

Providing animal  
technicians with the latest  
news from the NC3Rs

# Tech3Rs

Welcome to the latest edition of Tech3Rs. In each issue, we share updates on recent advances in the 3Rs and highlight new resources, research and events.

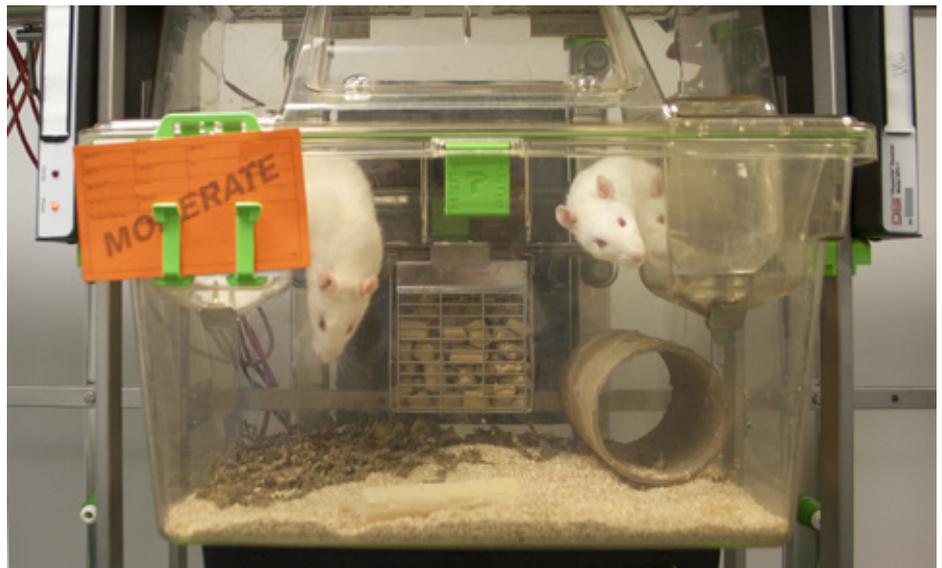
This newsletter is for animal technicians working in research establishments to help with identifying opportunities to embed the 3Rs in practice and ensure high standards of animal welfare. If you have any ideas for future issues or are working on a 3Rs approach you would like us to feature, please get in touch – we would love to hear from you! You can email us at [tech3rs@nc3rs.org.uk](mailto:tech3rs@nc3rs.org.uk).

In this issue we take a look at refining rat telemetry studies, focus on recent publications about monitoring rodent behaviour, and highlight animal technicians championing the 3Rs for the IAT's Animal Technologist Month.



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## Refinement of rat telemetry studies

A new paper challenges the assumption that rats implanted with telemetry devices must be singly-housed.

Can telemetry recordings be routinely performed in rats housed in groups? Or can recordings be made in larger cages, such as double-decker IVCs which provide extra space for natural behaviours? This is an important question as a recent survey of industry experts showed that almost half of rats (46%) are singly-housed during telemetry recordings despite advances in technological innovations that facilitate multiple recordings in a cage.

A paper published in the *Journal of Pharmacological and Toxicological Methods* describes research to assess the practicality of telemetry recordings in group-housed rats and compared standard IVCs with new double-decker IVCs, which provide the animals with a

more spacious environment to perform natural behaviours such as full upright posture and stretching.

The study showed that telemetry signals can be successfully collected from the larger space within double-decker IVCs and cardiovascular changes following pharmacological intervention can be detected. The quality of data was comparable to previously published data from rats singly-housed in standard IVCs, demonstrating that recording from group-housed rats in double-decker IVCs to assess drug-induced cardiovascular changes is technically possible.

### Further information:

[www.nc3rs.org.uk/doubledeckertelemetry](http://www.nc3rs.org.uk/doubledeckertelemetry)



Skinner M *et al.* (2019). Social-housing and use of double-decker cages in rat telemetry studies. *Journal of Pharmacological and Toxicological Methods* 96:87-94. doi: [10.1016/j.vascn.2019.02.005](https://doi.org/10.1016/j.vascn.2019.02.005)

# Fundamental concepts of experimental design

The NC3Rs ran workshops at the 2019 Institute of Animal Technology (IAT) Congress exploring the role of animal technicians in helping to design experiments.

We discussed how bias can be introduced when there are flaws in the design or conduct of an experiment, and how this can lead to distorted results. The workshop covered two key concepts that are critical to improve experimental quality and which animal technicians are likely to be involved in – randomisation and blinding.

Using a valid method of randomisation when allocating animals into experimental groups reduces systematic differences in the characteristics of animals in each group, such as one group having more animals with a high baseline body weight. During the workshop delegates explored practical approaches to randomise animals using hands-on activities. They also explored ways to use randomisation once experiments have begun, in order to reduce bias.

Blinding is not being aware of which animals are in which group throughout the experiment. This ensures that researchers and technicians involved in the experiment do not unconsciously influence the results by behaving in

a different manner towards animals in different groups. For example, expecting one group to perform better in a behavioural task and being more relaxed around that group which may in turn influence the animals' performance. During the workshop delegates were challenged with several scenarios and had to decide who should be blinded. We discussed ideal solutions, as well as what is feasible in "real world" facilities.

**For more information about experimental design, visit our hub at [www.nc3rs.org.uk/experimentaldesign](http://www.nc3rs.org.uk/experimentaldesign) or attend the NC3Rs/IAT Animal Technicians' Symposium in October (see back page).**



# 3Rs papers of interest

Each issue we feature recent 3Rs publications, providing summaries and links to the full articles for further reading.

This issue we focus on the latest technologies for monitoring the behaviour of rodents. Behavioural studies are typically carried out in unfamiliar environments away from the home cage and require animals to perform bespoke tasks in the presence of an observer. Social isolation, a change of environment and handling can be stressful and lead to behavioural changes that affect the quality of the results as well as the animal's welfare. The following papers provide alternative automated approaches to monitor behaviour in a 'home' environment.



**Erskine A et al. (2019) AutonoMouse: High throughput operant conditioning reveals progressive impairment with graded olfactory bulb lesions. *PLOS ONE* 14(3):e0211571. doi: [10.1371/journal.pone.0211571](https://doi.org/10.1371/journal.pone.0211571)**

- Researchers at the Francis Crick Institute and the Max Planck Institute for Medical Research have developed the AutonoMouse, a mouse 'smart house' to study animal behaviour. The team were awarded the inaugural [Crick 3Rs award](#) for their research.
- The fully automated, high-throughput training system allows groups of up to 25 mice to be housed together in an enriched environment with running wheels, ladders and unlimited access to food and water. Each mouse is uniquely tagged to allow monitoring of activity levels, weight and water consumption. Mice can voluntarily access a training cage connected to the home cage to carry out behavioural tasks for a reward without water restriction.
- The new approach improves welfare as animals are housed in large social groups in an enriched environment with minimal interference. This also enhances the efficiency and reliability of behavioural research findings as the data is collected from unstressed animals.
- The utility of AutonoMouse was validated in a series of olfactory behavioural tasks used to determine the impact of lesions on the olfactory bulb and showed that small lesions impaired odour detection.
- Full details and instructions for construction of the system have been made openly available to allow other labs to adopt a similar approach across other areas of neuroscience research.

**Yip PK et al. (2019) Studies on long term behavioural changes in group-housed rat models of brain and spinal cord injury using an automated home cage recording system. *Journal of Neuroscience Methods* 321:49-63. doi: [10.1016/j.jneumeth.2019.04.005](https://doi.org/10.1016/j.jneumeth.2019.04.005)**

- Researchers at Queen Mary University of London investigated the feasibility and practical benefits of using home cage automated analysis to non-invasively measure behaviour in rats with traumatic brain injury and spinal cord injury.
- The study used an automated system developed by [Actual Analytics Limited](#) and funded through an NC3Rs [CRACK IT Challenges award](#).
- The system is capable of capturing individual temperature and behavioural data from group-housed rodents in a standard IVC cage rack. The system uniquely tags each individual animal and combines this with video analytics to record distinct behavioural patterns.
- The behaviour of rats with neurotraumatic injuries was studied over a 12-week period. The system recorded a range of behaviours including aggression, rearing, grooming, feeding and drinking.
- Distinct changes in social behaviour were detected between injured and non-injured animals, such as lack of self-grooming following a prolonged period of immobility. Failure to groom may be linked to mood impairments, such as depression, as observed in humans with neurotraumatic injuries. This could be used as a new avenue to assess the impact of neurotrauma treatment interventions on social behaviours.

**Pernold K et al. (2019) Towards large scale automated cage monitoring—Diurnal rhythm and impact of interventions on in-cage activity of C57BL/6J mice recorded 24/7 with a non-disrupting capacitive-based technique. *PLOS ONE* 14(2): e0211063. doi: [10.1371/journal.pone.0211063](https://doi.org/10.1371/journal.pone.0211063)**

- The aim of this study was to use automated cage monitoring to investigate the behaviour of mice across different facilities and examine the impact of different locations on the reproducibility of data.
- A digital IVC (DVC™) platform developed by Techniplast was used to track the activity of group-housed C57BL/6J mice across three animal facilities at the CNR, Italy; the Jackson Lab, USA; and Karolinska Institutet, Sweden.
- The results showed the impact of interventions involving handling or transfer of animals, such as cage changes, disrupted the basic activity patterns in the home cage.
- Despite efforts to make conditions as similar as possible, the results showed variation in activity patterns between mice at different sites. The authors propose the change of behaviour reflects subtle differences in the environment such as lights-on and lights-off procedures and highlights the importance of protocols to ensure reproducibility across different facilities.
- This paper demonstrates how home cage monitoring can be scaled across multiple facilities and identifies the impact of environmental conditions such as light cycle and cage cleaning protocol on behavioural activity.

# NC 3R<sup>s</sup>

# Celebrating animal technicians for #animaltechmonth

We marked the IAT's Animal Technologist Month with our #animaltechmonth Twitter campaign. Throughout March, we shared quotes and pictures from researchers and technicians about the important role technicians play in putting the 3Rs into practice. Take a look below at what we shared.



Changing to using tunnels for picking up mice has been straightforward. We've used the pre-existing tunnels provided for enrichment and the mice enter them easily. Another bonus: I can quickly health-check both ends of the mouse.

Sue Ecob, Animal Technician, University of Nottingham

NC 3R<sup>s</sup> #animaltechmonth



Sam's expertise in fish husbandry has been invaluable and ensured my stock fish were kept in peak condition during the project.

Dr Lynne Sneddon, University of Liverpool

It's always a pleasure to work with the zebrafish ensuring that their welfare is paramount and their needs are met. I thoroughly enjoyed working with Dr Sneddon and take great pride applying my skills and expertise to a project that also has wider applications for all fish welfare.

Sam Moss, Technician, University of Liverpool

NC 3R<sup>s</sup> #animaltechmonth



We are very proud of all of our technicians and the care and efforts they put into improving animal welfare on a daily basis. We are especially proud of their efforts across our global sites to share their enthusiastic approaches to implementing alternative mouse handling such as cupping and tube handling.

Dr Sally Robinson, UK Head Laboratory Animal Science, AstraZeneca

NC 3R<sup>s</sup> #animaltechmonth



Huge thanks to all of the animal technicians at the University of Leicester who helped us introduce playtime for our rodents. We're looking forward to working with a new team of animal technicians in Nottingham.

Professor Claire Gibson, University of Nottingham

NC 3R<sup>s</sup> #animaltechmonth



We both joined the 3Rs working group as it gives us an opportunity to share our thoughts and ideas regarding the welfare of the animals that we take care of.

Aimee and Alicia, Animal Technicians, Leicester University

NC 3R<sup>s</sup> #animaltechmonth



Our technicians are so important because they are the caring bridge between our research and our animals. Their skill and care ensure the frogs make the very best embryos so we have reproducible results.

Professor Matt Guille, University of Portsmouth

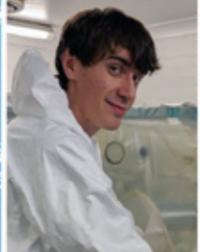
NC 3R<sup>s</sup> #animaltechmonth



One of the most satisfying parts of the job is using my knowledge and dedication to identify innovative new ways of providing tank enrichment and improving the welfare of the fish.

Carl Breacker, Senior Animal Technologist and NACWO, Leicester University

NC 3R<sup>s</sup> #animaltechmonth



I am using the move as a chance to share my 3Rs ideas from projects I've worked on. I work with fish and amphibians but I'm preparing to work with rodents in the near future to start developing refinements in their care.

Callum Branstone, Animal Technician, University of Nottingham

NC 3R<sup>s</sup> #animaltechmonth



Working at the Oxford Primate Lab is an honour and privilege. My favourite part of the job is training our monkeys to trust the staff and cooperate with procedures so that their day to day experience in the lab can be as positive as possible.

Maria Martinez, Biomedical Services Facility NACWO, University of Oxford

NC 3R<sup>s</sup> #animaltechmonth



We are trying to give our rabbits the opportunity to display more natural behaviours like running, digging, foraging, and rearing, and provide them with a varied environment while they are on a scientific study.

Debbie Bursnall and Dave White, NACWOs, University of Leicester

NC 3R<sup>s</sup> #animaltechmonth



We support the 3Rs by maintaining a large frozen archive of sperm and embryos to preserve different genetic mouse strains, which can be shared across the scientific community, minimising the need to ship live mice.

Animal Technicians Team, MRC Harwell

NC 3R<sup>s</sup> #animaltechmonth



My job is to look after mice that have been rederived from frozen embryos and sperm. Using methods such as IVF and embryo transfer reduces the number of animals that we need to breed and keep.

Kelly, Animal Technician, MRC Harwell

NC 3R<sup>s</sup> #animaltechmonth

To find all of our Animal Tech Month posts, search the hashtag #animaltechmonth on Twitter and follow @NC3Rs for future updates.

# 3Rs champions

We would like to help you share your ideas for putting the 3Rs into practice. In every issue of Tech3Rs we feature animal technicians who are championing the 3Rs at their establishments.

**Therese Jones-Green is a Chief Aquatic Technician and NACWO at the Wellcome Trust/Cancer Research UK Gurdon Institute. Here she describes her efforts to refine the health surveillance of *Xenopus laevis* under her care.**

## What 3Rs ideas are you developing?

I have worked with *Xenopus laevis* for over ten years, during which colleagues and myself have encountered many different clinical signs displayed by these animals in varying housing conditions such as redness around the hindlimb or swelling. Often it is difficult to find any practical information about these clinical signs in the published literature.

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Clinical signs are picked up earlier and these help us to make informed decisions on actions to take.”

To overcome this, I started to develop a refined approach to monitoring the health of frogs using photography. Since 2016 I have photographed frogs that show any clinical signs, even relatively minor ones. I took this approach as it's easy and also informative. On the back of the photos I capture details such as dates and treatments. This information can be kept with the individual animal's IDs beside the tank so we can monitor them without having to refer to paper or computer records, which are not compatible with wet environments.

These photos have been used during training and have proved to be an extremely useful reference for checking the health of the frogs and monitoring their recovery. As a result, clinical signs are picked up earlier and these help us to make informed decisions on actions to take. From a welfare perspective, this has



been a great refinement and as a result we now are able to identify welfare issues earlier and take preventative measures.

## What are your future plans?

I would love for the information to be shared and feedback to be received. I would really like to hear how other facilities manage similar health concerns. It would be great to collate information on a larger scale.

**Please email [tech3rs@nc3rs.org.uk](mailto:tech3rs@nc3rs.org.uk) if you would like to get in touch with Therese about this initiative.**

**Rhys Perry is a NACWO at Cardiff University. Here he describes the approaches he takes to work with others to promote the 3Rs and improve the welfare of animals.**

To help promote the 3Rs, I've found it is incredibly important to be approachable and build good relationships with researchers and technicians, taking the time to understand how they work and why. By doing this it has allowed me to suggest improvements where possible with their techniques, and people are more receptive to this as the time has been taken to understand their position.

It's also important to show real enthusiasm when promoting the 3Rs to researchers and technicians. As a NACWO it is important to keep championing implementation of refinements, leading by example and never getting discouraged. While it can

be hard sometimes, it's important to take each step gained as an achievement.

We are encouraged to look through project licences to discuss and suggest refinements in the methods. For example, I queried why a behavioural study required mice to walk across a beam set at 60cm high, which is a significant height for a mouse and can pose a risk of injury. Following discussions at our AWERB, the researchers agreed to alter the method and halved the height required.

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It is important to keep championing implementation of refinements, leading by example and never getting discouraged.”

I continue to look out for new 3Rs developments by meeting with colleagues across the country at IAT events and more, discussing with them how they work and what improvements they have come across that could perhaps be brought back to Cardiff. It's also important to participate in IAT forums and subscribe to newsletters from the NC3Rs, which continually promote these improvements or often inspire them.

I am also a believer it's so very important to keep the joy in work in what, at times, can be a challenging environment. When people are happy, they are more relaxed and confident, and this can drastically improve handling and minimise stress in the animals we work with.

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**Want to be featured in our next issue, or nominate someone else championing the 3Rs at their establishment? We would love to hear from you! Please email [tech3rs@nc3rs.org.uk](mailto:tech3rs@nc3rs.org.uk) and tell us all about it.**

# Highlights from our news and blog

The NC3Rs blog is a platform to talk about the research we champion and the issues we care about. Recently we highlighted two new publications to improve the welfare of macaques used in research.



## Efficient transport box and chair training of rhesus macaques

A team based at the University of Oxford and KU Leuven has explored how refined training methods reduce the amount of time needed to acclimatise monkeys to transport devices. Training methods were based on positive reinforcement techniques (PRT) to reward desired behaviours with preferred food treats, rather than using restraint via the 'pole-and-collar'. These training refinements can reduce the total time monkeys need to spend in an experimental setting or allow

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In our experience, PRT techniques work well for most monkeys and create a positive relationship between trainer and monkey.”

Mr Stuart Mason, University of Oxford

more time to be dedicated to data collection, benefiting science as well as animal welfare.

**Further information:**  
[www.nc3rs.org.uk/  
macaquetransporttraining](http://www.nc3rs.org.uk/macaquetransporttraining)

## Behavioural assessment of wellness and pain in macaques

NC3Rs-funded research has identified behavioural indicators of wellness and pain for macaques, paving the way for more accurate assessment of their welfare. Researchers from the Universities of Stirling and Newcastle observed 36 rhesus macaques undergoing surgical procedures, recording how their facial expressions and behaviour changed in response to procedures and pain relief. Potential pain indicators identified included lip tightening and chewing, which were more prevalent the day following a procedure and prior to the administration of additional analgesia.

**Further information:**  
[www.nc3rs.org.uk/  
macaquepainassessment](http://www.nc3rs.org.uk/macaquepainassessment)

## Spotlight on the evidence for refined mouse handling methods

We have produced a new table summarising the main findings of 11 research papers that report the use of tunnel handling and cupping to pick up mice. This printable resource complements our existing hub of information on these refined handling methods and their effects on animal welfare and scientific outcomes.

Whether you already use refined handling methods in your work or are considering trying them, the table will provide you with an overview of the current evidence that can be shared with researchers and animal care staff.

**Further information:**  
[www.nc3rs.org.uk/  
mousehandlingresearch](http://www.nc3rs.org.uk/mousehandlingresearch)



# Upcoming events



## NC3Rs/IAT Animal Technicians' Symposium Wednesday 2 October 2019, central London

The NC3Rs and IAT are hosting an Animal Technicians' Symposium this October. The programme will consist of presentations, posters and networking opportunities, aimed primarily at junior animal technicians. Speakers will present the latest refinement opportunities and approaches to improving the welfare of laboratory animals. Full attendance at the symposium carries 5 IAT CPD points.

### Call for posters

Are you working on a topic relevant to the 3Rs at your facility? The symposium will provide an excellent opportunity to showcase your work and share your ideas, through presenting a poster on your work. Selected applicants will be invited to participate in a flash poster session and a prize of £100 will be available for the best poster. If you are interested in presenting a poster, please complete the submission form online and submit by **9 August**.

### Travel bursaries available

Up to ten travel bursaries of up to £100 each are available to contribute to travel expenses. To apply for a travel bursary, please complete the travel bursary form online and submit by **9 August**.

### Confirmed speakers include:

- *Tickling rats for better welfare: practical applications of heterospecific play*  
Ms Megan LaFollette, Purdue University
- *Reduction and refinement in research on wild small mammals*  
Dr Sarah Knowles, University of Oxford
- *Handling and training techniques for less stressed laboratory rodents*  
Ms Marie Eriksson, Research Institutes of Sweden (RISE)
- *The importance of randomisation and blinding in animal experiments*  
Dr Esther Pearl, NC3Rs
- *Refinements in zebrafish research: improving welfare through behavioural assessment and enrichment*  
Dr Lynne Sneddon, University of Liverpool
- *Artificial intelligence to improve animal welfare*  
Dr Helen Gray, University of Leeds
- *Perceived barriers to implementation and misconceptions about tunnel handling: results of a recent survey*  
Dr Johnny Roughan, Newcastle University
- *An engineering approach to improve in vitro culture of marine embryos*  
Dr Virginia Pensabene, University of Leeds

**Attendance is free, but registration is essential. Please visit [www.nc3rs.org.uk/ATS2019](http://www.nc3rs.org.uk/ATS2019) to register by 13 September.**