cats to get infected. Animals seized by RSPCA inspectors had the highest probability of infection compared to other sources (e.g., surrendered). Infection probabilities increased in winter and showed a linear pattern with how full the shelter was.
This study gives a deep insight into the epidemiology of FURTI in shelter environments. The model's predictions indicate that a small change in an animal's environment can have a significant impact on final outcomes for feline welfare and conservation of shelter resources.

Development of Next Generation Therapeutics with the Potential to Replace the Need for Animal Testing

Lani Davies, Australian National University

Abstract

Fragment-based Drug Design of Heparanase Inhibitors

Fragment-Based Drug Design utilises animal-free experimental techniques, such as computational modelling, high-throughput X-ray crystallography, and synthetic chemistry to selectively design drugs for specific targets that would replace the need for animals in the drug development process. In traditional drug development processes animals are used in a number ways, from harvesting antibodies from their blood serum, to being used to test novel drugs for toxicity and side effects. Computational modelling and *in silico* drug design allows the identification and removal of toxic chemical moieties and creation of favourable interactions in potential drug leads without the need for pre-clinical animal trials. X-ray crystallography is an entirely animal-free technique which provides an in-depth examination of drug-protein interactions which can be used in computational models and synthetic optimisation of drug leads for the treatment of disease.
An enzyme that has become of particular interest as an important drug target in recent years is human heparanase. It is a promising drug target for the treatment of cancer, diabetes, inflammatory diseases, as well as COVID-19, where heparanase activity has been shown to contribute to pathogenesis. However, no drugs or therapeutic treatment designed to specifically inhibit heparanase have made it through phase III clinical trials. The majority of effective heparanase inhibitors have off-target effects and undesired high anticoagulant activity. In our research we aim to use a combination of structural biology, high-throughput crystallography, computational methods and synthetic chemistry to screen fragment libraries against heparanase and elaborate them into promising lead compounds.

Replacing porcine and ovine animal training models with advanced simulators for life-saving extracorporeal membrane oxygenation (ECMO) implantation training.

Rezan Jafary, Monash University

Abstract

Aim:

Heart and Lung diseases remain the leading causes of death worldwide especially with the recent COVID-19 pandemic. Currently, donations are scarce and some patients receive a type of artificial heart-lung device called Extracorporeal membrane oxygenation (ECMO). ECMO provides temporary support for severely ill patients until they recover or receive a transplant. Despite its life saving nature, ECMO is technically challenging to implant and therefore, frequent clinical training is essential to maintain competency and proficiency. Typically, this training is performed using animal models (live piglets and lambs), therefore, the aim of this project is to construct a reliable alternative using synthetic materials. This bench-top medical simulation training offers a cost-effective alternative to animal-based training free of the ethical and moral constraints.

Methods:

The developed simulators mimic the tactility of the skin, fat, muscle and vessels as well as the ultrasound properties of biological tissue. This study aimed to evaluate the suitability of these simulators as a reliable alternative to animal tissue for ECMO training. To evaluate the models, experts in the field of ECMO used the models and rated the realism of the ultrasound and the needle insertion experiences. The evaluation process was in the form of specially constructed questionnaires; rating the performance of the simulators on a five-point scale (1—performs exactly like a human 2—performs very closely to human 3—neutral 4—doesn't perform like a human but adequate for simulation 5—inadequate for simulation). The study recruited 38 clinicians attending the ECMO course at the Alfred hospital, Melbourne.

Results:

The simulators were scored 1 and 2 for the overall ultrasound experience by 90% of the participants, respectively. As for the needle insertion experience, 84% of the participants scored the overall needle insertion experience simulators 1 and 2.

Conclusion:

Feedback from the majority of participants (98%) scored the overall usability of the simulators for training 1 and 2, exactly like human or close to human. Future designs will include incorporating the models in functional mannikins that will be made available globally to support the elimination of animals (e.g. pigs and sheep) used for ECMO training.

A mechanical heart and circulatory system to replace animal-based medical device prototyping

Andrew Stephens, Monash University

Abstract

Background:
Cardiovascular diseases are a major cause of death worldwide, with a significant research effort directed at developing new devices to combat these prolific diseases. Most devices undergo an iterative pre-clinical development phase of design, test, and refine to ensure the device is fit-for-purpose. Historically, cardiovascular device development has relied heavily on animal models, which are expensive and ethically ambiguous at best. This research describes a sophisticated mechanical cardiovascular system that can replace animal models in the early iterative prototyping phase and can also facilitate basic science and clinical management research around existing cardiovascular devices.

Methods:
The benchtop cardiovascular simulator (called a mock loop) is a series of interconnected pipes and tubes representing the heart and circulatory system. The mock loop replicates both the left and right sides of the heart as well as the systemic (body) and pulmonary (lungs) circulatory systems. The mock loop employs a five-element Windkessel model representing the compliance (springiness), inertance, and resistance of the veins and arteries, producing accurate pressure, flow, and volume waveforms. In addition, the mock loop contains several autoregulatory mechanisms (Frank-Starling mechanism, baroreflex, bi-phasic coronary flow), allowing it to mimic how the body adapts to changing cardiac demand.

Results:
The mock loop has been used to evaluate several cardiovascular devices, including artificial heart devices, artificial heart-lung machines, prosthetic heart valves, and life-supporting conduits (cannulae). This presentation will explore three case studies of how the mock loop has been used for basic science, informing clinical practice, and device evaluation research, demonstrating mock loop utility and how it can be incorporated into modern cardiovascular device research.

Conclusion:
Sophisticated benchtop cardiovascular systems can reduce costly animal trials while providing a wealth of repeatable data for device design and evaluation. Further advances in benchtop models over the decades will continue to supplant animals models in pre-clinical evaluation, making research more ethical and cost-effective.

Replacement of Animal-derived Antibodies with Synthetic Nano-bodies in Yeast Surface Display in the Fields of Structural Biology, Biotechnology, and Medicine

Jesus Ruiz Flores, Australian National University

Abstract

The production of animal derived antibodies has been declared obsolete since 2015, as much of them have been unspecific and unreproducible for different applications they were meant to be used for. A protocol for yeast surface display of a synthetic nanobody library was published recently, allowing the identification of high affinity nanobodies to a particular antigen, without the immunisation of animals. Nanobodies are a specific type of antibodies produced by camelids (llamas, camels, alpacas, etc.), that are composed solely by heavy chains instead of having two identical heavy (V_H) and light chains (V_L) polypeptides as the conventional ones. Such kind of antibodies bind to their target antigens through a single variable domain, termed V_{HH}, which contains the entire antigen-binding surface. Their three-complementarity determining region (CDR) loops contain all the necessary biochemical features to achieve nano-molar binding affinity to a given antigen and have superior qualities for many applications relative to IgG's, due to their smaller size and stability. Nanobodies have been employed effectively to trap transient conformations of medically relevant proteins for structural biology, facilitate non-invasive diagnostic imaging, imaging of dynamic processes in the cell, super resolution imaging of protein complexes, point of care diagnostic biosensors and as next generation of cancer therapies and other diseases.

Wildlife Research Welfare Considerations

Gail Anderson, ANZCCART Australia

Abstract

Whilst preparing the materials for the ComPass wildlife modules, it struck me that there are many common welfare themes relevant to those researching wildlife in both Australia and NZ.

For most wild species the very act of being captured, restrained, removed from their home environment and handled is very stressful. Add to this the potential for capture myopathy and the effects of ambient weather conditions and there are many potential welfare concerns. How can we minimise these stressors?

Trapping or netting involve holding an animal in a space where it may be vulnerable to predation or harm due to its inability to escape. What precautions need to be in place to minimise risks to captured animals?

Biosecurity issues need to be understood as animals taken away from their own environment may both be exposed to new pathogens in that novel space or expose other conspecifics to different microflora exposing them to new pathogens. How do we minimise theses risks? How too do we ensure that potential pathogens are not transmitted between individuals being assessed by the research team?

Sampling of our hugely varied species requires good knowledge of their specific anatomy, appropriate sampling sites and methods. When is sedation or anaesthesia needed and how can this be achieved safety in a remote setting?

The fitting of tracking devices to wild species also requires good understanding of the impact of these devices on locomotion or flight and the implications of these devices on normal behaviours.

How might we sample or survey wild animals using means that are less invasive?

Finally, if an animal is injured, what are the criteria for euthanasia and how is this best performed in remote locations when a veterinary practice may not be available? What does two-stage euthanasia involve?

These questions will be discussed and considerations of what information needs to be supplied to AECs before attaining approval addressed. Reference to the new ComPass wildlife modules and other recently available resources will be included.

Animal Welfare and Zoological Parks

Justine Partoon & Mark Smith, ZoosSA

Abstract

Animal welfare science continues to progress, bringing with it advances in both public understanding and public concern regarding animals in human care. Demonstrating optimal standards of animal welfare, while delivering conservation goals and engaging visitors, is essential for the success of a modern zoo. Zoos South Australia's approach to animal welfare science is holistic, considering biological functioning, naturalness, and the affective state in all animals, with a focus on promoting positive mental states, as opposed to a focus on mitigating negative states. A compressive animal welfare strategy, encompassing a robust five-year framework, to continually improve animal welfare in an objective, evidence-based, scientific manner has been developed and adopted by Zoos SA. This strategy focuses on three main premises: understanding, evaluation and improvement. Animal welfare risk assessments, species-specific welfare assessments, animal welfare evaluations, professional development of the entire staff body, directed and practical policies, and focused research have been identified as key components of the strategy. Zoos SA are 28perationalized28 the strategy by using both resource and animal-based measures combined with evaluation, planning, action, and a re-evaluation of key areas, ensuring all avenues that impact animal welfare are improved. Having a clear evidence-based strategy allows the team at Zoos SA to ensure optimal welfare for the animals in its care and to promote continued improvement to industry best practice, with the ultimate goal of animal flourishing and fulfilment 24/7.

Male Reproductive Characteristics and Inbreeding Depression in Wild Koala Populations: Implication for Specific Management

David Taggart, The University of Adelaide

Abstract

Translocation has been used historically to help manage koala populations in SE Australia threatened by overabundance, habitat loss associated with urbanization and fire, dog attacks and disease affecting fertility (eg. Chlamydia). However, as a consequence of their translocation history, koalas in Victoria and South Australia have undergone a series of population bottlenecks resulting in a significant reduction in genetic variation compared with outbred Queensland and New South Wales populations. This study compared male reproductive health of koala populations with differing levels of inbreeding from Victoria and South Australia, with a large genetically variable population in northern New South Wales. In particular we examined sperm morphology, testicular morphology, testosterone levels, and the incidence of testicular aplasia in wild koalas. Significant correlations were observed between declining levels of population genetic variation and declining male reproductive health. The proportion of abnormal sperm types in the ejaculate, the number of Leydig cells in the testis and the incidence of testicular aplasia all increased with increasing levels of inbreeding. In contrast round spermatid number decreased with increasing levels of inbreeding. Together these results indicate that there has been a significant decline in the reproductive fitness of male koalas following successive translocations and bottle neck events in Victoria and South Australia. Given that koalas are already significantly threatened, management of the Victorian and South Australian populations to conserve and enhance genetic diversity, avoid inbreeding depression and improve fertility would appear vital if this species is to persist long term.

Tracking for Conservation: The Use of GPS Tracking Devices for Rare Birds and Feral Cats

Graeme Finlayson, Bush Heritage Australia

Abstract

Understanding the movement and habitat use of wildlife is critical for decision making in conservation programs. One such program being undertaken by Bush Heritage is on two former sheep stations in outback SA that have been drastically altered by pastoral activities. Restoration efforts revolve around threat mitigation and monitoring the conservation values and threatened species present on these properties. One major threat to Australian wildlife, the feral cat, has been implicated with the decline of numerous native species and efforts to control this species have had mixed success. To understand habitat preferences we deployed collars that were hand made and up to 10 times cheaper than commercial products. In the same landscape we also study the plains wanderer, a unique and critically endangered bird, threatened by habitat loss and predation by foxes and feral cats. Our research used short term commercial GPS trackers with hand-made harnesses. Both designs provide an effective monitoring and research device for integrated wildlife management and research.

The NSW Inquiry in the Use of Animals in Medical Research

The Hon. Emma Hurst MLC

Abstract

The 2022 NSW Parliamentary Inquiry into the 'Use of primates and other animals in medical research' was the first of its kind in NSW. It allowed members of Parliament to hear from experts, animal protection advocates and whistle-blowers about some of the key challenges and opportunities surrounding the regulations for animal used in research in NSW. Key areas of focus for the Inquiry were the use of forced swim and smoking experiments, the role of animal ethics committees, transparency and oversight of the industry and – perhaps most importantly – the use of alternatives to animal research.

In this presentation, the Hon. Emma Hurst MLC – who was Deputy Chair of the Inquiry – will share her reflections on the Inquiry hearings and report, and discuss the recommendations from the Inquiry.

Why aren't we saying out loud, what we really think? How to embrace the public conversation about the use of animals in science

Tara Jackson, The New Zealand Anti-Vivisection Society

Abstract

Over the past few years, there has been a significant improvement in openness between NZAVS and some members of the animal science and research community which has enabled many productive conversations. From these interactions, a notable, widespread opinion has stood out to me; no one actually *wants* to use [harmful] animal experiments.

Whilst this community and NZAVS can disagree on the usefulness or need for animal experiments, there is a clear common goal emerging: the genuine desire to replace animals wherever possible and improve outcomes for the health of New Zealanders and beyond.

When we name the issue and say it out loud as a group, regardless of what impels us, there is a clarity in how we can work better together to achieve this shared outcome.

The scientific community has an excellent opportunity to bring this conversation to the public domain, and help drive solutions, NZAVS has a whole list of ideas to help kick start this powerful dialogue!

Reflections of Transparency in Animal Ethics Committees

Karina Burns, The University of Adelaide

Abstract

Transparency within the animal research space has largely been acknowledged as a positive, with parties both in support of and in opposition to the use of animals in research believing that transparency will reveal an ultimate truth favouring their stance. In Australia, while there are ongoing discussions around transparency, the concept is yet to be 33perationalized on a large scale with respect to animal research. As such, transparency within an Australian context remains conceptual, with real world outcomes yet to be known.

The Code stipulates that any Australian institutions undertaking animal research are required to establish an Animal Ethics Committee, which oversees and ensures the responsible conduct of animal research. In this paper I unpack some preliminary data on application outcomes from Australian AECs, consider why AECs in Australia appear to be reluctant to be open about approval trends, and finally discuss reasons why approval trends may not tell us as much about AECs as I had anticipated when conducting this research. As a body acting independently of the institution where the research is conducted, how transparency might be implemented by AECs is a complex matter: ultimately the institution decides on the degree of transparency, not the AEC itself.

1st Annual Report for the New Zealand Openness Agreement

Ian Saldanha, ANZCCART New Zealand

Abstract

The ANZCCART Openness Agreement on Animal Research and Teaching for New Zealand was launched in July 2021. It now has 28 signatories that pledge to be open about how and why they use animals in their research and teaching. A report on signatories openness activities in its first year has now been published.

The Openness Agreement is designed to provide the public with more information on the use of animals in research and teaching and to enhance communication between the scientific community, the public, and tangata whenua. The first Annual Report presents the progress and experiences of the signatories over the September 2021 to September 2022 period and provides a benchmark for future improvements in Openness.

The Report shows that 86% of research/teaching organisations and 83% of non-research/teaching organisations have discussed animals in research and teaching with the public. Furthermore, 67% of research/teaching organisations and 33% of non-research/teaching organisations have made using animals in research and teaching clear to their researchers, staff, and students. The Report highlights that 57% of research/teaching organisations and 33% of non-research/teaching organisations have communicated work around the Three Rs (Replacement, Reduction and Refinement of animals and research methods) to the media and the public.

The Openness Agreement aims to ensure informed discussion and debate among the scientific community, public, and tangata whenua. The agreement aims to promote high animal welfare standards and adherence to the Three Rs. As the public becomes more aware of the use of animals in research and teaching, the scientific community must remain open, trustworthy, and accountable.

The first Annual Report provides an opportunity to share progress towards the commitments and benchmark advancements in Openness about the use of animals in research in Aotearoa.

The Importance of Animal Models in Obtaining New Knowledge

Emma Parkinson-Lawrence, University of South Australia

Abstract

In almost all patients with a genetic disease called mucopolysaccharidosis (MPS), lung function - their ability to breathe easily and without breathlessness on exertion - is reduced. This is mainly caused by the disease affecting the windpipe (trachea) and major bronchi of the lungs, which allows or restricts the passage of air and therefore affects the ability to breathe. We know very little about MPS disease in smaller airways, those extending downwards from the bronchi. Yet some patients have experienced unusual and catastrophic symptoms. Using an MPS mouse model we have applied new non-invasive and high-resolution X-ray imaging technology, together with standard lung function analyses to study the breathing cycle in this disease. We hope to gain insights and knowledge needed to understand this otherwise little-known lung pathology in patients.

Behavioural-based Pig Management and Vascular Access Ports for Blood Collection in Infectious Disease Research

Rachel Layton, CSIRO

Abstract

Improving animal management and sample collection methods in infectious disease studies is crucial for enhancing both animal welfare and scientific outcomes. However, this can prove challenging due to the strict biocontainment and safety protocols that must be followed to prevent the escape of infectious agents, and to minimise the risk of laboratory acquired infections to animal care staff. The adaptation and use of behavioural-based animal management techniques and surgically implanted vascular access ports can reduce stress and reliance on repeated anaesthesia, increase positive experiences for laboratory animals, and reduce study variables that can lead to less applicable science.

At the Australian Center for Disease Preparedness, a positive reinforcement training regime has recently been developed and implemented for pigs in high biocontainment and zoonotic disease studies. In conjunction with the use of vascular access ports, this has led to the ability to collect repeated blood samples from conscious pigs without the need for manual or chemical restraint, improving upon scientific and welfare outcomes.

Replacing animal products in early-stage optimisation of cardiac assist devices: Improving the standard

Antony NcNamee, Griffith University

Abstract

Artificial organs for circulatory support are lifesaving systems that support or replace the function of failing organs in critically ill patients. While these devices enable complex lifesaving interventions, increasing evidence implicates sub-optimal system design is likely to cause blood damage (not identified in pre-clinical testing). Early development phases of artificial organs appear severely limited by international standards recommending use of animal products to predict success of life-support systems designed for humans. Thus, we aimed to compare the suitability of human and bovine blood for artificial organ haemocompatibility testing.

Human blood was sourced, tested, and compared to data obtained from previous bovine blood studies for haematological and rheological parameters, including specific assessment for mechanical sensitivity of blood cells and high-shear tolerance. Haematological assessment identified that when compared with bovine blood, human blood contains: ~25% more blood cells·μL-1; erythrocytes with ~25% larger diameter, ~50% larger volume and surface area, and 10-15% less cytosolic haemoglobin (implicating substantially decreased cytosolic viscosity). Rheological profiles were also identified to be drastically different; human plasma is approximately half the viscosity of bovine plasma; however, as bovine erythrocytes do not aggregate, low-shear whole blood viscosity is markedly increased in human blood. Further, while human erythrocytes are substantially more deformable than bovine, human erythrocytes exhibit far greater susceptibility to shear-induced damage (i.e., half the strength of bovine blood).

Due to inherent biological differences that exist between human and bovine blood, it is likely that current bovine recommendations have resulted in the development of nonrepresentative models of blood-device compatibility. To improve the outcomes and quality of life of patients receiving artificial organ therapies, future devices must be designed, tested, and optimised for humans; bovine blood is a poor model of human tissue and should not be used as a surrogate.

Electric Shock and Serum Corticosterone in Mice

Chris Mayberry, Harry Perkins Institute of Medical Research

Abstract

Research involving delivery of electric shocks to mice has been around since at least 1962, when Hoffman *et al* described a scrambling circuit for that purpose, and is commonly used to study learning and memory in laboratory animals . While an electric shock is likely to be uncomfortable, it is debatable whether an electric shock is actually painful or at what point it becomes painful. However, it is likely to be stressful. Measuring stress and pain is necessarily rather subjective but one well-recognised proxy is circulating corticosterone levels . I searched on-line using "passive avoidance test","electric shock", "corticosterone" and "mouse" in Google Scholar ® but found remarkably few publications relating serum or plasma corticosterone levels to administration of electric shock.

It appears that corticosterone levels can vary according to the strain of mouse under study and whether the test is novel or a repeat. For example, Chester *et al* exposed 2 strains of mice, bred for either high or low alcohol food preference, to a light stimulus of 7 watts and 30 seconds duration. He recorded serum corticosterone levels of around 40 ng/ml. When this was paired with an electrical shock of 0.8 mA and 0.5 seconds duration, serum corticosterone rose to 150-200 ng/ml (high alcohol preference mice) and 200-300 ng/ml (low alcohol preference mice).
Dunn *et al* exposed male CD-1 mice to a 2 second shock at 0.4 mA, serum corticosterone rose from 50 ng/ml to 200 ng/ml. Interestingly, when mice which had previously been exposed to a shock were put into the same environment but given no shock, they exhibited a similar rise, indicating that they remembered the relationship between the environment and the shock.
Benedotti *et al* (2011) recorded resting values of 20 ng/ml, 240 (Bl6 mice) and 320 (BalbC) ng/ml with 5 minutes handling, 350 (Bl6) and 330 ng/ml (BalbC) with subcutaneous injection of capsaicin, and 240 (Bl6) and 450 (BalbC) ng/ml with subcutaneous injection of 10% alcohol in saline.

These stressors were all comparatively acute. By comparison, Shuai Gong *et al* (2015) recorded 100 ng/ml in Kunming mice with a submandibular bleed, rising to 600 ng/ml when subjected to 2 hours at 42 deg C. and 1200 ng/ml after one day in a cage 10cm long X 2cm, too small to turn around but long enough to move back and forth, with food and water within reach. Hennessy (1991) showed serum corticosterone rose from a resting value of about 40 ng/ml to 100 ng/ml after 15 minutes exposure to a novel environment (clean, clear polycarbonate cage with woodshavings for bedding), 150 ng/ml after 30 minutes, and 160 ng/ml after 45 minutes. With exposure repeated daily for 6 days, the response rose to 250 ng/ml. The level fell back by 10 exposures to 150 ng/ml, but remained at 250 ng/ml for a more-novel exposure (clean cage with no bedding).

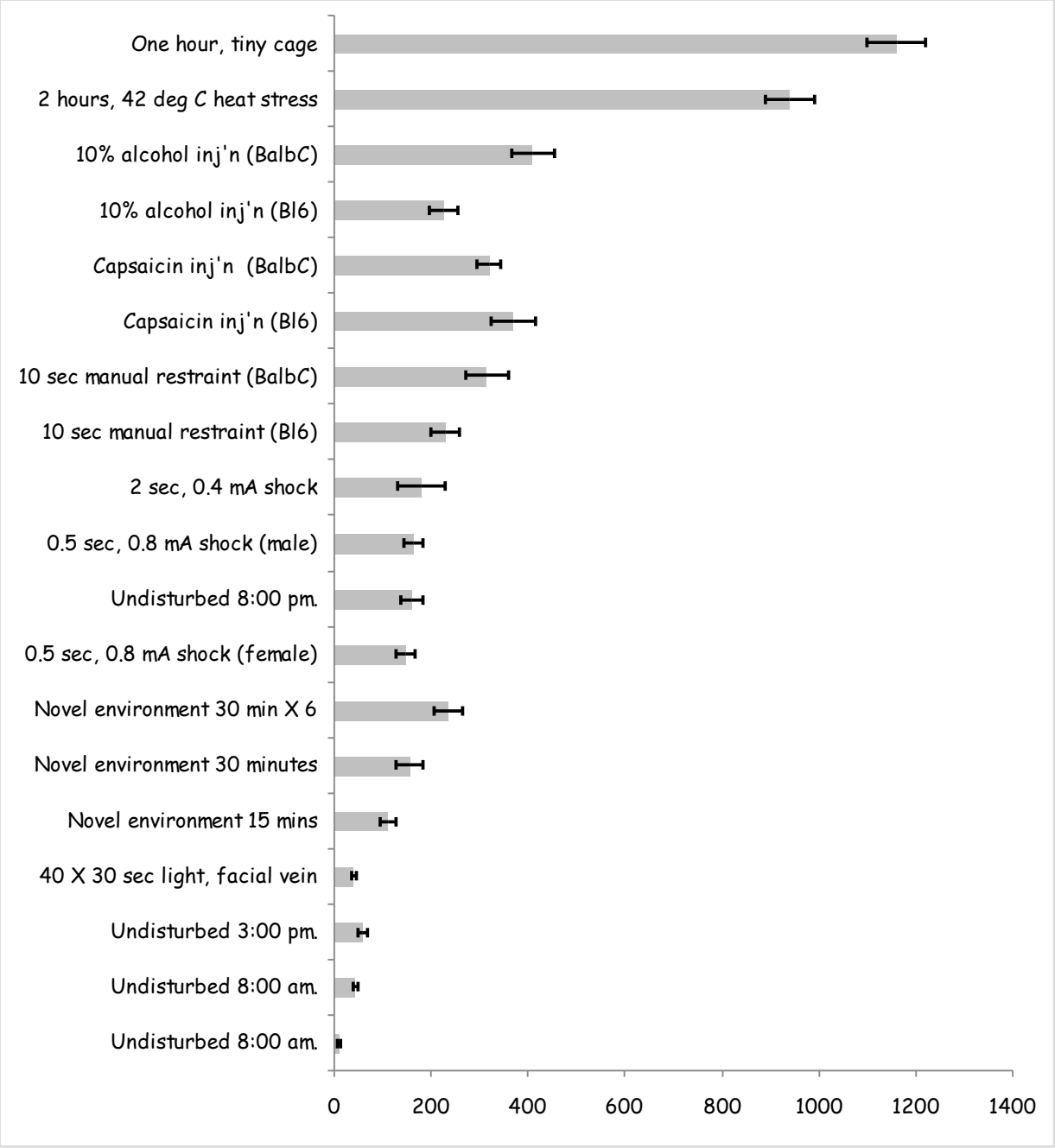

Figure 1.Circulating corticosterone concentration in ng/ml in response to various stresors

We can make few solid conclusions from these results but there are some indications:
Electric shocks to the feet generate higher serum corticosterone levels than collection of blood from the facial veins or bright light.
Strain of mouse is important, and just because one strain (read BalbC) appears more docile, it doesn't mean it suffers less stress (than say, Bl6).
Acute stress seems to result in lower serum corticosterone levels than prolonged or repeated stress.
Subcutaneous injection of irritants such as capsaicin and alcohol, generate higher serum corticosterone levels than electric shocks of 2 seconds or less.
Daily repetition of comparatively mild stress (new cage) leads to increasing corticosterone levels.

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Lessons Learnt from Animal Models of Childhood Dementia

Adeline Lau, Flinders University

Abstract

Childhood Dementia Research Group, College of Medicine and Public Health, Flinders Health and Medical Research Institute, Flinders University, SA, Australia

Childhood dementia is an umbrella term for more than 70 genetically-inherited brain disorders where the affected children progressively lose learnt skills such as the ability to speak, walk, write and play. As only 5% of these conditions have a treatment, most of these children will die prematurely, often before their mid-late teens. For one of these conditions, Sanfilippo syndrome, several animal models exist including a naturally-occurring mouse model. Our characterisation of Sanfilippo mice demonstrates that this model recapitulates many of the features evident in the human condition including behavioural, biochemical and neuropathological changes. This will allow us to continue to develop, evaluate and refine potential therapies for Sanfilippo syndrome.

Troubled Waters: Overcoming Sipper Sack Problems in a Biomedical Research Facility

Amanda Guy-Chresby, University of Wollongong

Abstract

When UOW animal research operations moved to a new facility in early 2020, we made the decision to move away from bottles and introduce sipper sacks as our standard water supply for laboratory rats and mice. The decision was made based on a number of factors including improved water quality for animals and better ergonomics for animal care staff. As research animal numbers ramped up in late 2021 post NSW COVID-19 lockdown, we began to see an increase in the occurrence of leaks in animal cages and researchers started to raise complaints with facility management.

Initial strategies included providing additional instruction to researchers to reduce user error, and a system set up for reporting of sipper leak events and causes. Data collection commenced in February 2022, and although the incidence of sipper sack leaks was quite low, it was important that we find a solution to minimise the risk to animal welfare. I will be discussing the direct causes of and other contributing factors to leaks, how we went about finding potential solutions, what we trialed, what was chosen for implementation, and what has successfully reduced the incidence of sipper sack problems in our facility.

Presenter Biographies

Patricia Turner

Patricia Turner is a laboratory animal veterinarian and pathologist who works as Corporate Vice-President, Global Animal Welfare for Charles River Laboratories. In this role, she is responsible for assessing welfare risks and developing global animal welfare policy and related training. Turner is also a University Professor Emerita at the University of Guelph, where she worked previously as a professor and program leader of laboratory animal science in the Department of Pathobiology. Her research group explores refinement of pain detection in research animals, refinement of behavior management programs for research animals, as well as impediments to human behavior change to enhance research animal care. Turner is currently Vice-President of the American College of Laboratory Animal Medicine, Immediate Past-President of the World Veterinary Association, and an author and editor of many academic publications on animal welfare and ethics, laboratory animal science, and small mammal pathology.

Lewis Vaughan

Lewis is a university veterinarian working at Flinders University and the University of South Australia. He has had a long career in mixed veterinary practice, vocational education and supporting institutions in animal research. Lewis has membership with the Australian and New College of Veterinary Scientists in Animal Welfare, is a past president of the Medicine and Management of laboratory Animal chapter of the College and is a life member of the Australian and New Zealand Laboratory Animal Association.

Rich Little

Rich Little is a Research Scientist at CSIRO Environment, in Hobart, Australia. His research specializes in modelling population dynamics, economics, and management decision-making in natural resource and marine environmental science. He is part of the CSIRO Marine Visual Technologies team, an initiative developing solution to support sustainable fisheries management using deep video analytics, and Principal Investigator for the South East Australian Marine Ecosystem Survey.

Sarah Berry

Dr Sarah Berry is a Postdoctoral Research Fellow with CSIRO Agriculture & Food. Her research in prawn biology includes broodstock maturation & performance, investigating ablation alternatives, and welfare. Her PhD work with CSIRO and JCU focused on physiological and transcriptomic responses to stress in prawns and understanding what drives resilience and performance in farmed prawns. Sarah utilises skills in animal husbandry, molecular biology, and physiology to her research to improve practices and knowledge for industry and research.

Shari Cohen

Shari is passionate about advancing animal welfare through education, collaboration, and good management practices. She is a Veterinary Fellow in Animal Welfare, Ethics & Law. She initiated the Animal Welfare and Excellence award at University of Melbourne and worked on the Victorian animal welfare reform. She holds a UNSW 3Rs grant and University of Sydney PhD candidacy. Shari continues to enjoy her roles as a lecturer, researcher, clinician, animal welfare officer and industry consultant.

Mandy Errington

Mandy has been a member of five AECs and has worked as a facility veterinarian, animal welfare officer, and in the regulatory team in Victoria. She has significant experience in reviewing compliance with the Australian code including review of practices and processes to support the welfare of animals used in research and teaching.

She is a veterinarian, and member of both the Animal Welfare and Medicine and Management of Laboratory Animal Chapters, of the Australian and New Zealand College of Veterinary Scientists. She is a member of the Australian Institute of Company Directors and is a Board Director of a Victorian Statutory Authority.

Gomez Guillermo

Dr Gomez laboratory at the Centre for Cancer Biology (Adelaide) combine cutting-edge wet-lab and computational approaches, including artificial intelligence, for the study of fresh tumour samples from patients and the growth of patient-derived brain tumour organoids to identify new molecular targets based on the tumour microenvironment to develop improved personalized therapies for brain cancer.

Isabelle Harris

Isabelle is a PhD candidate in the Department of Biomedical Engineering and Graeme Clarke Institute at the University of Melbourne, and St Vincent's Hospital Melbourne. Her PhD uses multidisciplinary approaches to engineer theoretical frameworks to better understand the relationship between patient-specific neutral networks and their dynamics; improving our understanding of the underlying neuroscience, to develop novel treatments. Isabelle hopes to transform healthcare for epilepsy patients by encouraging a paradigm shift towards patient-specific diagnosis and prognosis.

Michaela Vranic-Peters

Michaela is a PhD student in the Department of Biomedical Engineering at the University of Melbourne, where she studies bran states and their transitions. Her work has involved finding non-invasive measures of cortical excitability in epilepsy patients, by measuring the brain's response to visual stimulation. She aims to also investigate stimulation responses in other altered states of consciousness including meditative states and sensory deprivation. She also works as an independent games developer and multi-media artist.

Rachael Moses

Rachael obtained her PhD in Tissue Engineering from Cardiff University. Her research focused on the elucidating the mechanisms that novel pharmaceuticals promote preferential wound healing responses, resulting in inclusion as an inventor on a worldwide patent 'Methods and Compositions for Wound Healing'. Rachael's interests lie in natural compound pharmaceuticals for would healing particularly chronic wounds. Rachael has a strong interest in the 3Rs (reduction, replacement, refinement), focusing on developing 3D wound models.

Tony Rowe

Tony is a veterinarian and animal welfare officer and CSIRO. He has a PhD in immunology and is a member by examination of the Chapter of Medicine and Management of Laboratory Animals of the Australian and New Zealand College of Veterinary Scientists (MANZCVS). Previously he was the manager of an animal facility which held mice, rats, and rabbits and was a researcher working in areas such as toxicology oncology and parasitology.

Sashika Naidoo

Sashika Naidoo is an accomplished Regulatory Affairs specialist who has effectively managed clinical trials and ethics committees for research involving humans and animals in the health and medical field. Her background in clinical work, research ethics, and governance, along with her international experience, has allowed her to apply her expertise to various legislative and regulatory guidelines in the health and medical research industry.

Emma Hurst

Emma Hurst is the first female Animal Justice Party MP elected to the Upper House of NSW Parliament. She was a former psychologist, with a background in campaigning, political lobbying, and media work. Emma was Deputy Chair of the NSW Parliamentary Inquiry into the 'Use of primates and other animals in medical research'. Last year, she passed the Animal Research Amendment (Right to Release Bill) 2022 which addresses the rehoming of animals from research institutions.

Tara Jackson

Tara Jackson (Kāti Māmoe) is the Executive Director for the New Zealand Anti-Vivisection Society (NZAVS). NZAVS is an NZ-based charity that works to end animal experimentation, and the harmful use of animals in science in Aotearoa. Some
of the most well-known campaigns that NZAVS have been a part of are the campaigns that successfully banned the testing of cosmetics on animals in New Zealand and prevented legal highs from being tested on animals in New Zealand.
Tara holds a Bachelor of Science in Zoology and has a strong passion for animal rights, human rights, and environmental protection. She has worked for NZAVS since 2015 and over that time the strategy that the charity follows to create change for animals used in science has evolved significantly. Collaboration and focusing on shared, common goals are now key elements of the work that NZAVS carries out.

Rezan Jafary

Rezan Jafary is a biomedical engineer holding a PhD from Monash University. Rezan's work involves building a novel simulation-based training model for clinical training. The model is a patient simulator that allows clinicians to practice the basics of ECMO in a safe environment. This model will increase accessibility to ECMO training and allow repetitive practice without the ethical and time constraints of animal-based training.

Justine Partoon

Justine completed a Master of Animal Welfare Science, Ethics and Law in 2022. She has worked in the zoo and aquarium industry for over a decade and currently is Zoos South Australia's Animal Welfare and Research Manager. Justine focuses on improving welfare for all animals at ZoosSA by applying the most recent science. Justine focuses on ensuring a holistic and evidence-based approach to animal welfare is applied, thus supporting optimal welfare states in all animals.

Mark Smith

Mark's experience includes the design, construction, and operation of world-class zoological facilities and laboratories, with a strong emphasis on exhibition, research, conservation and education. He has worked at Sea World Australia, L'Aquárium de Barcelona (Spain), Oceanário de Lisboa (Portugal), Ocean Explorium (USA) and New England Aquarium (USA). Mark founded was a researcher, writer, and senior editor of the 1st and 2nd elasmobranch husbandry manuals published by the Ohio Biological Survey: *Elasmobranch Husbandry Manual 1: Captive Care of Sharks, Rays, and their Relatives* (2004); and *Elasmobranch Husbandry Manual 2: Recent Advances in the Care of Sharks, Rays, and their Relatives* (2017). Mark is an editor of the forthcoming *Water Quality and Water Treatment in Zoos and Aquariums*.

Jesus Ruiz Flores

I studied my Bachelors and Masters degree in Biochemistry at the Universidad Nacional Autónoma de México (UNAM), where I focused on aggregation in *Saccharomyces cerevisiae*. In 2022 I had the opportunity to come to Australia for my PhD at the Australian National University (ANU), to work at the Membrane Structural & Synthetic Biology lab under the supervision of Dr Joe Brock in the project of nanobodies.

Ian Saldanha

Ian has been involved in the lab animal industry for over 10 years. Before taking up a position at the Cawthron Institute in Nelson, New Zealand Ian was the Head of the Animal facility at the Malaghan Institute in Wellington, New Zealand. He also served on the executive committee for Australia New Zealand Laboratory Animal Association (ANZLAA) for a few years. In his current role Ian oversees animal ethics and biosecurity compliance across Cawthron Institute and is a current board member of ANZCCART NZ.

Andrew Stephens

Andrew Stephens is a biomedical engineer working on smart devices for heart and lung failure and emergency medicine. He is a research fellow at Monash University and the deputy director of the CREATElab.

David Taggart

Dr David Taggart completed his PhD at Monash University on *Life history and Reproductive biology of Marsupial Carnivores*, then took up a research position at the Institute of Zoology (London). Since then he has worked at several Australian Universities /Wildlife institutions, including 11 years as principal scientist with ZoosSA.

David has >28 years' experience conducting field-based wildlife conservation and research projects across Australia. He has broad expertise on marsupial ecology-reproduction-conservation, with specific expertise on wombats, rock-wallabies, koalas and marsupial carnivores. He is an active member of state-national Threatened Species Recovery Teams.

David is passionate about the conservation of Australia's unique wildlife and in bringing together diverse expertise and innovative techniques to halt species decline and improve ecosystem health and resilience at the landscape scale. David currently works as an Affiliate Associate Professor of Wildlife Biology and Conservation with the University of Adelaide, and

Ngaio Beausoleil

Ngaio is Professor of Animal Welfare Science and Co-Director of the Animal Welfare Science and Bioethics Centre, School of Veterinary Science, Massey University, NZ. Her research employs behavioural and physiological methods to investigate various aspects of animal welfare in domestic and wild animals. A key strength is her systematic, science-based approach to evaluating welfare impacts and she has been closely involved in the evolution of the Five Domains Model.

Malcolm France

Malcolm France is a consultant veterinarian working in the care and management of laboratory animals. He has a PhD in veterinary pathology and has served as the director of animal facilities at two of Australia's Group of Eight universities. Other appointments have included chair of two Animal Ethics Committees, reviewer for the international journal Laboratory Animals, ad hoc site visitor for AAALAC International, inaugural President, Registrar and Public Officer of ANZLAA, and secretary of the ANZCVS laboratory animal chapter.

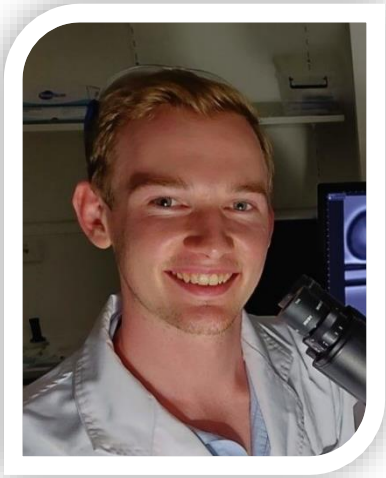
Emma Parkinson-Lawrence

I am the team leader for a research program focused on lung pathology in the monogenic lysosomal storage diseases; specifically, the Mucopolysaccharidoses. I have dedicated my post-doctoral career to MPS research and have a passion for improving outcomes for patients afflicted with these devastating diseases. I am currently employed as the Program Director for the Bachelor of Biomedical Science and Project Leader in the Mechanisms of Cell Biology and Disease (MICBAD) research concentration at UniSA.

Rachel Layton

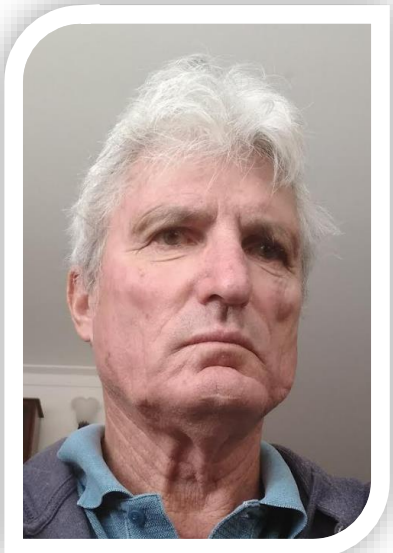
After completing her Honours degree in Animal Science, Rachel has spent the past 15 years working as an animal technician in infectious disease research. In addition to working at the highest levels of biocontainment with viruses including Ebola, Hendra and SARS, Rachel has spent 10 years as a category E Animal Ethics Committee member. Rachel is currently undertaking a PhD in Veterinary Science, focusing on improving laboratory animal welfare and scientific outcomes in infectious disease research.

Antony McNamee



Dr Antony McNamee is a Research Fellow from Griffith University working between health and engineering faculties. His primary research focuses on blood rheology and erythrocyte physiology with particular emphasis on detrimental changes caused by heart-lung machines and artificial organs. Dr McNamee and his team conduct projects in medical device testing, cardiovascular physiology, medical laboratory science, and allied engineering with capacity to invent novel technologies unavailable elsewhere. His team regularly consult international biomed tech industry for testing novel cardiovascular medical devices.

Chris Mayberry



I am a veterinary surgeon registered with the Veterinary Surgeons Board of Western Australia (V0104). After working with the Western Australian Department of Agriculture for over 30 years, I returned to university in 2006 and was awarded a Doctorate in Philosophy for my studies on reproduction in kangaroos. I am currently a Category A member of the Animal Ethics Committees at Perkins Institute and at Curtin University. I previously served as a Category A member on the Animal Ethics committees at Edith Cowan University the Telethon Kids Institute, and briefly the University of WA, and as acting secretary for the Department of Agriculture Animal Experimentation and Ethics Committee where I was also Animal Welfare Monitor for research projects involving livestock on departmental premises in Perth and environs.
I moved from Cat. A member of the UWA AEC to Animal Welfare Officer at UWA in 2012-2016. Although there is quite a lot of research at UWA on wildlife and livestock, the majority of animal research at UWA is on laboratory rodents, so I had to become familiar with the health and welfare requirements of laboratory rodents, the main animals studied at the Harry Perkins Institute. In my time with the Department of Agriculture, I carried out some field research with livestock, and then as a PhD student I became more familiar with experimental design and data analysis.

Adeline Lau

Dr Adeline Lau is a Research Fellow in Neurometabolic Disorders in the Childhood Dementia Research Group at Flinders University. Her research focusses on developing novel therapeutic approaches for the treatment of early-onset neurodegenerative disorders using patient cell, fly and mouse models of disease. These therapies include bone marrow transplantation, viral and non-viral gene transfer and novel small molecule drugs. She also has an interested in mouse model characterisation including behavioural phenotyping.

Amanda Guy-Chresby

Dr Amanda Guy-Chresby has been the Animal Facility Technical Coordinator at the University of Wollongong for six and a half years. She manages the Molecular Horizons Animal Facility, which holds rodents for biomedical research and the Ecological Research Centre, which houses a variety of animals and plants for conservation and ecology research. Amanda has a degree in Animal and Veterinary Bioscience, and a PhD in conservation, specialising in wildlife rehabilitation and release programs.

Rachel Smith

Rachel has worked at Humane Research Australia since 2019, having been active on the issue of animal experimentation since childhood. She holds a MSc in Animal Welfare Science, Ethics and Law, during which she undertook her dissertation project on Freedom of Information Legislation and Animal Research. She provided evidence at the New South Wales Inquiry into medical research using primates and other animals. During her career, Rachel has worked for NGOs in the animal welfare and conservation fields, in Europe, Asia and Australia, as well as employment in the community engagement and health sectors for local, state and federal Government.

Alexandra Whittaker

Alexandra Whittaker is a veterinary scientist, lawyer and behavioural neuroscientist. She is a dual veterinary specialist in animal welfare science, ethics and law, and laboratory animal science through UK certification. Alex has significant research expertise in applied animal behaviour and welfare assessment of animals. She is particularly interested in the welfare science-policy interface and how best practice research can feed into animal law reform. Given her breadth of training and experience in welfare science and animal law, she is often involved in multi-disciplinary projects such as social science-based investigations.

Graeme Finlayson

Graeme is currently the South Australian Healthy Landscape Manager for Bush Heritage Australia, responsible for conservation programs in SA. He has over 20 years' experience with wildlife research conducted throughout Australia and New Zealand including general vertebrate fauna surveys for reptiles, amphibians and small mammals. He has previously worked in research roles, environmental consulting and as part of the oiled wildlife team in the veterinary school at Massey Uni in NZ.

Annabella Lear

Bella is Chief Executive of Understanding Animal Research Oceania, communicating how animal research benefits society. A professional science communicator with a background in neuropharmacology, Bella has worked for the past 18 years on creating social change to support the impact of science, including as an architect and then strategic lead of the Concordat on Openness on Animal Research in the UK. She now works in Australia and New Zealand providing, communication-support on animal research.

Wayne Pitchford

Prof Wayne Pitchford is Director of the Davies Livestock Research Centre within the School of Animal and Veterinary Sciences at the University of Adelaide's Roseworthy Campus. The Centre works across wellbeing and health, breeding and genomics, maternal productivity and neonatal survival, pest animal management, meat and wool science. He works closely with the sheep and beef industries including meat processors across Australia and other countries. He owns a farm with sheep and cattle run by his son.

I am a peptide and protein chemist competing my PhD in the Nitsche Lab at the Australian National University. With support from the Medical Advances Without Animals Trust, I am working to develop novel therapeutics for a range of drug targets, from cancer causing enzymes, to viral proteases and bacterial pathogens.