Abstracts from IAT Congress 2022 Platform and Workshop presentations 29 March – 1 April 2022

PLATFORM PRESENTATIONS

The use of ultrasound imaging as a refinement to early detection of neuroblastoma in mice and orthoptic injection techniques

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The use of ultrasound imaging as a refinement to early detection of neuroblastoma in mice and orthoptic injection techniques Imaging modalities in cancer studies offer significant 3Rs benefits. We use portable ultrasound imaging for a number of procedures that would otherwise be more invasive and less accurate. In this presentation I compare the use of Ultrasound with MRI and palpation in the early detection of neuroblastoma in transgenic mice together with the refinements offered when conducting orthotopic intracardiac injections. We have demonstrated that Ultrasound imaging can be a fast, efficient and non-invasive tool to help in the refinement of procedures.

Adverse affects of adverse effects

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Within the majority of animal research facilities there will be occasions when a project Standard Condition 18 report needs to be submitted if the severity limits specified in the licence, or other controls stated, have been, or are likely to be breached. For example, breaches may occur if a new transgenic line exhibits an unknown phenotype that was not accounted for in the PPL, or if death has unexpectedly occurred as a direct result of a scientific procedure. Adverse effects are often experienced in research studies but at the time of publishing the results, they are rarely mentioned. The ARRIVE Guidelines 2.0 recommend detailing scientific implications of a study, including adverse effects, but this is not part of the essential 10 areas that should be covered in a publication. By sharing the unexpected adverse events more widely in the research community there is the opportunity to refine techniques, thereby reducing the number of animals used and the potential pain, distress and lasting harm they may experience. This talk will address how research facilities could encourage the research community to share the unexpected adverse events they have encountered and how they overcame them to successfully meet the scientific aims and objectives of their research.

Breath sampling in mice: reducing stress for optimal results

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Stress is intrinsically linked to respiratory function and alterations to breathing and lung architecture present immediately in the gases released. Because of this, animal handling, environment and any other factor affecting stress needs to be considered when researching the compounds found in breath. Therefore the use of animals for breath biomarker research must reduce stress for direct implications upon immediate results. This in turn affects scientific reproducibility, translatability in addition to ethical and welfare concerns. This talk will discuss how these challenges have been overcome through specialist chambers and methodological approaches to discover new biomarkers in the breath of mice bearing tumours. These biomarkers can then be discovered in the breath of humans to provide fast, non-invasive diagnostic tests.

Defining a good Culture of Care in an animal research facility and how this is translated into organisation practices

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Culture of Care forms part of the regulatory requirements under Animals (Scientific Procedures) Act 1986 (ASPA) and has been under discussion for some time in animal research facilities in the UK. This talk identifies gaps by explaining a Culture of Care in the context of an academic

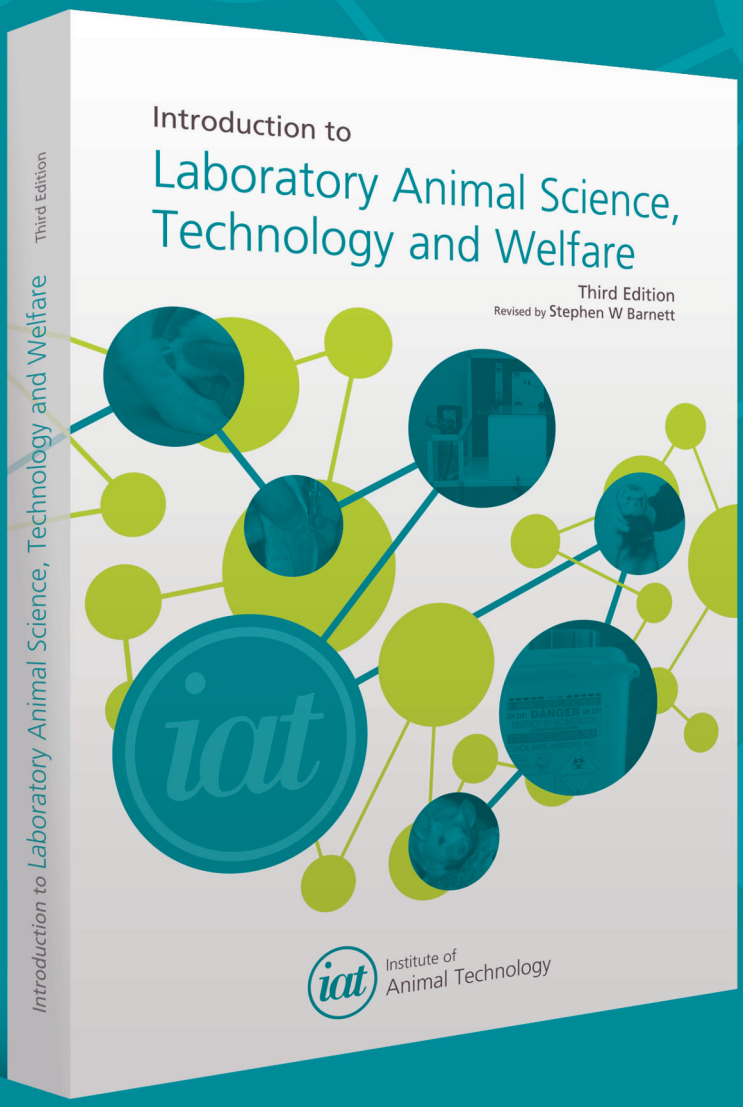
Introduction to

Laboratory Animal Science, Technology and Welfare

The last edition of this book, titled *An Introduction to Animal Technology* was published in 2001. This edition has been revised and enlarged to take account of developments in the subject over the last 16 years. It is well illustrated with most of the illustrations being in colour.

The Animals (Scientific Procedures) Act 1986, as Amended 2012 has been covered in detail as this impinges on all aspects on the care and use of animals used in science. Other topics covered include animal health, housing and environment, routine care, feeding and watering, breeding, ethics and welfare.

The text has been specifically prepared for staff beginning their careers in Animal Technology and closely follows the syllabus for the IAT level 2 Diploma in Laboratory Animal Science and Technology. It is also hoped it will be of interest to any other person starting to work in establishments licenced under the Animals (Scientific Procedures) Act 1986, as Amended.



Copies can be ordered via the IAT website **www.iat.org.uk/books**

Institute of Animal Technology

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animal research facility, understanding what could be learnt from health care organisations Culture of Care and the translation into organisational practices. A definitive description of ten organisational practices that influence organisations to be compliant has been identified. The support that Named Persons working under ASPA require from their organisation identifies how they can demonstrate effective working and the promotion of Culture of Care. A theoretical training framework for all stakeholders supports them to understand their own responsibilities, contributing towards compliance and supporting the organisational vision and mission statement. Introducing two additional 'Rs, Responsibility and Respect, provides a significant link between the animal and stakeholders, thus identifying the organisational behaviour expected. Defining a Culture of Care should involve the contribution of all stakeholders and provides animal research facilities with a definitive outline of how to define their own Culture of Care.

Procurement planning in laboratory animal facilities

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Animal Care Technicians, may be thinking... this doesn't really affect me. However for many Animal Technologists and veterinarians whose careers eventually develop into a facility senior and/or management position, procurement can, and usually does, become a fundamental part of their roles, often with little, or no formal training or an understanding of the implications and responsibilities involved in the procurement process. Whether it's buying some stationary for the office, diet and bedding for the animals, or small and major equipment purchases, they may be responsible for spending many thousands of £GBP or in the case of Facility Design and Build, many millions of £GBP. This presentation will outline some of the processes involved, with a case study and potential training options.

The low carbon animal facility

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Amongst all the challenges of the last 18 months, the move to zero/low carbon is one of many but over the next 10 years this is likely to be the most important topic. Animal research facilities are normally the most energy intensive buildings on the campus and the move to all electric energy can increase energy costs by up to a factor of 3. If these costs are to be fully recovered, this will have consequences which are yet to unfold. This presentation looks that the changes that will be required in construction, operation and compliance that are needed to start this journey to zero/low carbon.

Controlling relative humidity – a way of improving breeding performance of an immunodeficient mouse strain?

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Home Office Code of Practice for Housing and Care of Animals Bred, Supplied or Used for Scientific Procedures provides the guideline that relative humidity (RH) above 70% or below 40% should be avoided for prolonged periods. This is because RH levels below 30-40% in the laboratory rodent facility may increase the risk of certain physiological conditions in mice and rats, including skin and eye conditions and a delayed puberty in female mice. Likewise, a RH level above 60-70% seems to induce the first oestrus earlier in mice. To investigate how control of RH varying within regulatory guidelines can have a beneficial but non-harmful effect on breeding performance of nude mice, we controlled RH accurately at cage level, comparing to room-controlled RH, where the variation was greater. In collaboration with a commercial breeding facility, we collected productivity and RH data from a commercial breeding colony of immunodeficient nude mice over a multigenerational breeding period. The ScanClime (SCANBUR A/S) was used to control RH at cage level in individually ventilated cages (IVCs) at a set point of 55% with an accuracy of maximum 3% under this set level. Thus, the humidity is always above 52%. The breeding performance in the ScanClime ventilated cages was compared to breeding performance in cages ventilated by a standard air handling unit not capable of humidifying, and the humidity in these cages was controlled at room level. RH in a humidity-controlled barrier room environment is controlled centrally, and the RH can fluctuate within specified set points with variable weather conditions. Simultaneously and for comparison, productivity data was gathered over the same period from colonies of the same immunodeficient nude strain housed in IVCs in the same barrier environment where humidity was controlled at the room level only. As a further level of control, multigenerational productivity data was also gathered over a period where humidity was controlled at the room level only, and the cage level humidity control afforded to a subset of the immunodeficient nude colony within the barrier environment was not active. Productivity was measured as a monthly average in Production Index, defined as the number of animals weaned per breeding female per week (homozygous animals only). We hypothesise that the higher RH control offered by the ScanClime (SCANBUR A/S) can have a beneficial effect on colony productivity in particular in the winter months, when RH in the barrier environment can be lower. At the time of submitting this abstract, this difference between the RH in the room and in the cages is becoming distinct and measurable and it is our hypothesis that productivity data will follow.

Animal rights extremists, why we should all share the burden of this crisis

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It is a long-standing tradition in this country that people have the right to protest and are free to gather together in order to demonstrate their views (even if some people may be uncomfortable with these views), as long as they do so within the law. Over the last 2 years we have seen an increase in Animal Rights activity and although we are only talking a small number of protesters, the tactics they use can be harmful to individuals and organisations. This presentation will provide individuals and organisations advice on how to deal with protesters and protect themselves from overt and covert protest.

Animal Technicians and the Technician Commitment

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The Technician Commitment is a university and research institution initiative, led by a steering board of sector bodies, with support from the Science Council and the Technicians Make It Happen campaign. The Commitment aims to ensure visibility, recognition, career development and sustainability for technicians working in higher education and research, across all disciplines. Universities and research institutes are invited to become signatories of the Technician Commitment and pledge action against the key challenges affecting their technical staff. The presentation will give the background to the Technician Commitment identifying the significant impact it has had since its launch in 2017 and update on recent activities including how it has been working with the IAT to support technicians in the sector.

How little we knew ... starting a lifetime in Animal Technology

Graham Goodfellow, Agenda Resource Management

This presentation will put forth a lifetime of experience, to share with the audience and set out that even the modest of accomplishments in a career can be very worthwhile. At the start of a career in Animal Technology, learning and understanding various practices, technical lessons mastered, aspects of the role that surprised or astonished plus early attempts at presenting a paper to peers (including the need for good audio-visual aids!) will all be addressed. Also and importantly, how new innovations have taken the industry forward and lastly as a summary, abiding memories.

Pre-clinical cancer research: the processes, paradigms and prominence of in vivo models

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The world is on a mission to increase cancer survival, with huge strides having been made over the last few decades in prevention, detection, diagnosis, and treatment of this deadly disease. However, with the prognosis of some cancer types having changed little during this time (CRUK, 2014), there is still much more work to be done. With an estimated 10 million people dying of cancer every year worldwide, it's no surprise that over $50 billion was invested in oncology research and development in 2018 (McKinsey). During this talk we will discuss what role in vivo models of cancer play in the development of new cancer therapies, with a focus on models used for efficacy studies, as well as Verinnogen's mission to aid cancer researchers and technicians worldwide with our technology.

Veterinary care of invertebrate laboratory animals

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Invertebrate medicine is still a niche area both in research and veterinary care, despite dedicated specialist publishing for many decades. Part of this is probably due to the complexity of answering simple questions of the invertebrate lab animal, such as, is the animal sick? is it in pain and how do I tell if the subject is dead? These all make the invertebrate lab animal a challenging proposition. Many tarantulas (properly called Theraphosids) can live much longer than many other lab animals and thus can become very long-term research subjects. However, because it is not yet commonplace to see invertebrates in veterinary care scientists need to search further afield for invertebrate medical advice. This is one area where the Veterinary Invertebrate Society (VIS) can get involved and connect technicians and scientists with vets with experience of invertebrates. The new frontiers in invertebrate medicine presented here show the progress being made in diagnosis, management and treatment of invertebrates with a bias towards large arachnids. This presentation will also deliver novel data from researching these fascinating lab animals and related information. This is part our memorandum of understanding between the VIS and the IAT to share expertise and improve the care for the animals we work with.

The evolution of the rat playroom

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Over the years the Culture of Care and welfare for laboratory animals has improved significantly. We at the MSRU are constantly changing and adapting to provide the best possible welfare for the animals under our care. So we decided to set-up a rat playroom within our unit, it has developed over time and proven to be valuable in many circumstances. This includes socialisation with humans before re-homing, introducing adult rats before they are housed together and most importantly it allows the animals in our facility the ability to explore and exhibit their natural behaviours such as running, climbing, and foraging in a secure area. Despite being away from the confines of their cage, the rats desire for human interaction was something we weren't expecting, but fully embraced. The difference in behaviour between strains was also something we weren't expecting but we found quite fascinating. We understand that we are quite lucky to be able to provide our animals with such a space and that other units may not, so we have also investigated and experimented with different ways to provide the same level of welfare and enrichment in a much more confined area. This presentation will explain more about the playroom and cage adaptations we have undertaken.

Creating specialised antibodies from llamas

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Camelid species (including llamas, alpaca and camels) are known to produce small, specialised antibodies called nanobodies as well as conventional antibodies. There is a growing scientific interest in the potential therapeutic utility of using nanobodies as alternatives to conventional antibodies and other biological or small molecule drugs. Nanobodies are potentially more immunogenic, have improved efficacy, are more economic and easier to deliver to their target than larger conventional antibodies. The first nanobody drug, caplacizumab, was introduced in 2019 to treat a rare bleeding disorder. Interest in nanobody technology has been further enhanced during the on-going COVID-19 pandemic, with several research institutes seeking to develop nanobodies from camelids. Llamas are social, pack animals and can be kept as part of a herd. The University of Reading has maintained a herd of llamas at its Centre for Dairy Research (CEDAR) farm facility since 2014. We currently have over 20 male and female llamas working with project partners from the pharmaceutical industry and research institutes such as Pirbright, The Crick Institute and the Rosalind Franklin Institute (RFI) in Oxford. We have recently worked with RFI to generate nanobodies against the SARS-CoV-2 virus. Antibodies are raised in llamas by injecting isolated protein (such as the SARS-CoV-2 'spike protein' responsible for mediating the binding of the virus to human host cells), together with a suitable adjuvant. Llama are held in a secure 'crush' for primary immunisation whereby antigen/ adjuvant are injected intramuscularly at up to 4 sites on the llama shoulder/ neck. Booster immunisations (typically 2-4) are given every 3 weeks. Blood samples (~500 ml) containing antibodies/nanobodies to the antigen are taken at the end of the procedure. The blood is processed to isolate, select and expand suitable nanobody populations. Work with RFI in our llama, Fifi, has generated nanobodies that have been shown to neutralise SARS-CoV-2 virus and variants in vitro (Huo *et al.,* 2021); moreover, a mixture of these nanobodies showed potent therapeutic efficacy in the in vivo Syrian hamster model of COVID-19, via both respiratory and intraperitoneal injection. Work with the isolated SARS-CoV-2 virus spike protein provides a compelling example of the utility of using llamas to provide potentially life-saving medical interventions. The technical team involved in the procedures described, and their management of the llama herd at CEDAR further illustrates, the positive use of animals in research, for which the University of Reading was awarded Understanding Animal Research Openness Awards in 2019 and 2020. RFI and the University of Reading will also showcase this work at the Royal Society Summer Exhibition in July 2022.

Reference

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The trials and tribulations of setting up a Chick Embryo Facility (CEF) as a replacement model

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I'll tell you what I want, what I really, really, want … and that is to see more replacements used before researchers move into protected animals. I became an NC3Rs Board member in 2019. Part of this role means I attend selected mid-term grant meetings. It was at one of these meetings that I met Dr Anne Herrmann who was an NC3Rs grant holder running a Chick Embryo Facility at the University of Liverpool. The chick embryo model is an excellent tool and I was fascinated by the model as it seemed to have so many potential applications from cancer research to drug discovery / toxicity, it also appeared to be relatively simple in its set-up. Further advantages over murine models include its cost effectiveness, its simplicity and immunodeficiency, which allows the engraftment of any xenogenic material. As the experiments are terminated at E14, the model is

classified as non-protected under the Animals Scientific Procedures Act 1986 (amended 2012) and hence it is a valid animal reduction as well as replacement technique. Moreover, the chick embryo has the potential to be readily imaged in vivo. I engaged with some of my researchers and they were sold on the idea. We put in an application for an NC3Rs Skills and Knowledge Transfer grant, to set-up the technique at Strathclyde, and we were successful. This presentation will give an overview of the set-up of the facility at The University of Strathclyde, demonstrate a commonly used method in cancer research, as well as provide some information about the benefits and limitations of this model.

Managing moral stress: Learning from the use of ethical discussion groups and ethical decision making tools in veterinary practice

Vanessa Ashall, University of York

Less than half of the 48 People's Dispensary for Sick Animals (PDSA) UK hospitals are completely satisfied with the level of staff discussion about ethically challenging cases (Wensley et al 2020). In this presentation I share the progress of a collaborative project which aims to evaluate the use of ethical discussion groups and ethical tools to reduce moral stress in PDSA veterinary teams. I highlight how such approaches might also prove beneficial in the laboratory animal setting. Through preliminary findings from an analysis of focus groups and individual interviews I identify the role of practical and relational barriers in creating veterinary moral stress (Reynolds et al, 2012). I highlight the complexity of relationships and responsibilities between humans in the veterinary setting, which may become better understood through sociological research. I show how these relationships may challenge current veterinary ethical approaches (Grimm et al 2018). Finally I illustrate some of the ways in which formal ethical discussion may benefit PDSA veterinary staff, even when it does not change clinical outcomes for animal patients.

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ANDREW BLAKE TRIBUTE AWARD WINNER 2022

Exploring environmental enrichment as a tool for assessing cognitive degeneration in ageing mice

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Environmental enrichment is used to improve animal welfare, but could it be used for more? As mice age, their cognitive abilities decrease. We looked at our ageing colony and how mice at different life stages and of different genetic backgrounds interact with environmental enrichment. We evaluated not only the preference for different EE items, but also if the preference for EE items changes in different age groups. We also trialled the use of an EE strategy and evaluated the potential effect of routine exposure to EE on the level of interaction in different age groups. Our findings suggest that the use of repetitive EE does not affect the interaction level in adult and middle age mice, but it decreases significantly in the old groups over time. Also, interaction with EE item decreased significantly at an earlier stage (middle age) in some knockout lines and especially in one particular strain of mice whose phenotype has synaptic plasticity and memory lesions. This could suggest that standardised evaluation of EE interaction level has the potential to be used as an alternative method to assess cognitive impairment in mice. Our findings confirm the preference of mice for foraging and nesting EE items, as reported in literature, but add that preference doesn't change with age. They also indicate that the level of interest with repetitive EE items decreases in old mice, while it is unaffected in younger animals. This seems to suggest that an adequate and varied EE programme should be put in place and monitored for ageing colonies to be effective and maintain adequate enrichment standards.