Science & Care

The 54th Conference of the Scandinavian Society for Laboratory Animal Science

Programme & ABSTRACTS

Scand-LAS 2024

21–24 May
Tampere, Finland

scandlas2024.fi

Scientific Programme

TUESDAY 21.5.2024

13:00–18:00	Arrival, Registration at Tampere Hall
13:30–15:00	SITE VISIT to Zebra Fish & Drosophila units at Tampere University (departure from Tampere Hall at 12:45)
14:00–15:30	**Workshop 1**, *Riffi*: Score sheets as a tool in pain assessment (Jussi Helppi, Hanna-Marja Voipio)
16:00–17:30	**Workshop 2**, *Riffi*: Improve your refinement skills in a case lab (Anna Meller, Karoliina Alm)
19:00–20:30	Tampere City Reception

WEDNESDAY 22.5.2024

Plenary session, *Small auditorium*

9:00–9:15	Opening of the Conference
9:15–10:00	**Karl Johan Öbrink memorial lecture** Chair: Siri Knudsen (Norwegian University of Life Sciences) *Hannes Lohi (University of Helsinki):* Hunting new genes and mechanisms of human disease with the help of man's best friends – dogs and cats
10:00–10:30	Chair: Sakari Laaksonen (University of Oulu) *Henna-Kaisa Wigren (University of Helsinki):* Considering species-specific sleep-wake patterns in research: from cells to social structure
10:30–11:00	COFFEE *Exhibition area*

	Session 1 *Duetto 1*	Session 2 *Duetto 2*	Commercial presentations *Riffi*
11:00–12:30	**Aging and Laboratory Animals** Chair: Erika Roman (Swedish University of Agricultural Sciences) *11:00* *Jukka Jolkkonen (University of Eastern Finland):* Aging rodents in stroke research *11:30* *Sira Karvinen (University of Jyväskylä):* Can we tackle the adverse health effects of hormonal aging with animal models? *12:00* *Emrah Yatkin (University of Turku):* Health notification system as a tool to record and identify health issues in a rodent facility *12:20* General Discussion	**Optimizing handling and environment** Chair: Otto Kalliokoski (University of Copenhagen) *11:00* *Anna Meller (University of Helsinki):* Optimizing the refinement tools, housing, and handling of laboratory rats – search for a harmonized solution *11:30* *Vootele Voikar (University of Helsinki):* Optimizing the housing conditions of laboratory mice – harmonizing biomedical research and animal welfare *12:00* *Talk sponsored by Scanbur:* *Louise Piilgaard (University of Copenhagen):* The best of two worlds: Invasive and non-invasive approaches to unveil narcolepsy Type I in mouse models of narcolepsy	11:15–11:45 *Bob Davis (OPEND / Gruenberg Dry Heat Sterilizers):* Dry Heat Sterilization in vivariums – An alternative option for sterilization in the lab animal facility 12:00–12:30 *Adriaan Schmal (UNO BV):* Inhalation Anaesthesia: Best practices for welfare and avoiding occupational risks
12:30–13:30	LUNCH *Exhibition area*		

<table>
<tr><td>13:30–15:00</td><td>Using Zebrafish in biomedical research

Chair: Brian Mphande (University of Tampere)

13:30
Jan Kaslin (University of Tampere & Australian Regenerative Medicine Institute, Monash University):
Regrow with the flow: force and flow regulate neural progenitor quiescence following spinal cord injury

13:50
Maria Sundvik (University of Helsinki):
Zebrafish as a model organism in behavioral neuroscience

14:10
Ilkka Paatero (University of Turku):
Zebrafish models for cardiovascular biology and intravital imaging

14:30
Laura Oksa (University of Tampere):
Modelling of childhood acute lymphoblastic leukemia in zebrafish

14:50
General Discussion</td><td>Scand-LAS Education and Training Committee: It’s all about training

Chair: Lene Gorm Pedersen (Roskilde Technical College, Denmark)

13:30
Åsa Holmberg Wenell (Karolinska Institute):
Practical training without and with animals – from dummies to live animals

14:00
Stine Drent Larsen (Novo Nordisk):
Training of animals to participate and the construction of a training set up

14:30
Lene Gorm Pedersen (Roskilde Technical College, Denmark):
Visitors program update

14:40
Poll & Discussion</td><td>13:30–14:00

Georges Hasson (OPEND / SAFE):
Diets in protocols – key points to consider. Discussion about 2 possible drift sources: Phytoeostrogens and Mycotoxins

14:30–15:00

Robin Labesse (OPEND / Allentown):
Improved and ergonomical rat handling</td></tr>
<tr><td>15:00–15:30</td><td colspan="3">COFFEE Exhibition area</td></tr>
<tr><td>15:30–16:30</td><td colspan="3">Scand-LAS Annual meeting, Duetto 1</td></tr>
<tr><td>16:30–18:00</td><td>Insights in wild animal research

Chair: Esa Koskela (University of Jyväskylä)

16:30
Jenni Prokkola (Natural Resources Institute Finland (Luke)):
Wild fish as experimental animals: research and conservation viewpoints

16:55
Elmo Miettinen (Natural Resources Institute Finland (Luke)):
GPS-tracking of wild boar (Sus scrofa) – room for refinement?

17:20
Liisa Hämäläinen (University of Jyväskylä):
Using wild birds as model predators to study predator-prey coevolution

17:45
Siri Knudsen (Norwegian University of Life Sciences):
Is the EC Educational and Training Framework adapted for wildlife researchers?</td><td>Facility and quality management

Chair: Peter Bollen (University of Copenhagen)

16:30
Emrah Yatkin (University of Turku):
Quality management systems and accreditation standards in laboratory animal research facilities

17:00
Jussi Helppi (Max Planck Institute of Molecular Cell Biology and Genetics, Dresden):
Strategic quality assessment: A multi-level feedback system for improved management of animal facilities

17:30
Jukka Puoliväli (Charles River Laboratories, Kuopio):
How to reduce cumulative suffering during the whole study cycle?</td><td>16:30–17:00

Peter Kesa (FujiFilm Visual Sonics):
Ultrasound and photoacoustic imaging forming the backbone for 3R</td></tr>
<tr><td>18:30–22:00</td><td colspan="3">Exhibitors’ Evening</td></tr>
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THURSDAY 23.5.2024

Plenary session, *Small auditorium*

9:00–9:45	Chair: Hanna-Marja Voipio (University of Oulu) *Merja Voutilainen (University of Helsinki):* Novel approaches for treating neurodegenerative diseases
9:45–10:30	Chair: Hanna-Marja Voipio (University of Oulu) *Axel K Hansen (University of Copenhagen):* The impact of the microbiome on animal models – an overview
10:30–11:00	COFFEE *Exhibition area*

	Session 1 *Duetto 1*	Session 2 *Duetto 2*	Commercial presentations *Riffi*
11:00–12:30	**Microbiome matters!** Chair: Axel K. Hansen (University of Copenhagen) *11:00* *Harri Alenius (University of Helsinki):* Microbe-host interactions in human diseases and their modeling in experimental animals *11:30* *Suvi Ruuskanen (University of Jyväskylä):* The role of the gut microbiome in temperature adaptations in birds *12:00* *Esa Koskela (University of Jyväskylä):* Does the biodiversity hypothesis matter for wildlife health? Exposure effects of urban and pristine forest soils on wild rodent microbiome	**Pain recognition and management** Chair: Klas Abelson (University of Copenhagen) *11:00* *Ann-Helena Hokkanen (University of Helsinki):* Understanding signs of pain in laboratory animals *11:30* *Niina Jalava (Orion Pharma):* Human pain mimicked through an animal pain-like responses? *12:00* *Sara Hestehave (University of Copenhagen):* Calling for early management of joint pain: Early weight bearing deficit in joint disease predicts hypersensitivity and comorbid depressive-like behavior in late disease stages *12:15* *Harikrishnan Sreelatha (Sree Chitra Tirunal Institute for Medical Sciences and Technology, India):* Analgesic treatment of rats subjected to spinal cord injury using conventional laminectomy: Effects on well-being and functional outcome	11:00–12:00 *Giorgio Rosati (Scanbur / Tecniplast):* Advancing vivarium efficiency and animal welfare through digitalization: A operational evaluation of the DVC® System
12:30–13:30	LUNCH *Exhibition area*		
13:30–15:00	**Finnish 3R Centre** Chair: Adrian Smith (Norecopa) *13:30* *Vootele Voikar (University of Helsinki):* Finnish 3R Center – finding place in national and international 3Rs landscape *13:45* *Dario Greco (University of Tampere):* Integrated approaches for chemical safety assessment and drug discovery *14:15* *Pirjo Laakkonen (University of Helsinki):* Peptide-based brain tumour targeting	**Health monitoring; do we still need animals?** Chair: Emrah Yatkin (University of Turku) *13:30* *Massimo Foa (IDEXX_BioAnalytics):* *Sponsored by Idexx BioAnalytics* Microbiological monitoring of rodents: past, present and future *14:15* *Alistair Thompson (Surrey Diagnostics):* *Sponsored by Surrey Diagnostics* New advances in laboratory animal health monitoring	13:30–14:00 *Urte Jaeh and Lars Friis Mikkelsen (Charles River):* Science & Care through the lens of the 4Rs

	14:45 *Sabine Bischoff (Jena University Hospital, Germany):* Reflection on critical incidents leads to a good error culture and strengthens the culture of care for animal and human wellbeing	*14:35* *Varpu Laine (University of Turku):* How we have changed from sentinel to sentinel-free health monitoring in Turku?	14:30–15:00 *Andy Dickinson (Envigo RMS B.V):* Health Monitoring – comparing apples with oranges
15:00–16:00	COFFEE *Exhibition area*		
15:00–16:00	POSTER SESSION *Park Foyer 1*		
16:00–17:30	**Short communications from Abstracts** Chairs: Katarina Cvek (Swedish University of Agricultural Sciences) & Sara Persson (Swedish University of Agricultural Sciences) *16:00* *Jenny Berrio (University of Copenhagen):* Challenging the old ways: a call to rethink behavioral methods *16:10* *Fabienne Ferrera (ConScienceTrain):* Retention and job satisfaction in animal research – what can we learn for creating an institutional culture of care? *16:20* *Maja Ramløse (Ellegaard Göttingen Minipigs A/S):* Social Housing of Göttingen Minipigs *16:30* *Agathe Cambier (Etisense):* 3Rs benefits for cardiorespiratory and activity monitoring in rats using jacketed external telemetry? – Review of evidence *16:40* *Layung Wikanthi (AstraZeneca, Sweden):* Improved memory and lower stress levels in male mice co-housed with ovariectomized female mice *16:50* *Gina Hyberg (AstraZeneca, Sweden):* Detection of male-mouse incompatibility in research studies using an automated in-home cage monitoring system (the TRACK-system) *17:00* *Nadine Sündermann (ZOONLAB GmbH, Germany):* The iMouse System – A visual method for standardized digital data acquisition reduces severity levels in animal-based studies *17:10* *Andrew Smith (Benchling):* Digital transformation: Connecting in vivo teams to the wider R&D ecosystem *17:20* General discussion	**Pandemics, Biosafety & Occupational Health** Chair: David Arney (Estonian University of Life Sciences) *16:00* *Laura Kakkola (University of Turku):* Zoonotic epidemics and pandemics: what, from where, and how to be prepared? *16:30* *Tarja Sironen (University of Helsinki:* Animal models in response to COVID-19 and highly pathogenic avian influenza *17:00* *Kirsi Aaltonen (University of Helsinki):* Animal experiments in a bio safety level 3 laboratory – practice and occupational safety	
19:00–00:30	Gala Dinner		

FRIDAY 24.5.2024

	Session 1 *Small Auditorium*	Session 2 *Riffi*
9:00–9:45	Chair: Pirjo Laakkonen (University of Helsinki) *Sarka Lehtonen (University of Eastern Finland):* Human cell-based models to study neurodegeneration	**Engagement of animal technicians in research** Chair: Johanna Åhlgren (University of Helsinki) *9:00* *Hajnalka Nádai (Experimentica Ltd., Kuopio):* The link between management, communication, culture of care and the individual through the eyes of the designated veterinarian *9:20* *Lauri Elsilä (University of Helsinki):* Research form – a text-based communication channel supporting culture of care *9:40* *Varpu Laine (University of Turku):* Animal Welfare Body at the University of Turku, Central Animal Laboratory: effective communication through focus groups *10:00* *Karoliina Alm (University of Helsinki):* Kick-off meetings a a tool to improve communication *10:20* General Discussion
9:45–10:30	Chair: Pirjo Laakkonen (University of Helsinki) *Otto Kalliokoski (University of Copenhagen):* How common are fraudulent animal studies and how do they impact us?	
10:30–10:50	COFFEE *Exhibition area*	
Plenary session, *Small auditorium*		
10:50–11:35	Chair: Vootele Voikar (University of Helsinki) *Stuart Peirson (University of Oxford):* The importance of light: From vision to circadian rhythms & sleep	
11:35–12:00	Closing	

BROGAARDEN

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WHAT TO PUT INSIDE

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Abstracts

Poster Presentations

Commercial Presentations

Hunting new genes and mechanisms of human disease with the help of man's best friends – dogs and cats

Hannes Lohi
University of Helsinki, Finland

Our research has focused on the development of spontaneous canine and feline models of human disease over the past decade and half. We take advantage of an experiment initiated by man ~23,000 years ago, taming of the wolf and, more recently, generating >400 strictly inbred pure dog breeds. Canine pure breeding has resulted in highly uniform genomes within each breed. That alone would not be very helpful without the fact that several of the essential components of most disease phenotypes can be found and measured in dogs. Dog is a large animal and clinically and physiologically closer to human than typical laboratory rodent models. Canine disorders usually respond to human medications and other clinical and phenomenological studies suggest that these traits may share biological mechanisms across species. The same with cats. We aim to utilize these two unique genetic systems to identify new genes for disease, morphology and behavior. Towards this aim, we have established a dog biobank with >80 000 samples from 330 different breeds. We have also ~5000 samples from ~50 breeds of cats. We work with many genetic traits in dogs and cats and have mapped >100 new loci and genes across traits. The presentation will demonstrate several examples of how the natural canine and feline disorders provide clinically and physiologically relevant models to corresponding human diseases.

Considering species-specific sleep-wake patterns in research: from cells to social structure

Henna-Kaisa Wigren
University of Helsinki, Finland

The universality of sleep-wake patterns across the animal kingdom is demonstrated in detailed studies in species ranging from the round worm, fruit fly, zebrafish, and the laboratory rodents as well as in domestic and wild animals in their natural habitat. While waking behaviors are extensively mapped, and well characterized in the laboratory conditions (and increasingly so also in the wild) the same is unfortunately not true for sleep. The root causes for neglecting sleep stem from the scientific tradition of defining behavior as an observable action/movement; the false assumption that during sleep physiological processes are downregulated or turned off and the poor availability of tools for non-invasive or minimally invasive sleep monitoring in a large scale. Currently, it is evident that sleep is as multifaceted as waking, having multiple functional roles for instance in energy metabolism, immune function, and memory consolidation. Most importantly, there is a bi-directional relationship between sleep and waking: modifications in waking affect sleep and vice versa. Therefore, it is of outmost importance to understand: 1) the species-specific sleep phenotypes, 2) provide optimal conditions for healthy sleep and 3) consider using sleep as a sensitive "biomarker" for animal well-being and/or as an outcome measure for experimental procedures. Recent technical advantages in behavioral monitoring and implant technology allow for non-invasive or minimally invasive sleep monitoring also in social groups revealing important insights into sleep biology. The challenge for the future is to consolidate sleep monitoring as a standard practice in animal housing and promotion of welfare.

Aging rodents in stroke research

Jukka Jolkkonen
A.I.Virtanen Institute for Molecular Sciences and Biomedicine, University of Eastern Finland

The number of elderly people will increase dramatically in next few years and many of them are prescribed CNS-active medication such as anticholinergics, antidepressants, neuroleptics, and hypnotics for the purpose of primary care and treatment of behavioral disturbances. Polypharmacy is common. The same elderly people are at a high risk of cerebrovascular events, which could potentially be exaggerated by concomitant psychotropic medications. Here, I will summarize the findings from a series of experiments designed to replicate real-world scenarios in which elderly individuals at high risk of stroke are administered CNS-active medications. Male Wistar rats aged 24 months were administered galantamine, risperidone, fluoxetine, or zopiclone prior to inducing stroke using the Rose Bengal model (photothrombosis). Medication was continued for 20 days thereafter. Sensorimotor recovery was assessed by beam-walking test over the follow-up. Subsequently, infarct size was measured. Photothrombosis consistently produced a cortical infarct with a transient impairment in forelimb function and a permanent impairment in hindlimb. Surprisingly, age did not appear to significantly affect stroke severity or functional outcome. Moreover, the tested medications, with exception of risperidone, showed no significant impact on functional sensorimotor recovery. In conclusion, despite facing practical challenges, complex study designs, and higher costs, use of aged animals in stroke research enhances scientific rigor and facilitates the translation of findings from rodent models to human clinical contexts.

Can we tackle the adverse health effects of hormonal aging with animal models?

Sira Karvinen
University of Jyväskylä, Finland

Ovariectomy (OVX) is a procedure commonly performed on rodents to simulate the effects of menopause in the female body. OVX is done by surgically removing both ovaries, and it enables to study the effects of systemic estrogen deficiency. However, the timing of OVX surgeries is crucial, and variations in this timing may lead to misinterpretation of the results. Common mistakes include performing OVX on animals that are not fully grown or failing to randomize animals into OVX and sham groups based on key outcome variables, such as body mass. When done correctly, OVX replicates the loss of ovarian function in several levels: behavior (decreased physical activity level), body composition (increased adiposity), and metabolic dysfunction (increased insulin resistance). Most excitingly, OVX has shown to replicate the absence of acute response to exercise in circulating extracellular vesicle cargo observed in women. However, OVX does not mimic the menopausal transition experienced by women. With increasing life expectancy, women spend a significant portion of their lives in an estrogen-deficient state. Hence, understanding the mechanisms behind this deficiency is crucial for mitigating potential adverse effects of menopause. In summary, OVX provides valuable insights into the consequences of ovarian hormone withdrawal, but proper timing and randomization need to be considered to draw accurate conclusions. Due to the increase in longevity, addressing menopause-related challenges have become increasingly vital to improve the healthspan of women.

Health notification system as a tool to record and identify health issues in a rodent facility

Emrah Yatkin[1], Varpu Laine[1]
[1]University of Turku, Finland

Systematic methods to evaluate and record the clinical symptoms of laboratory animals may help to enhance their wellbeing during maintenance and experimental practices. It also allows for earlier detection of humane end points and improves the accuracy in assigning the actual severity class. Our aim was to evaluate the health issues in an animal facility caused by aging, experimental procedures, genetical status and environmental factors. We retrospectively collected data regarding the amount and category of health notifications and correlated those numbers with relative humidity (RH) and temperature (T) and the genetic status of laboratory animals as denoted GS1 (non-genetically modified = non-GM), GS2 (GM without harmful phenotype) and GS3 (GM with harmful phenotype) from two rodent facilities during 2019 and 2020. Symptoms relating to the skin (wounds/scratches/bites) were the most common (approx. 35%). The following conditions amounted to about 10% each: loss of body weight/dehydration, fur condition/appearances, eyes, posture, delivery problems and moving/tremors. In GS3 category animals only, skin symptoms remained the most prevalent (approx. 30%); however, abnormal posture, eyes, moving/tremors and breathing problems were more common for this group. Statistically significant correlation was detected between the number of health notifications and genetical status indicating that genetically altered animals have higher propensity to develop health problems, so their phenotype should be evaluated often to ensure their overall health and wellbeing.

Optimizing the refinement tools, housing, and handling of laboratory rats – search for a harmonized solution

Anna Meller
University of Helsinki, Finland

The acceptability of the use of animals for scientific purposes is under scrutiny in society and there is increasing concern about the welfare of these animals. The legal and ethical demands for minimized harm and better welfare create the need to continuously reassess our current housing and handling practices and encourage looking for better refinements. Especially the size and height of the legally acceptable standard rat housing has been challenged. The size limits the refinement possibilities and may restrict rats' abilities to perform normal behaviours. The concept of Culture of Care, where we aim to improve the welfare of both animals and people working with them, should lead to better well-being by lowering the stress levels and creating a positive circle in the interactions between humans and animals. On the other hand, there is an increased concern about the quality of research. How are we able to replicate and translate our research better? Rats with good welfare and without negative stress, who can perform natural behaviours, should be the obvious answer. Do we have sufficient knowledge of what is optimal for the laboratory rats in the research setting to harmonize? How to optimize and harmonize so that all aspects are in balance? The size and weight of the cage will affect the workload of the animal caretakers. Some enrichment solutions may increase negative interactions in groups or cause effects to results. We need research to find better solutions for housing, refinements, and handling which will lead to better research quality and welfare.

Optimizing the housing conditions of laboratory mice – harmonizing biomedical research and animal welfare

Vootele Voikar
University of Helsinki, Finland

Optimizing the handling and environment of mice in biomedical research requires a careful balance between conducting effective research and ensuring the welfare of the animals involved. This balance is crucial to both ethical considerations and the reliability of research outcomes. Here are some key points to consider: adherence to ethical guidelines and regulations governing the use of animals in research on the one hand, but also providing appropriate housing conditions, considering factors such as cage size, environmental enrichment, and social interactions. The concept of environmental enrichment has origins in neuroscience, where it has been used for decades to promote neural plasticity, whereas "standard" conditions for laboratory rodents have been rather impoverished. These engineering standards are often based on practicality and economic, rather than biological, considerations. Justified concerns have been expressed whether the animals raised in such conditions represent a normal, healthy population. On a positive note, the biomedical research community is increasingly aware of this shortcoming. Focus is shifting to the automated, 24/7 monitoring of animals in their home cage where species-specific needs are met as much as possible. By maintaining a commitment to both rigorous research and high standards of animal welfare, researchers can contribute to advancements in biomedical science while upholding ethical principles. Collaboration between researchers, veterinarians, animal care staff and equipment manufacturers is essential for achieving this delicate balance.

The best of two worlds: Invasive and non-invasive approaches to unveil narcolepsy Type I in mouse models of narcolepsy

Louise Piilgaard[1], Camille Gylling Hviid[1], Jessica L. Justinussen[1], René Lemcke[1], Birgitte Rahbek Kornum[1], Petrine Wellendorph[1]

[1]University of Copenhagen, Denmark

Sponsored by Scanbur

Narcolepsy type 1 (NT1) is a neurological disorder caused by disruption of hypocretin (HCRT; or orexin) neurotransmission leading to fragmented sleep/wake states, excessive daytime sleepiness, and cataplexy (abrupt muscle atonia during wakefulness). Electroencephalography and electromyography (EEG/EMG) monitoring is the gold standard to assess NT1 phenotypical features in both humans and mice. Here, we evaluated the digital ventilated home-cage (DVC®) activity system as an alternative to detect NT1 features in two NT1 mouse models: the genetic HCRT-knockout (-KO) model, and the inducible HCRT neuron-ablation hcrt-tTA;TetO-DTA (DTA) model, including both sexes. NT1 mice exhibited an altered dark phase activity profile and increased state transitions, compared to the wild-type (WT) phenotype. An inability to sustain activity periods >40 min represented a robust activity-based NT1 biomarker. These features were observable within the first weeks of HCRT neuron degeneration in DTA mice. We also created a nest-identification algorithm to differentiate between inactivity and activity, inside and outside the nest as a sleep and wake proxy, respectively, showing significant correlations with EEG/EMG-assessed sleep/wake behavior. Lastly, we tested the sensitivity of the activity system to detect behavioral changes in response to interventions such as repeated saline injection, chocolate, and a wake-promoting compound. We conclude that the DVC® system provides a useful tool for non-invasive monitoring of NT1 phenotypical features and has the potential to monitor drug effects in NT1 mice.

Regrow with the flow: force and flow regulate neural progenitor quiescence following spinal cord injury

Jan Kaslin[1,2]

[1]University of Tampere, Finland, [2]Australian Regenerative Medicine Institute, Australia

Regenerative vertebrates, such as zebrafish and salamanders, exhibit near complete recovery from traumatic spinal cord injuries. This process requires tissue remodeling and reactivation of quiescent neural progenitors to replace lost and defective tissues. Using zebrafish models of spinal cord injury and high-speed live imaging and biosensors, we show that flow and tissue remodeling generate distinct biomechanical forces that orchestrate and drive the neural progenitor activation and local repair. We identify specifically located mechanically gated cation channels on the membrane and cilia of the neural progenitors and the downstream transcriptional programs that trigger exit from quiescence. Furthermore, we show that biomechanical sensing is also an important mechanism in control of normal spinal cord development and growth.

Zebrafish as a model organism in behavioral neuroscience

Maria Sundvik
University of Helsinki, Finland

Zebrafish, Danio rerio, has served as a vertebrate model organism in biomedical research for decades. It is relatively cost-efficient and easy to breed and keep in the laboratory. We have developed automated assays to study different behaviors in both larval and adult zebrafish. The initial assay was a simple test to quantify locomotion in freely moving animals in a high throughput manner in an environmentally controlled setting. The animals were of different ages (from 5 days post-fertilization up to one year-old animals) and traced for different periods of time (from seconds to days). Depending on whether the experimental animals were young or old, the assay had slight variations. This assay was helpful in studies of physiological sleep-wake cycle and mechanisms of neurodegenerative disorders such as Parkinson's disease. Further, we have set up assays to look at the response of fish to different stimuli, such as dark-flash response, chemicals, objects and other individuals. The dark-flash response assay helped to identify neurons involved in wakefulness in the developing brain. Furthermore, we have studied fast movements in millisecond range, memory, hierarchical behavior and social interactions in zebrafish to model dominance. Hierarchy is quickly established both in pairs of male-male and pairs of female-female adult zebrafish and can be traced in the offspring. Social interaction was further studied in experimental models of autism. All in all, we have developed a battery of useful behavioral tools to strengthen the use of zebrafish as a model organism in behavioral neuroscience.

Zebrafish models for cardiovascular biology and intravital imaging

Ilkka Paatero
University of Turku, Finland

Zebrafish models are increasingly used as an alternative for mammalian models for in vivo research in biomedicine. One of the key fields has been the analysis of cardiovascular biology and pharmacology using zebrafish embryos and adults. Many advances have been made by utilizing zebrafish models combined with different intravital imaging modalities. In this presentation, I will present the strengths and weaknesses of zebrafish models with emphasis on cardiovascular research and practical aspects of experiments utilizing intravital imaging.

Modelling of childhood acute lymphoblastic leukemia in zebrafish

Laura Oksa
Tampere University, Finland

Acute lymphoblastic leukemia (ALL) represents the most prevalent type of cancer in children, with its complexity and variation in genetic backgrounds demanding sophisticated models for in-depth study. We have developed a novel zebrafish model for childhood ALL, focusing on the ETV6:RUNX1 gene fusion, a hallmark of approximately 25% of pediatric ALL cases. Utilizing CRISPR/Cas9 technology, the model incorporated this fusion alongside secondary mutations in pax5 and cdkn2a/b genes, closely mirroring the disease's genetic underpinnings in humans. Results indicated an enlarged progenitor cell population, while leukemia development required additional genetic events, reflecting the disease's multistage progression. Importantly, RNA sequencing analyses revealed that the zebrafish model accurately recapitulated the transcriptional profile of human ALL, confirming its B-lineage origin and providing new insights into the leukemia's molecular drivers. This model not only deepens our understanding of ALL pathogenesis but also serves as a convenient platform for testing novel therapeutic interventions. Looking forward, the zebrafish model opens new avenues for dissecting the intricate molecular pathways involved in ALL pathogenesis and holds promise for the development of targeted therapies, potentially helping to improve treatment strategies for this childhood cancer.

It's all about training

Klas Abelson[1], Lene Gorm Pedersen[1], Åsa Holmberg[1], Siri Knudsen[1], Toomas Tiirats[1], Hanna-Marja Voipio[1]

[1]Scand-LAS Education and Training Committee

The Scand-LAS Education and Training Committee has the mission to endorse and promote educational activities for all personnel involved in animal care and use, in particular for animal caretakers and technicians. As part of fulfilling this mission, the committee organizes a session at the Scand-LAS conferences. This year's session will consist of three presentations. First, Stine Drent will give a presentation about a program for training of animals, with the goal to minimize stress in the animals and maximize their cooperation. Further, Stine will present how the skills and competences of the staff involved in animal training are maintained and developed. Second, Åsa Holmberg will present how dummies and other non-animal tools can be used as part of the training of technicians and researchers, to improve skills in animal handling and procedures on live animals. Finally, Lene Gorm Pedersen will present the most recent updates about the Scand-LAS visitor program, where animal caretakers and technicians can visit other animal facilities in the Scand-LAS countries to gain new knowledge. How it is structured, what the status is at current, and how it will continue, will be addressed. In addition to the above-mentioned presentations, the committee will end the session with a survey to raise topics for a planned workshop about communication in 2025. We want your opinion – bring your phones!

Practical training without and with animals – From dummies to live animals

Åsa Holmberg Wenell
Karolinska Institute, Sweden

What is a simulator and how can it be used? Why and when can it be a good idea to use the simulators? A simulator can be several different kinds of dummies but can also be a sedated or euthanized animal. The idea of using simulators before the training with live animals begins, gives the trainee a chance to practice how to place hands, fingers and equipment without causing any stress or harm to animals. It also gives the trainer better opportunities to explain, interfere and shape the trainees' techniques during the procedure. When using live animals, pre-trained animals are a good way to avoid stressful situations. When the trainee is comfortable with the procedures it is easier to start using the untrained animals in a calmer manner.

Training animals to participate and the construction of a training set up

Stine Drent
Novo Nordisk, Denmark

A description of how we achieve our common goal: "All animals must be trained for the procedures in which they participate" in practice. More specifically, how we build specific training plans built on the theories of positive reinforcement and reward-based training. And how we adapt the training to the exact study procedures and needs, so that the animals are included as stress-free and voluntarily in the technical procedures of the studies as possible. Further I will explain how we prioritize training in our daily routines in the animal facility, as well as further education of colleagues, so that we all can contribute to the training of the animals in our facility. The presentation will describe, how specific training plans are constructed, built on the theories of positive reinforcement and reward-based training, and how the training is adapted, to the specific study procedures and needs, so that the animal's participation is stress-free and voluntarily. To reach the goal of training all animals, we need time and flexibility. This means that we need to prioritize animal training in our daily routines in the animal facility, as well as further education of colleagues, so that all animal caretakers can contribute to the training. Lastly, I will speak about the development of the role as training coordinator, including the education "Instructor in Clicker training" by Canis-Academy in Norway, by Morten Egtved.

Wild fish as experimental animals: research and conservation viewpoints

Jenni Prokkola
Natural Resources Institute Finland (Luke), Finland

Wild fish constitute a major component of aquatic ecosystems and food webs, but they are also used for human consumption, which makes monitoring their population status a priority. Handling and marking of fish are prerequisites of sustainable fisheries due to the major limitations of effective, non-invasive monitoring. On the other hand, research on fish bred in captivity cannot replace studying individuals in their natural environment, and many questions are only feasible to study using long time series collected from the wild with consistent methodology, which requires fish handling. Such data sets are particularly valuable for the aim of mitigating the impacts of climate change on ecosystems and humans. A challenge in wild fish research and legislation is that the tens of thousands of known teleost species differ vastly in their optimal environments and tolerance to procedures. Consequently, there are many knowledge gaps in maximizing animal welfare for wild fish during experiments and data collection, even though general principles can be applied across species.

GPS-tracking of wild boar (Sus scrofa) – room for refinement?

Elmo Miettinen[1,2], Mervi Kunnasranta[1], Anna Meller[2]
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In studying the population ecology of wild mammals, the approach to the "3R" principles differs from laboratory research. Replacement is often impractical, and reduction is unnecessary due to intensive efforts in capturing animals. The emphasis is therefore on refinement. Throughout its global distribution, the increasing populations of wild boar (Sus scrofa) are involved in human-wildlife conflicts, notably with the risk of African swine fever transmission. While knowledge on wild boar is abundant in temperate and subtropical regions, it's lacking in the north. To study the behaviour and impacts at the northernmost edge of the distribution, 20 adult wild boars were GPS-collared in southeastern Finland. Although GPS collars are standard in studying mammalian movement, they may pose welfare issues, especially for wild boars, due to neck anatomy, body size changes, and risks regarding anesthesia. Young, growing individuals cannot be collared at all. Therefore, 108 individuals were also marked with less invasive devices: GPS pelt tags, GPS ear tags, and plain ear tags. The adults were relatively sedentary, despite having large home ranges (87 km2 in average), and 18% subadults dispersed, traveling direct distances up to 163 km. While the alternative tags did not match the data quality and duration of GPS collars, the ability to track a large number of young individuals with a less invasive method provided valuable information on dispersal potential, crucial for risk management. The refinement in animal subject welfare, improving technology and cost-effectiveness of the small tags promote their potential in future wildlife research.

Using wild birds as model predators to study predator-prey coevolution

Liisa Hämäläinen
University of Jyväskylä, Finland

Predators and prey are one of the best examples to study species coevolution. Prey have evolved many different defense strategies against predators, including chemical defenses and conspicuous warning coloration to advertise their toxicity. To understand the selection pressures from predators on prey defenses, we need to investigate predators' foraging behaviour and their decisions to attack different prey types. This requires controlled behavioural experiments with ecologically relevant wild predators. Wild blue tits (Cyanistes caeruleus) and great tits (Parus major) provide ideal model species for these types of studies as they are generalist predators of many insect species and easy to capture and keep in temporary captivity. In my talk, I will describe behavioural experiments that I have conducted with wild-caught blue tits and great tits. These include studies that investigated social learning of prey choices from other individuals using video playback and artificial prey, and a recent experiment that explored a link between the birds' gut microbiome and their foraging behaviour. Throughout my talk, I will discuss the regulations on the use of wild birds in research and the importance of considering bird welfare in behavioural studies, covering the capture, housing, and the release of birds after the experiments.

Is the EC Educational and Training Framework adapted for wildlife researchers?

Siri Knudsen
Norwegian University of Life Sciences, Norway

Quality management systems and accreditation standards in laboratory animal research facilities

Emrah Yatkin
University of Turku, Finland

Animal facilities can adopt accreditation or quality management systems (QMS) based on the nature of their activities. Good Laboratory Practice (GLP) is a quality system that must be complied with in non-clinical studies which are intended to be submitted to a national registration authority with the purpose of registering or licensing of chemicals, medicinal products, pesticide products, food/feed additives, and cosmetic products. Historically, GLP requirements were reaction to cases of malpractice and fraud in the non-clinical testing performed by some research organisations. Regulatory authorities accept laboratory studies from other countries provided they comply with the OECD GLP principles thus preventing unnecessary duplication of experiments. AAALAC International is a peer-reviewed accreditation scheme, which evaluates the organization and practices in a laboratory animal facility for adequate use of animals, safeguards for animal well-being ('state-of- the-art' housing, techniques, etc.) as well as health and safety risks to staff. ISO 9001:2015 specifies requirements for a quality management system when an organization needs to demonstrate its ability to consistently provide products and services and enhance customer satisfaction including processes for improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements. Could animal facilities implement high standards for animal welfare and quality scientific data without a quality management system? Regardless of whether there is or not or the type of quality management system, it is recommended that establishments standardize their protocols, implement continuing professional development, establish standard operating procedures (SOP) and put an emphasis on animal welfare.

Strategic quality assessment: A multi-level feedback system for improved management of animal facilities

Jussi Helppi
Max Planck Institute of Molecular Cell Biology and Genetics, Germany

Animal facilities face the ever-increasing challenge of running an effective and well-organised programme. The operation of animal facilities is also extraordinarily expensive. The Max Planck Institute of Molecular Cell Biology and Genetics in Dresden, Germany, addresses these challenges by implementing a full-service ideology in its scientific core services. This approach, particularly in the case of the animal facility, extends beyond standard animal housing to encompass comprehensive technical and scientific services, all delivered on a fee-for-service basis. To ensure the quality of services and to assess mission alignment, the institute utilises a multi-level feedback mechanism. A comprehensive costing matrix, coupled with a recharge principle, allows the animal facility budget to be collected solely through user fees, ensuring alignment with user needs. Additionally, each core facility, including the animal facility, undergoes regular evaluation by external advisory panels. One internal super-user and two external experts form individual panels that meet at the facility leader's discretion. A joint advisory panel, comprising representatives from each facility, convenes every three years, providing an evaluation integral to the institute's strategic development. This evaluation is also part of the Institute's SAB evaluation. This presentation will provide a concise overview of these management principles, drawing on past evaluations and recharge system examples. It will highlight the effectiveness of the approach in ensuring quality services, mission alignment, and fostering a culture of continuous improvement within the institute's core facility program.

How to Reduce Cumulative Suffering During the Whole Study Cycle?

Jukka Puoliväli
Charles River Discovery Research Services, Finland

Charles River, Kuopio, Finland, conducts preclinical studies using rodent models of neurological disorders. According to the retrospective assessments, approximately 10% of all animals used at the site belong to the severe category. It is crucial that all available tools are utilized to reduce cumulative suffering throughout the entire study cycle. The site should have institutional policies that describe the key components of the animal welfare program, supporting the work of veterinary and scientific staff. The internal review of study proposals, protocols, and animal licenses increases staff awareness about the research conducted at the site and provides the initial opportunity to influence study components and the 3Rs. The site's Animal Welfare Body (AWB) should actively work towards implementing new 3R methods. It is essential to conduct pilot studies to provide feasibility data and evaluate the cost impact of refinements to convince management. Improved welfare does not necessarily lead to increased costs; in fact, it can sometimes reduce them. Staff should receive training to actively use systematic tools for welfare assessment. Utilization of up-to-date, study-specific humane intervention point and humane endpoint information should be made as easily accessible as possible. Online reporting solutions should be employed for retrospective assessment and monitoring of daily tasks in the lab to enhance commitment, transparency, and timeliness of activities. An active site AWB forms the core of animal welfare work. With the support of the corporate animal welfare network, local management, and all staff working on the site, the AWB can best achieve its goals of improving animal welfare.

Novel approaches for treating neurodegenerative diseases

Merja Voutilainen
University of Helsinki, Finland

The prevalence of neurodegenerative diseases such as Amyotrophic lateral sclerosis (ALS) and Parkinson's disease (PD) is growing rapidly. Current treatments cannot stop the progression of the disease, thus there is an urgent need for new therapies. Neurotrophic factors (NTFs) are secretary proteins that regulate the survival of neurons, neurite growth and branching. They have been explored as novel drugs for the treatment of ALS and PD but their efficacy in clinical trials has been poor. CDNF is a protein with NTF properties that protects and restores dopamine (DA) neurons in animal models of PD and increases motor coordination and protects motoneurons (MNs) in rodent models of ALS. CDNF was safe and showed therapeutic effects in PD patients in Phase I/II clinical studies. However, a major limitation of NTFs and CDNF is the need for direct delivery into the brain. Drug delivery across the blood brain barrier (BBB) is a key unmet need in neurological drug development. I have shown that a novel CDNF fragment protects MNs and DA neurons in vitro and in vivo. Furthermore, our data show that CDNF fragment can pass through the BBB as measured by three different methods and has a neurorestorative effect in genetic mouse model of ALS and in 6-OHDA rat model of PD when administered subcutaneously. The ultimate goal of my research is to understand the mode of action and therapeutic effect of novel BBB penetrating CDNF-derived polypeptides. The innovative aspect of this study is the new ground-breaking concept for treating neurodegenerative diseases.

The impact of the microbiome on animal models – An overview

Axel Kornerup Hansen
University of Copenhagen, Denmark

Mice from different breeders or rooms exhibit substantial variation in model expression. Therefore, often data from mice are not reproducible in other similar mouse studies or applicable for the human patients, a phenomenon known as the reproducibility or translation crisis. It seems nowadays to be generally accepted that for certain traits the gut microbiota influences laboratory mice more than genetics does. Also, natural ingredient diets have a substantial batch variation, and they have an essential impact on the gut microbiota, and subsequently on the model expression. Commercial specific pathogen free mice have immune systems comparable to newborn babies, and, therefore, often fail to translate to adult human beings. Mouse models can be changed by phage or microbiota transplantation, but while mouse-to-mouse transplantation results in a re-colonization rate of approximately 80 %, a human-to-mouse transplantation results in a re-colonization of approximately 40 %. Key anti-inflammatory human bacteria are among those most frequently lost, and human-to-mouse transplanted mice still have newborn baby immune systems. Therefore, instead of standardizing the mouse for a specific microbiota, it may be a wiser strategy to embrace the microbiota variation and incorporate it in the data evaluation, which may increase the power of mouse studies dramatically. Even dirty mice with pathogens and a more complex microbiota might be a future research tool, but it may also be possible to mimic the pathogen stimulation artificially without getting the pathogens back into the animal facilities.

Microbe-host interactions in human diseases and their modeling in experimental animals

Harri Alenius
Karolinska Institute, Sweden, University of Helsinki, Finland

The exploration of microbial roles in human diseases is paramount for a comprehensive understanding of infection mechanisms, pathogenesis, and host immune responses. Microorganisms, including bacteria, viruses, fungi, and parasites, play pivotal roles in initiating and advancing a wide spectrum of diseases, and are also crucial for maintaining health, particularly in relation to inflammatory processes. This complex interplay between microorganisms and their hosts necessitates sophisticated experimental animal models to unravel the intricacies of these interactions. This abstract outlines the main topics of my presentation, reflecting on our research team's efforts in this field, both past and present. We initially examine the impact of environmental exposures on microbe-host interactions, focusing on allergic diseases. Subsequently, we explore how these interactions contribute to inflammatory skin conditions. Additionally, the presentation addresses the challenges of using experimental animal models to study the microbiome's role in human diseases. Improvements in animal models, coupled with advances in technology, offer valuable opportunities to decipher the complex relationships between humans and their microbiomes. This is expected to lead to the development of new therapeutic strategies and enhance our understanding of microbes' roles in health and disease.

The role of the gut microbiome in temperature adaptations in birds

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The gut microbiome varies between and within species and has been increasingly recognized as an important mediator of health and various adaptations across taxa. A key environmental factor influencing the gut microbiome is temperature, yet data across species is still scarce, and the underlying mechanisms need to be discovered. The gut microbiome has been suggested as a promising mechanism for regulating energy acquisition and heat production and may therefore contribute to cold (and winter) adaptation. To test this hypothesis, we studied environmental variation in gut microbiome in wild populations of a passerine bird, the great tit (Parus major), and report seasonal and population-level differences in gut microbiome across latitudes. To study the causal effects of temperature, we then sampled wild-caught birds in captive conditions kept under either summer or winter temperatures. Despite the strong effects of captivity, we showed compositional differences across temperatures. Importantly, to elucidate the causal role of the gut microbiome in cold adaptations, we performed experimental manipulations using antibiotics and reciprocal transplants and measured associated responses on metabolism. We showed that gut microbiome disruption led to lower metabolic rates, whereas transplants from cold-adapted allowed warm-adapted individuals to maintain higher body temperature. Finally, we studied multiple environmental contaminants that may further disrupt the gut microbiome. All in all, the data points to the key importance of the gut microbiome in mediating temperature adaptations and suggests that temperature-GM- associations should be considered in animal studies.

Does the biodiversity hypothesis hold for wildlife health? Exposure effects of urban and pristine forest soils on wild rodent microbiota

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The biodiversity hypothesis asserts that the diversity of living organisms in ecosystems has a positive impact on human health, while urbanization leads to a depleted host microbiota, immune dysfunction, chronic inflammation, and finally clinical disease. However, while urban areas are the most rapidly expanding ecosystems on Earth forcing wildlife to disperse or adapt to new environments, little is known how the biodiversity hypothesis holds for wild animal species. Using a well-studied wild rodent, the bank vole (Myodes glareolus), we test the hypothesis that environmental biodiversity affects wildlife health by promoting microbiota function at the host-microbiota interface (intestinal mucous layer) and reducing inflammation. Laboratory-born bank vole offspring were exposed to soil mixtures of urban forests and pristine forests (with sterile bedding as control) for four weeks in individually ventilated cages and monitored for changes in gut microbiota and function of gut flora. We found clear effects of anthropogenic disturbance on forest soil pH and microbial communities, with urban forest soils harbouring distinct and more diverse soil microbiota composition than pristine forests (alpha and beta diversity of bacteria). Soil treatments decreased species evenness and caused shifts in beta diversity in individual faecal samples compared to sterile controls. Measures of generic inflammation markers are currently under study. Whereas human disturbance has clear effects on forest soil microbiota composition, associations between the type of soil microbes and soil microbial biodiversity per se with host health are not easily understood, especially when considering the effects on wildlife.

Understanding signs of pain in laboratory animals

Ann-Helena Hokkanen
University of Helsinki, Finland

The purpose of pain is to protect. Therefore, pain is an unpleasant experience accompanied by distress and negative emotions. Pain makes animals alter their behavior, postures, and facial expressions to avoid pain and further damage, promote healing, and warn others. Motivation to get rid of pain is high. Animals learn from painful experiences and change their future behavior and hierarchy of needs due to pain. However, although protective, pain is also harmful, especially when severe and long-lasting. Thus, it is crucial to recognize, assess, and treat pain in laboratory animals. However, pain evaluation is demanding as pain-related changes in animals' behavior, postures, and facial expressions are complex and diverse. After forming a pain experience, the animal's brain decides the appropriate behavioral response in relation to previous experiences and all other information available in each situation. Therefore, an animal's subjective pain experience and related behavior can vary significantly in different situations and between individuals. For example, animals suppress pain behaviors when feeling threatened. Unfortunately, at the same time, anxiety often makes pain worse. Therefore, animals, especially many laboratory animals belonging to prey species, can feel severe pain but show only subtle signs of pain. Thus, evaluating deviations in spontaneous behaviors or activities and typical postures and facial expressions in their home environments without disturbing the animals is often the best choice for pain recognition and assessment in laboratory animals. Moreover, regular, and multiple observations before and after painful procedures will improve accuracy when using ethograms and grimace scales for pain assessment.

Human pain mimicked through an animal pain-like responses?

Niina Jalava
Orion Pharma, Finland

Pain is the most common reason people seek health care and is the leading cause of disability in the world. Current clinically used analgesics do not provide sufficient pain relief and poor tolerability limits their chronic use. Thus, pain research urgently needs novel non-opioid targets and preclinical methods to ensure discovery of efficacious and safe treatments for patients. The biggest complaint by human pain patients is spontaneous pain, which is thought to be reflected from clinical questionnaires (e.g. NRS, VAS) about the severity and location of pain. However, these can't be implemented in the preclinical pain research, and we still must use methods, which rely on non-verbal/observable pain-related behavior. Thus, there is a definite need to develop and validate additional, more translational and objective preclinical read-outs, besides the typical ones such as mechanical and/or thermal stimulus evoked pain-like responses, better recapitulating the hallmark features seen in human pain. This would help to achieve higher success rates in future clinical pain trials. Here, I will discuss about recent preclinical attempts and research using translational surrogate pain models mimicking Ph1 settings in healthy human volunteers, and non-evoked behavioral read-outs [e.g. mechanical conflict avoidance, blood flow imaging, CatWalk] in neuropathic and osteoarthritis pain models together with pharmacological validation in rodents.

Calling for early management of joint pain: Early weight bearing deficit in joint disease predicts hypersensitivity and comorbid depressive-like behavior in late disease stages

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Chronic joint disease is a significant burden to patients and can be associated with both expected complaints like pain and functional impairment, but also negative affective symptoms like anxio-depressive and cognitive dysfunctions. Whether the affective symptoms result from the more obvious sensory and functional impact remains poorly understood, likely contributing to inadequate management of the condition. Using two preclinical mouse-models of joint pain (CFA-induced ankle inflammation and MIA-induced knee-osteoarthritis), we found that while both models induced relatively similar sensory and functional symptoms in the chronic stages, the weight bearing deficit in the early disease-stages was of very different magnitude. The MIA-model caused the most significant changes in functional-impairment and was also the only model to cause early changes in activity and sleep patterns, cognitive impairment and also depressive-like behavior at 3 months. Interestingly, across models, the weight bearing deficits measured in the early stages strongly correlated with the sensory and depressive-like profiles at 3 months (Hestehave et al, 2023). Most crucially, when analgesic treatment by a novel FKPB51-inhibitor (SAFit2) was provided during the early stages of the MIA-model, this resulted in persistent improvement of sensory- and functional symptoms and prevented anxio-depressive behavior 3 months after injury. This suggests that early functional measures may be used as predictors of long-term symptoms from chronic joint-diseases, and that early therapeutic interventions may be crucial for better management of the symptom-complex. Reference; Hestehave et al, 2023, Biorxiv, https://doi.org/10.1101/2023.11.29.569246. Financial support: This work was supported by Versus Arthritis, UK, Research Award 21972.

Analgesic treatment of rats subjected to spinal cord injury using conventional laminectomy: Effects on well-being and functional outcome

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The contusion-induced spinal cord injury (SCI) rat model is widely employed in preclinical research. The model involves laminectomy at the lower thoracic (T10-T11) level followed by contusion of the spinal cord tissue with a pre-defined force. Despite the high severity classification, reporting of analgesic treatment in scientific literature is scarce. This study was designed to test whether analgesic treatment would improve the animals' well-being without negatively affecting the validity of the model by interfering with functional outcomes. Forty-two female Wistar rats (Crl:WI) randomly divided into six equal groups underwent conventional laminectomy and contusion SCI of high severity was induced with 200 kdyn force. The six groups received analgesic treatments subcutaneously for five post operative days: 1) Tramadol (5mg/kg) and buprenorphine (0.05mg/kg); 2) carprofen (5mg/kg) and buprenorphine (0.05mg/kg); 3) carprofen (5mg/kg); 4) meloxicam (1mg/kg) and buprenorphine (0.05mg/kg); 5) meloxicam (1mg/kg); and 6) no analgesia (0.5 ml sterile saline)). Body weight changes, Rat Grimace Scale (RGS), and activity in cages during dark phase were used to assess animal well-being, and Basso, Beattie and Bresnahan (BBB) scoring, Novel Object Recognition (NOR) test, von Frey test, and histopathology were employed to assess functionality during the 8-week study period. None of the analgesia-treated groups exhibited any significant low well-being scores, whereas there were no differences in functional scores, indicative of the fact that analgesics shall be employed in SCI studies involving the contusion-induced SCI rat model.

Finnish 3R Center - finding place in national and international 3Rs landscape

Vootele Voikar
University of Helsinki, Finland

After adoption of Directive 2010/63/EU and its transposition into national law of EU member states, the Finnish National Committee for the Protection of Animals Used for Scientific or Educational Purposes was established in 2013. Since then, there has been an ever-increasing number of Three Rs centers and platforms established in Europe and beyond (currently, 54 according to Norecopa's global map of 3Rs centers and networks). The main tasks of these organizations are to disseminate the knowledge and help the stakeholders in implementation of the Three Rs principles. After several years of preparations, the Finnish 3R Center was launched in June 2022. The center is nominated and supervised by the National Committee. The Leading group consists of a Coordinator, and Directors for Replacement, Reduction and Refinement. Each of the leaders has an advisory group with up to three experts. The objective is to promote development and use of methods and strategies based on the 3Rs in education and scientific research. This will be accomplished by increasing education and training of the researchers on 3R methods, further the development of these methods, and dissemination of the best practices to researchers and operators. One of the aims is also to improve communication between national organizations involved in using animals for research (e.g., establishing a network of animal welfare bodies) or developing replacement methods. In addition, we are actively seeking collaboration with other 3R centers internationally. The presentation will summarize the progress in achieving these goals.

Integrated approaches for chemical safety assessment and drug discovery

Dario Greco
Tampere University, Finland

Toxicology is going through profound changes as the focus of investigation is shifting from the observation of apical phenomena to mechanistic aspects of the exposure. Toxicogenomics aims at clarifying the mechanism of action (MOA) of chemicals by using omics assays. The Adverse Outcome Pathways (AOP) concept is also emerging to contextualise toxicogenomics-derived MOA. At the Finnish Hub for Development and Validation of Integrated Approaches (FHAIVE) of Tampere University, we use advanced modelling of large amounts of data to anchor molecular assays to AOPs. We also combine big data science, artificial intelligence (AI), network science, toxicogenomics, molecular assays and cell technology to analyse a comprehensive knowledge graph comprising tens of millions of data points with the aim to develop AOP-derived New Methodology Approaches (NAMs). In this talk, I will discuss how integrated data-driven approaches can be used to unify the currently fragmented comprehension of the chemical-biological interactions, while guiding the development of safe and sustainable by design (SSbD) and effective by design (EbD) chemicals, drugs, and materials.

Peptide-based brain tumour targeting

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Primary brain tumours and brain metastases are incurable central nervous system (CNS) disorders and represent an unmet medical need. Glioblastoma is the most malignant primary brain tumour in adults with a median survival of only one year. Brain metastases are common complications of other systemic cancers and associate with significant morbidity and mortality. We use patient-derived cells and organoids, pre-clinical animal models of brain tumours as well as clinical patient samples and profiling data available in the iCAN Digital Precision Cancer Medicine Flagship to reveal novel therapy targets and to understand the interactions between brain tumour cells, brain-resident, and tumour infiltrating cells to define the molecular mechanisms underlying brain tumour malignancy and immune suppression as well as develop novel therapeutic tools. Using our phage displayed peptide-screening platform, we identified the NAVIGATOR agent that very specifically targets the brain metastases. The NAVIGATOR was further validated as a diagnostics tool to detect brain metastases in preclinical models. [18F]NAVIGATOR also showed specific labelling of both breast and lung cancer derived brain metastases in clinical patient samples. In addition, we have identified the protein target of the NAVIGATOR in brain metastasis. Based on the literature the target is highly expressed in several different primary and metastatic cancers. Thus, the NAVIGATOR has potential to target multiple tumour types.

Reflection on critical incidents leads to a good error culture and strengthens the culture of care for animal and human wellbeing

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A culture of care includes focusing on the well-being of employees in animal husbandry and animal research as well as mutual respect and appreciation. For a motivated team structure, it is equally important to give every employee the opportunity and space to deal openly with unexpected incidents when working with animals. In a facility with an established error culture, mutual learning is possible in this way. The benefit is to ensure the welfare of the laboratory animals and to make scientific progress throughout the process of a study. The authors present the web-based database CIRS-LAS, in which incidents from the entire field of laboratory animal science can be reported. We provide an insight into some of the more than 80 incident reports that have been published in the database and evaluate the cases in relation to potential risk areas in laboratory animal science. Searching the online database, which is also possible via a mobile application, offers effective learning opportunities. This avoids potential risks in animal research and prevents the repetition of failed experiments, resulting in fewer laboratory animals being used. The database is an important resource for keeping up to date with the latest 3R perspectives and learning from others who are committed to a culture of care in their institutions. Join us and become part of the online resource used by more than 350 people worldwide to learn about the opportunities to implement 3R measures in the sense of a lived culture of care.

Microbiological monitoring of rodents: past, present, and future

Massimo Foa
Idexx BioAnalytics
Sponsored by Idexx BioAnalytics

The evolution of biomedical research, from wooden cages to IVCs and the improvement of diagnostic methodologies have significantly impacted the way of performing health monitoring and diagnostic possibilities. Many of the most prevalent infectious agents are in fact prevalent because often undetected or poorly detected but what is impacting changes in prevalence data and what is prevalent nowadays? Why are some old enemies still with us and what can be done to prevent and control infection? We will present a summary of data published in the literature as well as newly generated data obtained with modern technologies and discuss how health monitoring evolved over time and how it can be now a valid tool for prevention and control of infections.

New Advances in Laboratory Animal Health Monitoring

Alistair Thompson
Surrey Diagnostics Limited
Sponsored by Surrey Diagnostics Limited

In this presentation, I will describe the evolution of health monitoring from classic methods, such as microbiology and microscopy, through to the non-destructive methods of screening and onto the current emerging area of Sentinel-Free Diagnostics (SFD). The aim is to work towards the 3Rs ethos and reduce the number of animals used without sacrificing the quality of the colony health data obtained. I will explain that although the different methods have evolved over time it does not mean that older methods are still not useful. Each different method has pros and cons and a combination of methods can give the best overall result.

How have we changed from sentinel to sentinel free health monitoring in Turku?

Varpu Laine
University of Turku, Finland

Extensive research has been carried out during the past years provide evidence on the reliability of environmental testing in rodent health monitoring (HM). Reduction of animal use, need for improved pathogen surveillance and saving cost and time has prompted us to consider switching from dirty bedding sentinel to sentinel-free HM approaches. We normally perform quarterly sentinel HM in our two rodent facilities containing about 29 000 mice and 3000 rats during 2023. At each health monitoring, 4-6 mouse rooms and 1 rat room is sampled per rodent facility according to predetermined rotation. Pooled feces, dry oral swab and fur samples were obtained from sentinel cages placed in the bottom of each IVC- or open cage rack, in addition to an Optispot-sample, which was taken from one animal in a sentinel cage. We piloted the SFSB (sentinel free soiled bedding) method in parallel to sentinel method in Q1 sampling 2023. On July 2023 (Q2) we used SFSB method as a sole sampling method, while we kept our sentinels as backup. On Q4 in 2023, we used only SFSB method and did not renew the sentinel animals anymore. In the pilots and Q1 of 2024 we used cotton swabs as a method of obtaining the material for PCR testing, but after Q1 of 2024 onwards we have used IDEXX REPLACE™-matrix. Our results show that non-animal SFSB method detect reliably pathogens and saves cost and technicians' time and Reduce animal use.

Challenging the old ways: a call to rethink behavioural methods

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While conducting systematic reviews of one of the most popular behavioural tests for assessing depression in laboratory rats, we came to recognize that tradition might be working against us. Researchers, in the spirit of getting reproducible results, have opted to follow methods that have remained mostly unchanged over the years. Some of these methods, initially developed with practicality and ease-of-use in mind, may have prioritized convenience over solid biological grounds. As a result, these methods might confound the results of experiments by introducing critical, and easily overlooked, methodological biases. In our systematic reviews, we found that such faithful compliance to tradition led to a decrease in the reliability of the test and undermined the confidence in the body of evidence derived from studies using it. We would like to bring awareness to the detrimental effect that abiding to tradition might have on the quality of animal- based research. It is a call to go back to basics, to rethink and refine behavioural methods, because if tradition comes at the cost of validity, maybe it is time to challenge tradition.

Retention and job satisfaction in animal research – what can we learn for creating an institutional culture of care?

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As in other caring professions, providing care and compassion for research animals in challenging situations can be both rewarding and difficult. It can be rewarding to maximize animal welfare and contribute to high quality research in preclinical studies but can be challenging to observe stress in research animals, or to sacrifice them for research. This particular situation, often called a caring-harming paradox, is unique for caring professions including animal care professionals. Both distinctive factors, and typical workplace stressors like long working hours, can lead to reduced professional quality of life. Professional quality of life can be divided into compassion satisfaction and compassion fatigue. Given the gaps in research on workplace stress in animal research personnel the 3Rs Collaborative's Compassion Fatigue Resiliency initiative aimed to examine associations between reported job satisfaction and key workplace metrics for the first time. To gain quantity and quality data over time, we created a mixed-method cross-sectional survey for longitudinal research. Baseline data was collected from 198 participants. In summary, personnel who reported higher compassion satisfaction also reported higher retention and job satisfaction. In contrast, lower job satisfaction was associated with higher burnout. We also found indications that organizational culture impacts compassion fatigue for 70% of participants (n=118); specifically factors like feeling valued, work-life balance, training or pay. Our findings indicate that fostering a culture of care should also focus on a supportive work culture by promoting job satisfaction and decreasing burnout.

Social housing of Göttingen Minipigs

Maja Ramløse
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Göttingen Minipigs are social and curious animals with a strong motivation for performing various types of social behaviours. Appropriate social housing should therefore be prioritized. Although maintaining stable groups is optimal, animals may need to be regrouped for study, practical or veterinary reasons. Fighting tendencies tend to increase with age i male animals, and older male Göttingen Minipigs should not be regrouped. However, in young male animals and female animals of all ages regrouping can generally be performed successfully. Smooth and refined formation of new hierarchies can be promoted with various proactive measures taken before, during, and after regrouping, e.g. by providing plenty of space and distractions. If singe housing is unavoidable, steps should be taken to ensure that Göttingen Minipigs can exert social behaviours, e.g. through optimized pen design and socialization sessions.

3Rs benefits for cardiorespiratory and activity monitoring in rats using jacketed external telemetry? – Review of evidence

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In vivo monitoring on integrated models is of paramount importance for biomedical research and drug development. This includes the use of physiological measurement methods to achieve an optimal balance between obtaining relevant data and the animal welfare. In that sense, inspired on the telemetric jacket used on large animals, a rat version has been adapted, integrating three different non-invasive sensors (ECG skin-patches, inductive respiratory plethysmograph, and 3D accelerometer) in order to simultaneously measure the cardiac, the respiratory functions as well as behaviour in freely moving animals. This review aims to illustrate the scientific and 3Rs benefits in various studies conducted with this new device including home cage monitoring, pharmacological studies, and treadmill exercise as well as data comparisons with reference methods (Whole Body Plethysmography, Implanted telemetry). This compilation of data highlights that the Jacket is robust and well accepted for measuring socialized animals, its sensors provide physiological signal and parameters comparable to those of reference methods, and parameters capture the physiological and pharmacological variations induced during a study. In conclusion, by allowing the simultaneous monitoring of three function on the same animal in a completely non-invasive way jacketed telemetry offers the opportunity to Reduce and Refine the use of animal in preclinical studies while giving access to physiological monitoring compatible with a wide range of research situation.

Improved memory and lower stress levels in male mice co-housed with ovariectomized female mice

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Aggressiveness in the form of fighting is a frequent problem in group-housed laboratory male mice, leading to stress, injury, and death. Fighting can be prevented by single housing, but this contradicts welfare concerns considering the lack of social interaction. Another way is by pairing up the male mice and an ovariectomized female, to provide a companion. However, considering the effect of these housing conditions remains unclear, we aimed to evaluate behaviour and stress levels in two different housing conditions, pair-housed the male with an ovariectomized female, and group-housed with other males. Behavioural tests were performed to assess stress and anxiety-like behaviour. Moreover, the corticosterone levels in plasma were measured by ELISA. Based on home cage behaviour assessment, pair-housed male mice showed no fighting even after isolation and regrouping. Our results also showed that the pair-housed males had better memory and demonstrated less anxiety-like behaviour and subsequently, the pair-housed male mice tended to have lower corticosterone levels compared to group-housed males. Overall, pair housing reduced anxiety-like behaviour and stress levels in male mice. Moreover, the females were observed to nest and engage in ordinary social behaviour, which may suggest that co-housing with fertile male mice had a limited impact on their welfare (beyond their surgeries). Still, it remains important to balance animal welfare against the expected gains. We aim to further explore this balance in future studies. male mice aggression, housing condition, group-housed, paired with ovariectomized female, anxiety-like behaviour, stress levels, corticosterone.

Detection of male-mouse incompatibility in research studies using an automated in-home cage monitoring system (the TRACK-system)

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Group-housed male mice exhibit aggressive behaviour towards their cage mates as part of establishing social hierarchy. Compatibility depends on the degree of dominant and submissive behaviour among the male individuals. In some cases, the group remains incompatible, and fighting can escalate, being detrimental both to animal welfare and to data quality. Commonly, research institutions rely on manual supervision, and incompatibility is often noticed post factum, when fighting wounds are visible. Besides being labour-intensive, this method does not provide 24/7 surveillance, resulting in several aggressive altercations going unnoticed. Trackpaw Scientific AB is developing a platform in collaboration with AstraZeneca to detect incompatible activity for group-housed male mice in their home cage. The TRACK platform is placed in the cage bottom and does not rely on cameras or customized rack systems. It tracks weight and movement of microchipped mice to detect ongoing aggressive behaviour as well as to provide data for a more thorough post-processing analysis. Specific behaviours, e.g. escaping movements, can also be detected in real-time. In a pilot study, 21 C57 male mice (8 weeks old) were monitored in groups of 3, over two days, using the TRACK platform. The mouse groups were monitored with manual supervision and camera surveillance used as ground truth. The platform detected all fighting episodes (n=21) with very few false alarms. Sessions that involved chases and altercations also had a higher general activity. This pilot study provides good indications that the platform technology has the means to capture behaviours of incompatibility between group-housed male mice.

The iMouse System – A visual method for standardized digital data acquisition reduces severity levels in animal-based studies

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In translational research, using experimental animals remains standard for assessing the effectiveness of potential therapeutics. At the same time, minimizing the impact on the well-being of the animals regarding the 3R is mandatory. To fulfil this goal and therefore evaluate the severity level, animals must be inspected several times a day. It is noted that these visual assessments disrupt the animals during their resting periods, resulting in elevated stress levels and consequently affect the results of scientific studies. We examined the feasibility of implementing a digital monitoring system (iMouse) in a translational study conducted within home-cages. Our objective was to reduce or replace manual visual inspections during experiments and to examine whether digitally available data from this study can be used to train an algorithm capable of distinguishing between activities. We successfully demonstrated the feasibility of integrate the system into the existing IVCs and established remote access to the overserved home cages. Accordingly, digital surveillance of the experimental animal reduces their stress level. Furthermore, the digitally acquired data out of the home cages proved instrumental in training algorithms capable of analysing e.g. the long-term drinking behaviour of the animals. In summary, our work has yielded an integrated, retrofittable, and modular system that serves two critical criteria for the 3R. Firstly, it reduces the severity level of the animal by executing visual inspections. Secondly, it refines the traceability and transparency of animal-based research studies. The standardized iMouse system enables the analysis of data sets and the generation of new digital biomarkers.

Digital transformation: Connecting in vivo teams to the wider R&D ecosystem

Andrew Smith
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In research and development (R&D), the integration of digital technologies has revolutionized collaboration and efficiency. However, the transition towards digital transformation has not been uniform across all R&D teams. In vivo teams, although crucial for testing and validation in academia, pharmaceutical and biotech organisations, find themselves isolated or siloed from the broader R&D ecosystem due to their lag in digital transformation. There are inherent challenges faced by in vivo teams, which primarily rely on traditional, labour-intensive methods for experimentation and data collection. While other R&D sectors embrace digital tools for data analysis, simulation, and virtual collaboration, in vivo teams often lag behind due to the unique complexities of their work. This creates a disconnect, hindering seamless integration and knowledge sharing across the R&D spectrum. The consequences of this siloing include inefficiencies arising from manual data processing, limited accessibility to findings, and slower innovation cycles within in vivo research. Moreover, the lack of digital integration inhibits interdisciplinary collaboration, impeding the holistic understanding and advancement of research objectives. This presentation looks at the urgent need for in vivo teams to undergo digital transformation. It advocates for strategic initiatives aimed at fostering technological adaptation, promoting cross-functional collaboration, and redefining organizational structures to bridge the gap between in vivo and other R&D domains. Ultimately, addressing this disparity holds the potential to enhance research outcomes, accelerate discovery processes, and propel scientific innovation forward.

Zoonotic epidemics and pandemics: what, from where, and how to be prepared?

Laura Kakkola
University of Turku, Finland

Zoonoses are infectious diseases crossing species barriers from animals to humans. This spill-over event initially causes sporadic disease cases, and if resulting in a local outbreak, might expand to an epidemic, and ultimately to a pandemic. Zoonoses have occurred throughout the history, and the known zoonotic epidemics and pandemics cover the era from the first recorded plague until the very recent SARS-CoV-2 pandemic. Zoonotic epidemic or pandemic requires, in addition to changes in the microbe, also changes in environment, reservoir population, vectors and/or human contacts with the reservoir or vector. It is not possible to forecast in advance which zoonotic pathogen will cause the next epidemic or pandemic, but we can be prepared. The cornerstones of preparedness are global monitoring of microbes in animals and in humans, development of vaccines and antimicrobials, maintenance of good diagnostic readiness, capability to work with pathogenic microbes, and a functioning network of researchers, clinicians and veterinarians.

Animal models in response to COVID-19 and highly pathogenic avian influenza

Tarja Sironen
University of Helsinki, Finland

We are living in an era of outbreaks and pandemics, as witnessed by COVID-19 and the most recent threat of highly pathogenic avian influenza outbreak in wildlife as well as in livestock. Outbreaks and pandemics are usually caused by zoonotic viruses and we cannot yet predict, which ones - among the numerous viruses found in wildlife reservoirs - will emerge as causative agents of the next outbreak. We do know that a key process in disease emergence is the jump between animal species and this cross-species transmission involves virus evolution and changes in the characteristics of the given pathogen. To better understand these processes and key mechanisms of cross-species transmission and spillover, we need to study these viruses not only in cell culture models but in animal models. A rapid response to a new pathogen also includes the development and testing of vaccines and drugs, for which animal models are critical. In this presentation I will discuss the different animal models used for COVID-19 research and their limitations, and also discuss the overall research response to the crisis and lessons that should be learned. I will also discuss the animal models for avian influenza research, the vast knowledge on pathogen evolution in mammalian hosts and how that knowledge should be used in preparedness and response to the current outbreak.

Animal experiments in a bio safety level 3 laboratory – practice and occupational safety

Kirsi Aaltonen
University of Helsinki, Finland

The emergence of new pathogens has speeded up in the modern world due to increased travel, food production and cattle rearing taking up new areas, and the ever-increasing population. This places new challenges for microbiologists and medical researchers to quickly identify and characterize these new threats. One component of such research is animal experiments. These are often necessary and important for defining pathogenesis and evaluating the effectiveness and safety of therapies and vaccines. The urgency of this workplace's special demands on study design, choice of animal models, and most importantly the know-how and stress tolerance of personnel working with these pathogens. Working with animals infected with dangerous pathogens demands not only the common skills of animal maintenance, handling, and health evaluation but how to do these when the animal is shedding dangerous pathogens. It also requires specialist skills on how to properly use personal protective gear, how to manoeuvre and operate in a BSl-3 laboratory, how to handle samples, and how to exit the laboratory in a safe manner. Time constraints and other stressors will require self-diagnosis from the staff on wellbeing and ability to do the job. A few case studies on hantavirus and coronavirus research will be used to demonstrate the challenges of animal experimentation at a high-level bio safety laboratory.

Human cell-based models to study neurodegeneration

Sarka Lehtonen
A.I. Virtanen Institute for Molecular Sciences, University of Eastern Finland, Finland

Human cell-based models have emerged as valuable tools for studying neurodegeneration, offering advantages over traditional animal models and post-mortem human tissue studies. These models enable researchers to investigate disease mechanisms, screen potential therapeutic compounds, and personalize medicine approaches. By taking advantage of stem cell technology, we are able to derive diverse models, including mono-cultures at one end of the spectrum and 3D organoids and transplantation into intact brains at the other. The choice of culture-system is guided by the experimental question under investigation. Lehtonen's lab is particularly interested in the glial non-cell-autonomous mechanisms and identifying key therapeutic targets and pathways responsible for pathological glial phenotype, especially in Parkinson`s disease. We utilize patient-derived brain cells in 2D and 3D culture systems to more accurately mimic the disease`s pathological conditions. These models hold promise for advancing personalized medicine approaches by enabling the development of patient-specific therapies tailored to individual genetic backgrounds and disease profiles.

How common are fraudulent animal studies and how do they impact us?

Otto Kalliokoski
University of Copenhagen, Denmark

More than a million biomedical papers are published each year – every minute of every day sees two to three new papers being uploaded to a database like PubMed. This is too much information for any one person to handle. As a result, we have become more and more reliant on methods for aggregating information – methods like systematic reviews. But these methods rely on all of the information they gather being truthful. What happens when we mix in reports of studies that never actually took place? In a systematic review on laboratory rat studies of depression, we found that approximately one-in-five papers (in an investigation looking into more than a thousand papers) had serious issues. Of these, a majority of the problems were suggestive of outright fraud. These are staggering numbers – numbers that cannot be ignored. These fraudulent reports touch all of us, as laboratory professionals, by potentially misleading our research, and by misinforming policies and best practices. What do these studies look like? Who writes them? How do we avoid them? Whereas we cannot present a simple solution for addressing the problem, we can start by highlighting the problem. In this talk, I will present what we found in our investigation, and give some suggestions of what the future may hold.

The link between management, communication, culture of care and the individual through the eyes of the designated veterinarian

Hajnalka Nádai
Experimentica Ltd, Finland

What lessons a veterinarian can learn in a CRO (Contract Research Organization) environment, who is not formally trained in management and communication, but enthusiastic to support the culture of care of their establishment? What opportunities organizations might have to support animal welfare or other values? What specific aspects does a CRO need to consider in their management? Are there any tips and tricks individuals may use in their daily communication to provide better contribution? What are the 3Rs of communication? After reviewing some fundamental definitions that are necessary to discuss such topics of management and communication, that are out of the daily routines for most of us doing hands-on work with laboratory animals, we may attempt to review a few helpful analogies to place these "foreign" topics into the context of research animal use, primarily focusing on Contract Research Organization environment.

Research form – a text-based communication channel supporting culture of care

Lauri Elsilä
University of Helsinki, Finland

The research form serves as a standardised, text-based means of communication between the researchers conducting laboratory animal experiments and the personnel responsible for animal care. Filled out by the responsible researcher, it captures essential experiment details, animal care requirements (including special needs and deviations from standard care), intervention timing, caretaking duties, euthanasia procedures, and needs for biological samples. While ideally used alongside a kick-off meeting, it also proves practical as a standalone tool for recurring experiments and as a reference for on-call caretakers. This presentation will outline the University of Helsinki's research form structure, supplemented with real-life examples, and aims to demonstrate how this tool can be utilised to increase the quality of scientific experiments while also promoting researcher–caretaker rapport and culture of care.

Animal Welfare Body at the University of Turku, Central Animal Laboratory: effective communication through focus group

Varpu Laine[1], Emrah Yatkin[1]
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The functions of animal welfare body (AWB) are described in the EU Directive and include advising staff and keeping them up-to-date on the 3Rs and animal welfare in relation to supply, housing, care and use. In practice, AWB also follows the development and outcome of projects and aims to resolve occurred animal welfare issues. AWB may be organized in different ways in different institutions. At the University of Turku, the AWB has been organized as focus groups meeting with each research group to resolve any arising welfare issue. We organize approx. 15-25 AWB focus groups meetings in a year. In these meetings designated veterinarian (DV), researchers involved in the project, facility manager and animal technician meet in person (or via zoom during COVID) and discuss confidentially. In many cases hands on approach is needed, and the DV, researcher and animal care staff meet also in the animal facility and resolve the issues by the animals. The meeting memo is confidential and is signed by the persons involved in the case and available for the supervising authority. Lessons learned from animal welfare case or instructions regarding the 3Rs can be distributed to the whole research community by animal facility staff and through annually organized general AWB meeting involving representative of several research groups. AWB meetings organized in Focus groups provide effective and intimate discussions to solve acute welfare problems. The best result is reached when all participants have been heard and given equal input to form the decision.

Kick-off meetings as a tool to improve communication

Karoliina Alm
University of Helsinki, Finland

Before a research project or a new part of it starts, it is time for a kick-off meeting with researchers, animal caretakers, technicians, facility's responsible person and a veterinarian. The main parts of the project are gone through, what will be done and when, how many animals are involved and when the experiment will end. The critical parts of the project are highlighted, and the responsibilities are agreed, for example how often the animals are monitored, who will do that, and what actions are taken if found necessary. An important part of the kick-off meeting is ensuring the humane endpoints according to the licence and all possible refinements to be used.

The importance of light: From vision to circadian rhythms & sleep

Stuart Peirson
University of Oxford, United Kingdom

As well as vision, light exerts widespread effects on physiology and behaviour, including regulating circadian rhythms, sleep, hormone synthesis, affective state, and cognitive processes. Appropriate lighting in animal facilities supports welfare and ensure that animals enter experiments in a controlled physiological and behavioural state. Proper consideration of light during experimentation - both as an experimental variable and as a general feature of the environment - may improve experimental design and provide more reproducible outcomes, improving data quality. However, ambient light for animals is typically quantified in units (lux) designed for human observers. Here I report the consensus view of an expert working group, with expertise spanning mammalian photobiology, neurobiology and animal husbandry and welfare, convened in February 2023 to agree upon metrics for light appropriate for laboratory animals and application to improve animal welfare and the quality of animal research. The consensus view was that species-specific versions of the recently standardised alpha-opic metrology represent the best available approach to quantifying light for non-human species. Here I will describe the importance of this approach, methods for measuring these quantities, practical guidance for their implementation in husbandry and experimentation, and quantitative guidance on appropriate light exposure for laboratory rodents.

POSTER Presentations

Poster 1

Ammonia concentrations in differently sized IVC cages

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Cage size and cage occupancy in Individually Ventilated Cages (IVC) are, together with ventilation rate, determining air quality of the microenvironment inside the cage. Apart from temperature, humidity and carbon dioxide, ammonia is an important factor for the microenvironment. Increasing ammonia concentrations in small cages with a high cage occupancy and low cage change frequency may risk the animal's health and wellbeing and can e.g. cause nasal pathology after chronic exposure. To map the risk of ammonia build-up in four sizes of IVC cages with different cage occupancy and a 14-day cage change cycle, we measured ammonia concentrations at the end of the cage change cycle. We found that intra-cage ammonia in many cages exceeded 50 ppm, particularly the smaller models, although only the GM500 cages exceeded this level when comparing medians. In large Type III cages, the ammonia concentration did not exceed 50 ppm regardless of cage occupancy. The importance of this finding will be discussed.

Cage grid cleanliness evaluation – extending mouse grid and lid change intervals from 4 to 8 weeks

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We have evaluated the possibility of extending the mouse grid and lid change interval from 4 to 8 weeks. By extending the interval the AST Got (Animal Sciences and Technologies, Gothenburg) department will be able to shift hours spent on grid change to animal husbandry and welfare work, providing more study support to TAs and increase our safety study load. Expenses and environmental impact will be reduced due to less washing and autoclaving as well as the heavy physical workload for staff. Less frequent changes will potentially reduce stress for the animals, leading to better science. The study was conducted in collaboration with an external company over 10 weeks, sampling a total of 125 cages, comprised of either IVC or static cages with group or single housed males or group housed females. Bacterial growth has been assessed by using TPC pressure plates, and for evaluating general cleanliness, ATP levels were measured with a luminometer. Relevant cut-off values have been set for each assessment after extensive literature reviews. Statistical evaluation shows no biologically relevant variation between week 2 and 8, and results fall far under the thresholds, so the conclusion is that the change of grids and lids can be made every 8th week instead of every 4th week.

Life quality of diet-induced obese rats can be improved without affecting weight gain and glucose-tolerance

Camilla Falk Bulow Clausen[1], Helle Andersen[1], Rune Ehrenrich Kuhre[1], Maria Kristina Kiersgaard[1], Helle Nordahl Hansen[1]

[1]Novo Nordisk

Diet-induced obese rats for in vivo studies are most often purchased from a commercial vendor. At the vendor, rats are housed with minimal environmental enrichments and without chances for socializing across cages. At our animal facility we have the option of connecting cages through a tunnel system, enabling socialization between cages. Furthermore, we have an activity area which can be used for bouts of play. Nevertheless, these enrichments are seldom used for obesity or diabetes studies out of fear that this could impact data outcomes, precluding comparison to other data where standard housing was used. This assumption is based on a hypothesis that addition of the tunnel system will increase physical active and will, thereby, increase energy expenditure and attenuate weight gain and increase muscle mass and improve insulin sensitivity and oral glucose tolerance. The addition of trips to the activity area would presumably exaggerate these effects. Increasing life quality by tunnel access between cages as well as trips to activity area had no effects on food intake, weight gain or body composition during 100 days of study. Fasting glucose, fasting insulin, oral glucose tolerance, glucose-stimulated insulin secretion, and plasma levels of stress hormones (ACTH and corticosterone) were also not affected by environmental enrichment. Our study results clearly demonstrate that for in-house generation of DIO rats for obesity and diabetes studies animal welfare can be increased without concern of compromising data quality.

Uplifting culture of care for animal welfare

Ayesha Prajapati[1], Lynsey Frazer[1]
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Culture of care refers to going above and beyond the legislative requirements to optimise animal welfare and the wellbeing of the people working with them. Under this guiding principle, AST Gothenburg site aims to further refine rat housing environment and handling methods. The standard housing for rats in the Gothenburg vivarium is a large three-tiered house, originally designed for rabbit housing. These compartments, according to AAALAC specifications, are a high standard of rat housing allowing rats more opportunities for natural behaviours such as climbing, hiding, running, and rearing. It is established that boredom in laboratory animals should be addressed, and that rats prefer a complex environment. To add complexity to their environment, an adjustable lift is used to position an extended play area with free access from their home compartment. The play area consists of varied enrichment designed to encourage natural curiosity and provides a playtime between study procedures. After familiarising rats with the open play area, the handlers do not need to pick the rats from their home environment, which can often mimic chasing them and eventually become synonymous with stressful procedures. The open area also allows better interaction and assessment of the animal's wellbeing. Any small changes in their behaviour can be noticed and actions can be taken sooner. Importantly, it has been observed that rats are less stressed by handling and study procedures and choose to stay in the play area, which is a good indication that it has positive associations for them.

How to pick up a guinea pig without stress – call out for your experience & suggestions

Kirsten Bayer Andersen[1], Stine Bonde Eriksen[1], Sabina Christina Köppä Altenburg[1], Nete Junkuhn Rosendal[1]
[1]Statens Serum Institut, Denmark

Background: Guinea pigs are afraid of everything (reference: Any animal caretaker who has ever worked with guinea pigs. Purpose: We would like to refine our handling of guinea pigs to ensure as little stress for the animals as possible – just like we do when we use non-aversive handling methods for e.g. mice. WHAT WE HAVE TRIED & the accompanying challenges: GENTLE CATCH – Difficult because the guinea pigs still seem stressed – HANDLING TUBEs – Become too small as animals grow – HAY BUNGALOW FOR PICK UP – Didn´t "fit" in every handler´s hand. Also, we can´t buy them anymore – PAPER BAGS FROM THE DIET – Too noisy & big. WHAT WE WOULD LIKE is something – Not too big or heavy which can remain in the cages and thus, not be a novel object when used for handling – Reusable, Washable, Non-slippery & Squeezable – Standardized to ensure compliance with the GMP standards for the type of work we do.
Please contact Kirsten – kiba@ssi.dk – if you have suggestions :-)

The successful introduction of an early rabbit to human habituation programme to reduce stress and aggressive behaviour

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Rabbits as a species, are naturally overly sensitive to stress which is a source of concern and consideration for the use in research settings; both in terms of their interaction with humans, and in terms of the quality of the scientific outcome. To reduce stress and increase animal welfare, we have introduced an early rabbit/human habituation programme during the breeding and husbandry cycle; all the way from birth to when the rabbits are transported to the users. The programme consists in a holistic approach of early and positive human-rabbit bonding. It starts from birth with an impregnation programme of human contact in the nest boxes four times per week for 4 weeks. From weaning, the habituation programme continues with weekly positive interaction by individual petting. The effect of the habituation programme was evaluated with several clinical stress indicators observed during the acclimatization period at the users. The study was designed as a double-blinded randomized study with rabbits being evaluated from four different breeding areas with the habituation programme being implemented in one area only. After 16 months and with more than 2400 rabbits being evaluated, results show a significant decrease in stress scores of rabbits being sourced from the area with the implemented habituation programme and with total disappearance of aggressive behaviours, such as biting, while initial stress scores were maintained for rabbits being sources from the areas not having implemented the habituation programme.

Poster 7

The influence of a refined handling protocol on welfare and anaesthetic parameters in C57BL/6JRj mice

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Several studies have highlighted the positive influence of refined handling techniques, particularly tunnel handling, on the behaviour and welfare of laboratory mice. This includes reduced anxiety and stress when compared to traditional tail handling methods. However, limited research has investigated whether these benefits persist under additional stressors such as restraint and injection anaesthesia. The aim of this study was to assess the effects of tunnel handling on the welfare and physiological parameters of C57Bl/6JRj mice before and after a common stressor - injection anaesthesia. Our evaluation included assessing voluntary interaction with handler in the home cage, nest quality, integration of new nesting material, and levels of faecal corticosterone metabolites. Additionally, the study examined the impact of handling methods on anaesthesia induction by measuring the time from injection until loss of the righting reflex. Preliminary results showed no significant differences in anaesthetic induction in this study. Detailed results will be presented and discussed. This research offers insight into how refined husbandry practices can affect the welfare of laboratory mice, ultimately aiming to improve handling protocols and promoting the welfare of laboratory animals.

Poster 8

The effect of habituation and group-housing on health parameters during post-surgical recovery in mice implanted with the abdominal imaging window

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Intravital imaging using implanted abdominal imaging windows is increasingly utilized in research, yet the effects of implantation methods and handling stress on animal health remain poorly understood. This knowledge gap is critical given the impact of surgery-related immune responses on data validity in studies focusing on inflammation and immune mechanisms. Experimental animals' responses to handling stress can introduce variation in behavior and physiology, underscoring the importance of habituation to reduce stress. In this study, we examined post-surgical health parameters in BALB/c mice with abdominal imaging windows, assessing body weight, behavior, appearance, and peripheral blood leukocyte levels as inflammation indicators. We compared mice previously handled with those non-handled and housed them either individually or in groups post-surgery. Our findings reveal significant impacts of habituation and individual housing on body weight recovery and post-surgery urinary corticosterone levels in male mice. Additionally, habituation influenced leukocyte counts consistently across sexes. These results underscore the importance of prior handling, particularly in individually housed animals. Our study emphasizes the importance of considering habituation and housing conditions in relation to the sex of experimental animals for optimal post-surgical recovery. Understanding these factors can optimize experimental design, leading to improved data quality and animal welfare.

A Swedish statement to facilitate the implementation of refined mouse handling

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In recent years the development of mouse handling has moved forward, including techniques such as refined mouse handling. In refined mouse handling, mice are not to be picked up by the tail, but rather by using cupped hands or tunnel handling. Since Jane Hurst published her studies in 2010, the technique has been developed and spread between organizations and countries. In Sweden, some organizations have made the change to refined mouse handling or are working towards it, while others seem to have difficulties implementing the technique. In an effort to facilitate the implementation, the Swedish National Committee for the Protection of Animals Used for Scientific Purposes, assisted by the Swedish 3Rs Center, formulated a statement, expressing the firm opinion of the National Committee on how to handle mice. The focus of the statement is that mice should not be captured, lifted or moved by the tail and it contains a short summary of the scientific evidence supporting the claim. Furthermore, a list of tips that can facilitate the implementation has been written, containing advice gathered from Swedish research facilities, as well as from resources such as the NC3Rs. The statement and supplementary material were launched at a national meeting for Animal Welfare Bodies and thereafter spread to researchers, animal technicians and ethics boards in Sweden. The National Committee and the Swedish 3Rs Center hope that the material will support and facilitate implementation of refined mouse handling and thereby contribute to the improvement of animal welfare, as well as research quality.

Adapting animal handling to allow for animal friendly work in ventilated benches, while maintaining a high health status

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The Stockholm University Experimental Core Facility (ECF) is a top modern facility for in-vivo studies in rodents. ECF is constructed with the purpose of maintaining animal models at a Specific Pathogen Free health status. To keep the health status intact, all animal work is done in ventilated changing stations and LAF-benches. Handling IVC-housed rats only in a controlled air flow is often difficult and as ECF promotes animal welfare, we have developed routines for work by carefully considering the best practice, for both personnel and rats. Working in ventilated changing stations restricts the working space, thus processes need to be adapted. When changing cages, we allow rats to move to the new cage by themselves, instead of the animal technician moving them. The rats learn this quickly. During procedures, after habituation, the rats are handled on a sterilized vetbed. This makes the rats relaxed and as a result, procedures may be carried out by only one person. Additionally, we also use a homemade textile tunnel as a soft restrainer and the rats can choose to use the tunnel, or to remain on the vetbed only. By allowing the animals to change cages themselves, we give them control over the situation and have seen a reduction in displayed stress behavior at cage change. When making it possible to safely perform procedures on rats by only one person and on ventilated benches, we make life easier for all involved, including the rats.

CAT training of rats at Novo Nordisk

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CAT training (Constructional Approach Treatment) is a method used to build trust with fearful animals. CAT training is a step before clicker training, a form of trust training. The effect of CAT training shows up quite quickly because the animal's boundaries are not crossed. With this method, the animal chooses to contact us rather than us contacting the animal. When we contact the animal, we often cross its boundaries, and it can feel like coercion/abuse to the animal. Over time, the animal will resign itself to our coercion/abuse, but this is a lengthy process because there are many breaches of trust in the process through normal forms of animal handling. When we use CAT training, we use the animal's natural instinct for fear/curiosity. What could be a danger/hazard for the animal, disappears. So now, it's not coercion/abuse but a choice the animal must make whether it wants to continue investigating what could be a danger. With CAT training, the animal quickly figures out that what could be a danger is not dangerous because it does not cross its boundaries through coercion/abuse. Now, it's the animal that decides whether it wants to be in contact with us.

Training of dogs for voluntary blood sampling

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Physical fixation of a laboratory dog is a common way to ensure easy and safe handling under procedures like blood sampling. However, after physical fixation we experienced discomfort in some of our dogs and therefore we decided to improve the training program to include voluntary handling to be in better compliance with the 3Rs. The aim of the training program for blood sampling was for the dogs to voluntarily step onto a platform and sit still, while laying their front leg on an elastic band. The animal technician would now be able to take a blood sample, without fixating the dog. We started the training with three male Beagle dogs, about 1.5-year-old. Dog A had a normal behavior and was very eager to train, Dog B had symptoms of stereotypic behavior, and Dog C was quite nervous when handled. Dog A learned the procedure to perfection. Dog B and C did not reach the full goal, but the training improved their behavior and gave inspiration to develop individual training plans depending on the dog's temper. We then started training two other male dogs, 3-years-old, with normal behavior and for both it was possible to take blood samples without fixation within two weeks. By using voluntary handling, we discovered that our dogs were willing to let us handle them for a longer period, and they seemed more relaxed under and after the procedures.

Optimizing selection of Rodent Genotyping Assays – a 3Rs Perspective

Urte Jaeh[1], Amber Coulthwaite[1], Miriam Hopfe[1]
[1]Charles River Laboratories, Germany

Ensuring animal welfare using 3R Principles is well established but the addition of a 4th R, Responsibility, at Charles River encourages re-evaluation of current practices. Accurate zygosity testing is important, especially in cases where rodent strains can exhibit zygosity induced phenotypes. In our case study a researcher was relying on traditional PCR testing and manually interpreting results which could lead to incorrect zygosity reporting, mis-selection, and a breach of licensing conditions. Traditional PCR testing is reliable but may not be able to determine between some zygosities accurately. Real-Time PCR and qPCR testing can determine homozygous and hemizygous zygosity, including in animals with unexpectedly low or intermediate transgene copy number values. Genotyping is beneficial in rodent colonies to enable phenotype management, manage colony sizes and plan experiment study cohorts effectively to reduce the number of animals produced. Where genotyping methods are unable to provide accurate results, alternative methods should be considered.

Non-invasive sampling methods for genotyping: improvements towards the 4R principle

Urte Jaeh[1], John Gbadegoye[1], Miriam Hopfe[1], Rebecca Mohr[1], Sivatharsini Thasian-Sivarajah[1], Maria Walter[1]

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Genetically modified mice are usually genotyped using invasive ear or tail biopsies. In accordance with the 4R principle (Replacement, Reduction, Refinement and Responsibility) we have developed non-invasive sampling methods to prevent stress and pain for mice. DNA could be extracted from oral swabs and hair follicles using conventional PCR and real-time PCR. Signals could be detected up to 25 days after sampling, if the swabs were shipped and stored at +4°C. In a pilot study, oral swabs, hair and biopsies were compared, showing consistent genotyping results in all three sampling methods with hair being more susceptible to contamination. Oral swab and hair follicle sampling provide an alternative that can be used for large-scale routine genotyping, especially if no invasive biopsy is allowed (e.g., animals with ear tags or toe tattoos) or no second biopsy is possible.

Poster 15

Continuing Professional Development: Reaching the target group and teaching the relevant skills

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Continuing Professional Development (CPD) of persons involved in animal experimentation is of utmost importance for maintaining the highest possible standards of experimental procedures as well as housing and husbandry routines. The importance of CPD is highlighted in the European Commission's Education and Training Framework under the Directive 2010/63/EU, and FELASA has issued guidelines and recommendations for CPD activities as well as for reporting the same. Currently, few systems for recording and reporting CPD credits are in place at a national level in most European countries. However, as the matter is gaining more attention, the need for relevant CPD programs for anyone involved in laboratory animal care and use is therefore essential. At our department, we have developed an extensive program for basic and continuing education for all levels of animal experimenters, from master students to postdoctoral fellows, as well as a program for in-house training of animal caretakers, technicians, and trainees. This presentation will discuss the benefits and successes with the program, as well as challenges and limitations in terms of reaching out to the relevant target groups and determining which procedures and skills that are most relevant to teach.

Improved Animal Surveillance with Animal Welfare Monitoring (AWM) plans

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The capture of animal welfare data can give a more complete picture of study effects and contribute to model improvement while simultaneously ensuring relief for animals showing sign of harm. Animal Welfare Monitoring is a way of improving documentation of animal welfare in a structured but flexible way. Swedish research animal welfare regulations require detailed records of both study activities and animal welfare observations. Improved compliance is another advantage of this new way of working. Risk-based animal welfare monitoring consists of model specific surveillance timepoints, welfare scoring, pain scoring and body condition scoring. Adverse impact on animal welfare will require action, such as veterinary consultation and/or added surveillance time points. Animal welfare monitoring is planned in advance and surveillance is adapted to model, procedures or expected disease progression. Specific observations of relevance to the model or procedures are described in the guidelines to the tool. The AWM toll has been created through collaboration between study scientists, veterinarians and compliance staff and is based on clinical observations of animal wellbeing, behaviour and physical appearance. The tool is not linked or restricted to protocols and ethics approvals requirements. Traffic light colour coding (green, amber, red) is used to score animals, where green is normal and amber or red show degrees of deviations. Deviations are to be recorded and mitigated. Continuous checks of the records by compliance staff assists scientists to improve observations, recording and to understand animal welfare.

Poster 17

Application of medetomidine-midazolam-butorphanol anesthesia for hyperglycemic Sprague Dawley rats

Anni Tenhunen[1], Marc Cerrada-Gimenez[2], Xavier Ekolle[2], Anni Kolehmainen[2], Heidi Koskenniemi[2], Birgitta Lappeteläinen[2], Anna Mari Koponen[2], Anne Mari Haapaniemi[2], Satu Mering[2], Päivi Partanen[2], Leena Tähtivaara[2], Hanna-Marja Voipio[3]

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The streptozotocin (STZ) -induced hyperglycemic rats, commonly used in diabetes research, are prone to develop various welfare problems, including body weight loss and dehydration, which are further deteriorated when the rats are anesthetized with medetomidine-ketamine (MK). We tested medetomidine-midazolam-butorphanol (MMB) anesthesia, with the aim to validate an injectable anesthesia protocol that has reversal agent for each component, faster recovery, and less side effects compared to the MK. A total of 28 RjHan:SD male rats were induced with two injections of STZ (32.5 mg/kg) and compared with 22 sham-induced (control) rats. The rats were anesthetized for non-invasive imaging at weeks 4, 6, and 8 post-induction with either MK (0.3+40 mg/kg) or MMB (0.15+2+2.5 mg/kg). MK was reversed with atipamezole (1 mg/kg), and MMB was reversed with atipamezole-flumazenil-naloxone-mixture (0.75+0.2+0.12 mg/kg). Anesthesia recovery was evaluated for an hour after reversal by tracking the onset of normal behavioural patterns (e.g., grooming, climbing) and bacon-treat-consumption (Bacon yummies, Bio-Serv). Clinical health scoring (body weight, porphyrin, grimace) was performed 24 hours after anesthesia. At week 4, the MMB anesthetized rats consumed significantly more bacon treats during the one-hour post-anesthesia follow-up, compared to the MK-anesthetized rats ($p<0.0005$, Kruskal-Wallis test). Clinical scoring indicated lower distress levels and less body weight loss 24h after anesthesia in MMB groups compared to the MK groups. Furthermore, MK caused mortality in both sham-induced and STZ-induced rats. Overall, MMB proved a suitable combination of anesthetics to be used for hyperglycemic rats based on improved welfare and zero mortality without compromising the diabetic phenotype development.

Poster 18

Pain treatment reduces body weight loss in the subcutaneous ST146 tumor model

Lena T. Larsen[1], Lasse Gjedsted[1], Gitte H. Hansen[1], Ingrid Hunter[1], Kirstine T. Thrane[1], Maria Thaysen[2], Maria Z. Alfsen[1]

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Using patient-derived xenografts (PDX) is a very valuable tool in evaluating anti-cancer agents. However, the procedure of passing PDX tissue to recipient mouse has been shown to result in body weight loss after transplant. Thus, the purpose of this study was to evaluate the effect of pain treatment on body weight loss after transplantation to improve experimental setup according to the 3Rs. 40 female mice (Rj:NMRI-Foxn-1nu/nu) were transplanted subcutaneously on the flank with ST146 tumor pieces of ≈5x5 mm. Four groups (n=10) were included: Group A – microchipping under isoflurane anesthesia, Group B: tumor tissue under isoflurane anesthesia, Group C: tumor tissue under isoflurane anesthesia + Metacam (2 mg/kg, SC, QD on day 0), and Group D: tumor tissue under isoflurane anesthesia + Metacam (2 mg/kg, SC, QD on day 0-2). Isoflurane anesthesia was 3%, 1.5% O2. Tumor and body weight measurements were evaluated. No notable weight loss was observed in Group A. Group C and D demonstrated a lower weight loss compared to Group B indicating that Metacam reduced body weight loss after tumor transplantation. We also observed that tumor volume was higher in Group D, however, this was not statistically significant (One-way ANOVA, p=0.06). A follow-up experiment is currently being set up to see if we observe the same outcome in other tumor models. We report that optimizing the experimental procedure using Metacam resulted in reduction of post-operative body weight loss without affecting tumor growth. Refining our procedures may therefore improve animal welfare.

Poster 19

Development of a slow-release formulation of analgesia to allow for undisturbed recovery in mice after surgery

Tamsin Albery[1], Ulrika Dahlqvist[1], Petra Delavaux[1], Maria Englund[1], Birgit Ewaldsson[1], Gina Hyberg[1], Urban Skantze[1], Monika Sundqvist[1], Karin Åvall[1]

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The surgery models Myocardial Infarction (MI) and Ischemia Reperfusion Injury (IRI) are performed at AstraZeneca, Gothenburg to evaluate new drug candidates for cardiac and renal indications in mice. These models require sustained post-operative analgesia to allow recovery. Buprenorphine is a rapidly metabolised analgesia in rodents with a half-life of 3 hours in mice. Thus, the analgesic effects of a single dose Buprenorphine at 0.1 mg/kg are not expected to last overnight but require more frequent dosing. The aim of the current study was to develop a long-acting depot formulation that gives a slow and sustained release of analgesia (Buprenorphine) for up to 24 hours. Such a formulation would allow for an undisturbed recovery phase in mice as well as decreasing the workload for the staff responsible for the animal's post-surgery care. Two different depot formulations and concentrations were developed and evaluated in naïve mice. The formulation with the most preferable characteristics was tested in mice undergoing surgery. The target level of Buprenorphine (2 nM) was chosen based on reported effective analgesic concentrations in mice (Yun, M. et al (2010) Health, doi: 10.4236/health.2010.28124). The pharmacokinetic profile (3, 7 and 24 hours) shows that the exposure level of Buprenorphine in plasma was above the target level, indicating the animals were pain relieved, for at least 24 hours. We are currently implementing this slow-release formulation in our surgery models within CVRM AstraZeneca to ensure sustained, long-acting pain relief, increased animal welfare and reduced workload on staff.

Optimizing anesthetic and analgesic strategies in laboratory mice

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In laboratory mouse studies, inadequate and inappropriate anesthesia and analgesia pose significant challenges for the welfare of research mice. The key drivers for why researchers use suboptimal pain management strategies may include difficulty in assessing pain, concerns about potential side effects, and fear of the treatments interfering with study objectives. Insufficient pain management can prolong recovery times and induce inappetence. Yet, the use of postoperative pain relief in animal studies has been estimated to be as low as 25%, raising concerns regarding both animal welfare and the scientific integrity of these studies. This project aims to thoroughly assess available anesthetic and analgesic agents and strategies, with a focus on their application during anesthesia induction, maintenance, and recovery, as well as postoperative pain alleviation. Additionally, the study explores innovative approaches to pain assessment, potentially incorporating computer-assisted technologies. By utilizing a multidisciplinary approach, this project aims to be beneficial to researchers unfamiliar with rodent behavior, while also offering valuable resources for experts in the field. By refining mouse anesthesia and analgesia, animal welfare will be improved in research facilities, both at University of Copenhagen and elsewhere. Furthermore, the translational implications of our findings extend beyond the realm of laboratory mice, offering potential benefits for clinical research and medicine.

Poster 21

Impact of pandemic on the management of animal experiments and animal facilities in Korea

Sangho Roh[1], Na Ahn[1]
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The pandemic has affected the lives of people all over the world. The effects of the pandemic on laboratory animal facilities and their operations through this unusual global event are poorly understood. Here, we have applied a methodological framework of qualitative approach including semi-structured interviews to investigate laboratory animal operations in Korea and how it has shaped the on-going management and laboratory operations of such facilities. A total of fifty-two individuals, including members and administrators of the Institutional Animal Care and Use Committee (IACUC), researchers, and animal facility managers and staff, were surveyed through purposeful sampling. Survey questions explored how the pandemic impacted the IACUC and the functioning of animal facilities, and what steps to take in preparation of a future pandemic-like crisis. Our survey found evidence of an increase in animal experiments in Korea during the pandemic that correlated with increases in research funding during that period, such as for vaccine development. Also, operational challenges due to pandemic-related health issues in personnel were resolved through overtime, rather than by reducing facility operations. Moreover, a refinement of post-approval monitoring practices was also discussed by respondents. Taken together, our study offers insights into animal facility operations during the pandemic and outlines recommendations for safeguarding operations in such future scenarios.

Poster 22

Evaluation and comparison of historical background data used in GLP toxicity studies: possibility for reduction?

Mikko Voipio[1], Joonas Khabbal[1], Milla Kivikoski[1], Varpu Laine[1], Emrah Yatkin[1]
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Historical data from healthy animals in a preclinical research facility can be used in tandem with the concurrent control group data to evaluate the Good Laboratory Practice (GLP) toxicity study results. Historical data, usually collected within the last five years, is useful in establishing the acceptability of the data from control groups and aid in interpreting the biological significance of the data. In this study we collected whole blood samples from tail vein of awake restrained Sprague-Dawley rats (Envigo/Inotiv) for haematological and clinical chemistry analyses in 2018 and 2022. We wanted to compare the two time points and investigate the possibility of less frequent data collection to reduce the number of animals used solely for background data collection. No food nor water was withheld before sampling. Animals were divided into two age groups (9-15 and 16-24 weeks) and males and females were compared separately. Statistically significant differences in some parameters within age groups and between sample collection time points (liver function parameters, kidney parameters, haematocrit, red blood cells) were observed. However, the differences were mostly within the normal range. The obtained baseline results may change over time despite using the same strain or stock in the same laboratory and same analysis equipment. In conclusion, more studies are needed to evaluate the possible changes in background data over time and the possibility of reduction of animal use. We encourage you to publish preclinical safety data, including background data. However, appropriate concurrent control groups should always be used in the evaluation of toxicity study results.

Commercial Presentations

Dry heat sterilization in vivariums – an alternative option for sterilization in the Lab Animal Facility

Bob Davis
Gruenberg Dry Heat Sterilizers

The presentation focuses on the use of dry heat, instead of steam, for the sterilization of laboratory animal cages, IVC racks, enrichment and other items used in the vivarium. The outline of the talk is as follows:

- Development of dry heat sterilization in laboratory animal facilities.
- What is dry heat sterilization?
  - How does it work with laboratory animal cages, IVC racks and related items.
  - How does dry heat sterilization compare to steam sterilization?
- What are the benefits of dry heat sterilization?
- Three recent case studies showing specific customer challenges and how dry heat sterilization solved them.
- How are these systems validated?
- Review of recent study "Preventing the Transmission of Murine Norovirus to Mice (Mus musculus) by Using Dry-heat Sterilization".
- Review of recent study of dry heat sterilization to sterilize full water bottles in a lab animal facility.

Inhalation Anaesthesia: Best practices for welfare and avoiding occupational risks

Adriaan Schmal
UNO BV

Discussion about best practices when working with inhalation anesthesia. Measures to reduce the risk of exposure. Technical solutions, animal welfare and the human factor.

Diets in protocols – key points to consider. Discussion about 2 possible drift sources: Phytoeostrogens and Mycotoxins

Georges Hasson
SAFE

The presentation will discuss the importance of diet in biomedical research exploring the need for consistent, storage-stable, and protocol-friendly diet quality, as well as the two types of diets available: Standard and Purified diets. We will also discuss the constraints of laboratory animal diets and we will cover the importance of safe diets that meet regulations, have consistent quality, and controlled processes. We will delve into the essential role of contaminants control in laboratory animal diets, including the impact of mycotoxins and phytoestrogens. Discussing at the same time, preventive actions, including raw materials selection, and contamination prevention.

Improved and ergonomical rat handling

Robin Labesse
Allentown

This workshop will cover how rat handling can be refined by getting the most out of your equipment and maintaining safe and ergonomical working practices.

Ultrasound and photoacoustic imaging forming the backbone for the 3R

Peter Kesa, Caroline O'Riordan, Philippe Trochet, Dieter Fuchs
Fujifilm VisualSonics, Inc., Amsterdam, The Netherlands

The 3R, Replacement, Reduction, and Refinement has an impact on planning of future research projects in preclinical research. The 3R regulates the directions of welfare of animals used in a specific study [1]. The best practice in pre-clinical imaging as a golden standard for reproducibility is required in basic and translational research enabling transfer of knowledge to clinical praxis. High-frequency ultrasound (HFUS) and photoacoustic (PA) techniques are a non-invasive, real-time, and reproducible approach for anatomical, functional, and molecular imaging utilized in various applications. The HFUS and PA imaging is utilized especially in rodents and in bigger laboratory animals. The applications of HFUS include developmental imaging, neurobiology and neuro oncology, cardiovascular research, oncology, biodistribution studies and pharmacokinetics, and others. Here, HFUS gives anatomical and functional information, while the PA imaging provides information about the biodistribution of endogenous or exogenous contrasts on a molecular level. The standardized and reproducible approach in HFUS and PA imaging is helping in reducing the number of animals used in the animal study [2]. Also, the animals require light anesthesia only as the imaging itself is usually done within a few minutes. This has a favorable effect on animal welfare and overall animal condition helping to reduce the recovery time after the necessary examination.

[1] Hubrecht RC., Carter E. The 3Rs and Humane Experimental Technique: Implementing Change. Animals (Basel). (2019) https://doi: 10.3390/ani9100754

[2] O'Riordan, C.E., Trochet, P., Steiner, M. et al. Standardisation and future of preclinical echocardiography. Mamm Genome (2023). https://doi.org/10.1007/s00335-023-09981-4

Advancing Vivarium Efficiency and Animal Welfare through Digitalization: A operational evaluation of the DVC® System

Giorgio Rosati
Tecniplast, Italy

The paramount concern in vivarium management, as highlighted by this study, revolves around the welfare of laboratory animals, a domain where the Digital Vivarium Cage (DVC®) system marks a significant breakthrough. By enabling continuous monitoring of activity patterns, environmental conditions, and behavioural indicators, the DVC® system introduces an advanced approach to safeguarding animal well-being. It employs an AI algorithm capable of identifying behavioural anomalies such as aggression and stereotypic behaviours. This feature is instrumental in providing actionable insights for welfare assessments and interventions, thereby elevating the standard of care. Particularly, the system's ability to track nocturnal activity offers a nuanced, data-driven perspective that enhances traditional health check protocols with objective evidence of the animals' conditions.

Moreover, the integration of the DVC® system into existing Animal Management Systems (AMS) underscores its utility in scientific research by streamlining colony management and resource allocation, thereby facilitating a seamless operational workflow. This integration not only optimises task execution but also reduces manual labour, significantly improving accuracy in the animal census and asset management.

Operational efficiency is another critical aspect addressed by the DVC® system. The system's design for real-time tracking of laboratory animal cages addresses key operational challenges in vivarium management. By automating the calculation of cage per-diem costs and providing instant access to data on rack occupancy levels and cage locations, the DVC® system minimizes human error and enhances the reliability of operational workflows. The incorporation of dedicated LED indicators further aids in cage management, streamlining caretaker tasks and improving overall efficiency.

In essence, the DVC® system represents a leap forward in the scientific management of vivarium, with a pronounced emphasis on animal welfare. Its capability to offer precise monitoring and management practices through digital technology not only aligns with the scientific community's ethical responsibilities towards laboratory animals but also illustrates the transformative potential of digitalisation in achieving excellence in vivarium management. The dual benefits of enhanced animal welfare and operational efficiency position the DVC® system as a pivotal innovation in the field.

Science & Care through the lens of the 4Rs

Urte Jaeh, Lars Friis Mikkelsen
Charles River

The laboratory animal science community has long supported the principles of the 3Rs (Replacement, Reduction, and Refinement). For many years, we, at Charles River, have embraced a foundational fourth R – Responsibility. This fourth R ensures that we are placing a lens of responsibility on everything we do, driving progress for patients and animals that depend on our work.

This workshop will focus on the management of rodent colonies through the lens of the 4Rs. We welcome you to join us as we review useful practices to reduce colony sizes and support animal welfare.

Health monitoring – Comparing apples with oranges

Andy Dickinson
Envigo RMS B.V

Knowing the limits of health monitoring assays and their application in different scenarios can be very useful when designing a robust health monitoring system, whilst providing options for reducing the number of animals used. This talk will hope to provide some insight and ideas on combining the available techniques.