

Practical advice on improving quality, safety and translatability in animal facilities

Adrian Smith

adrian.smith@norecopa.no

[linkedin.com/in/adrian-smith-bb567b5a](https://www.linkedin.com/in/adrian-smith-bb567b5a)

norecopa.no/Vienna

Practical advice on improving quality, safety and translatability in animal facilities

What is this advice based upon?

- *Experience in managing animal facilities for 30 years*
- *Lessons learned in achieving and maintaining international accreditation of facilities*
- *Experiences when planning, supervising and conducting my own and other peoples' research – and clearing up afterwards...*
- *Building and maintaining a knowledge base for this and all the 3Rs*

Norecopa

Norway's National Consensus Platform for the
Three Rs: Replacement, Reduction and Refinement



<https://norecopa.no>

Norecopa: PREPARE for better Science

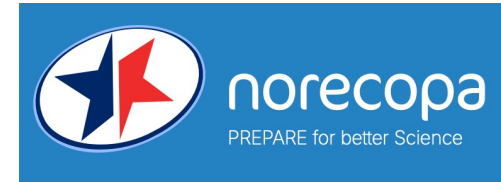
"...better science?"

- Replacement if possible
- Reduction and Refinement if not possible to replace
- Valid data (a true treatment effect)
- Reproducible and Translatable experiments
- Best possible animal welfare
- Health & Safety (of animals and people)
- Culture of Care at the animal facility
- Communication of best practice to others



Ignorance of ways to achieve these creates bad science

Disclosures



“Norecopa.no: A one-stop-shop for global 3R

*Our **aim** – and you decide whether this is a justifiable **claim***

Manager of the Norecopa website
(11,000 pages, >1,000 hits per day)

- Co-author of several databases and a Refinement Wiki
- Lead author of the PREPARE guidelines

Norecopa is a member of AAALAC International,
based upon our positive experiences in accrediting
animal facilities



We are promoting **your** resources!

Let us know what's missing!

norecopa.no/Tour

How do the professionals achieve quality, safety and translatability?



<https://www.meonuk.com/runway-markings-explained>

...and precision in a variable environment?



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10-15 checklists even on short routine flights

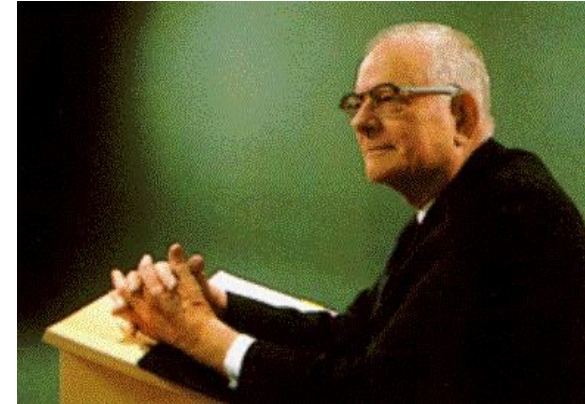


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Checklists

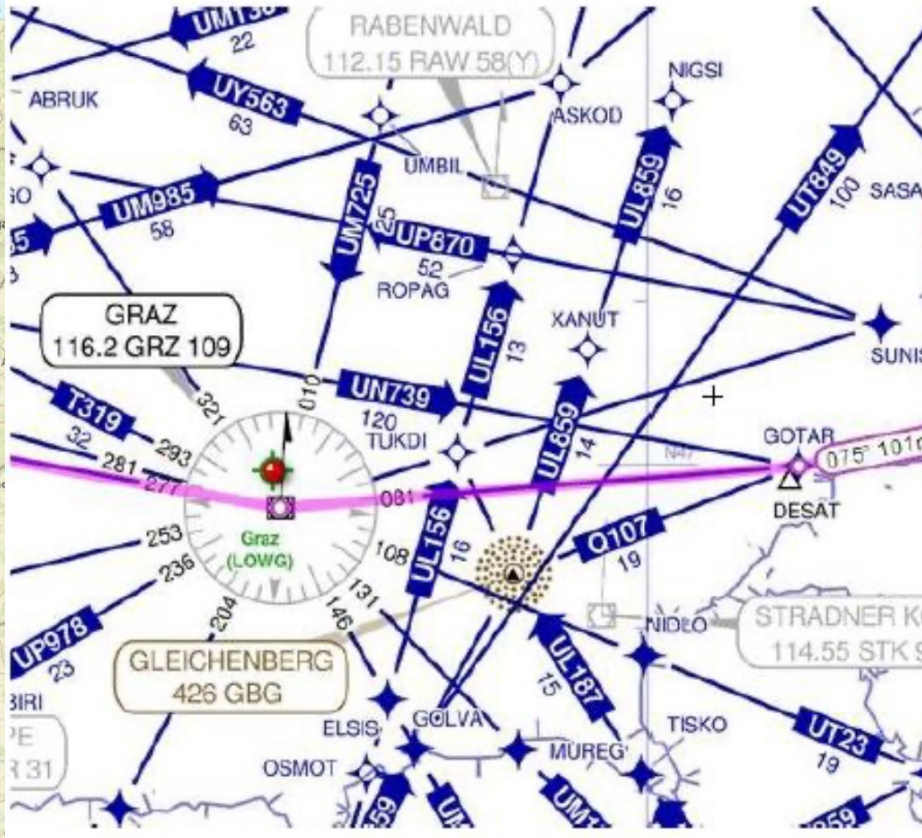
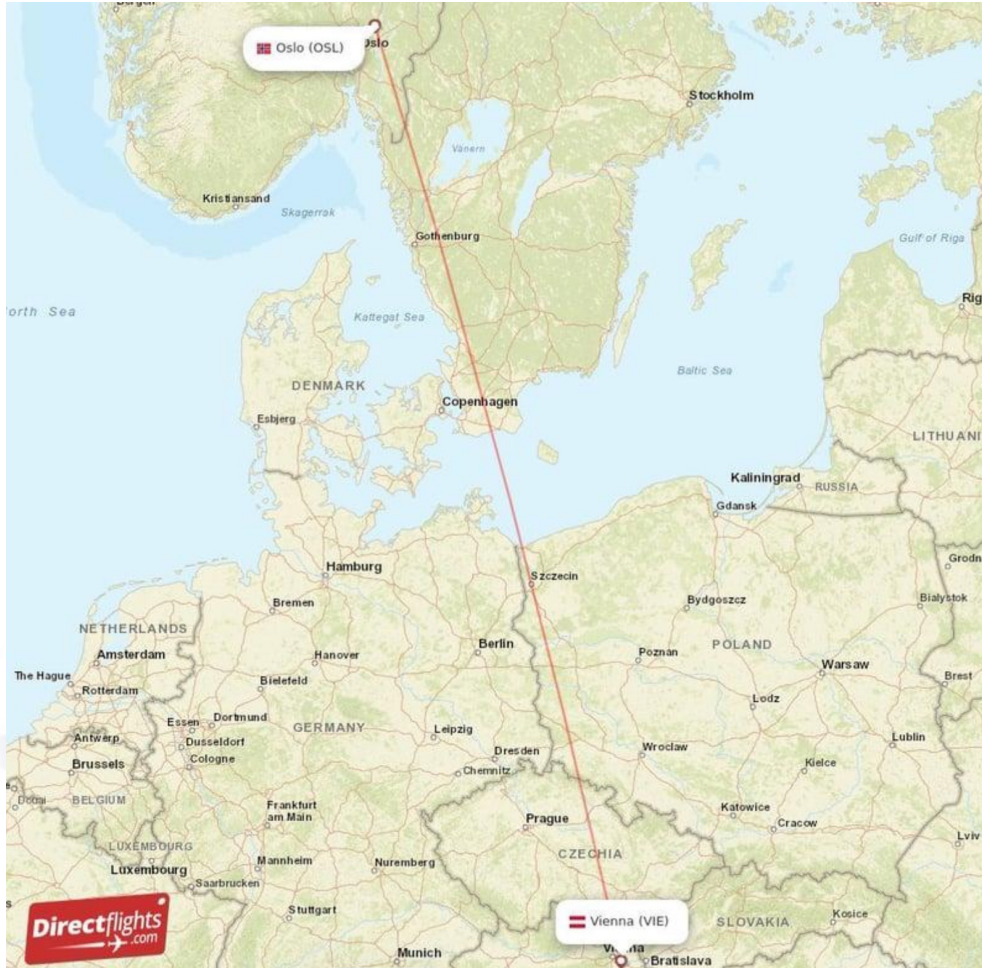
- Reduce risk of **forgetting** to carry out vital actions
- Ensure checks are carried out in the **correct sequence**
- Encourage **cooperation** and **cross-checking** between crew members
- Make sure that everyone is "**on the same page**"

Checklists = Standard Operating Procedures



“The use of standards (i.e. SOP’s) frees resources within problem areas that have already been solved and have become a routine, so that these resources can instead be used for creative work in areas where problems still exist”

W. Edwards Deming



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travelandleisure.com/airlines-airports/what-happens-when-planes-hit-birds

15.25.33	-01.38	Kaptein	Cockpit	V one, rotate
15.25.38	-01.33	Kaptein	Cockpit	positive rate
15.25.39	-01.32	Styrmann	Cockpit	Gear up please
15.25.39	-01.32	Kaptein	Cockpit	Gear up
15.26.37	-00.34	Kaptein	Cockpit	Uh what a view of the Hudson today
15.26.42	-00.29	Styrmann	Cockpit	Yeah
15.27.07	-00.04	Kaptein	Cockpit	After takeoff checklist complete
15.27.10	-00.01	Kaptein	Cockpit	Birds
15.27.11	-00.00	Styrmann	Cockpit	Whoa
15.27.11	00.00			
15.27.12	+00.01	Kaptein	Cockpit	Oh ---
15.27.13	+00.02	Styrmann	Cockpit	Oh yeah
15.27.14	+00.03	Styrmann	Cockpit	Uh oh
15.27.15	+00.04	Kaptein	Cockpit	We got one rol... both of 'em rolling back
15.27.18	+00.07	Kaptein	Cockpit	Ignition, start
15.27.21	+00.10	Kaptein	Cockpit	I'm starting the APU
15.27.23	+00.12	Kaptein	Cockpit	My aircraft
15.27.24	+00.13	Styrmann	Cockpit	Your aircraft
15.27.28	+00.17	Kaptein	Cockpit	Get the QRH... loss of thrust on both engines
15.27.32	+00.21	Kaptein	Radio	Mayday mayday mayday. Uh this is Cactus fifteen thirty [sic] nine, hit birds. We've lost thrust on both engines. We're turning back towards LaGuardia.





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Hudson River, 2009

en.wikipedia.org

All 155 passengers and crew saved



Rapid evacuation by trained cabin crew saved many lives

norecopa.no/PREPARE/film
3-minute whiteboard film



TOO LATE!!

HOW CAN WE IMPROVE ANIMAL STUDIES?

WE ARRIVED BECAUSE WE WERE PREPARED
VISIT: NORECOPA.NO/PREPARE

PRECISION
REPLICABILITY
HEALTH AND SAFETY
TRANSLATABILITY

PILOTS
CABIN CREW
GROUND STAFF
AIR TRAFFIC CONTROLLERS

RECIPE
NORECOPA.NO/PREPARE

SUGGESTIONS FOR

- GUIDELINES
- DATABASES
- INFORMATION CENTRES
- JOURNALS, DISCUSSION LISTS, ETC.

SUGGESTIONS FOR

- A MASTER PLAN
- A CONTINGENCY PLAN
- A CONTRACT (ANIMAL FACILITY & RESEARCH GROUP)

COLLABORATION

- ANIMAL CARERS AND TECHNICIANS
- VETERINARIANS
- FACILITY MANAGERS
- SCIENTISTS AND THEIR STAFF
- ANIMAL WELFARE AND ETHICS COMMITTEES
- REGULATORS

THIS WAY WE CAN

- REDUCE THE RISK OF ANIMALS SUFFERING
- IMPROVE OUR METHODS - DO BETTER SCIENCE!
- WRITE BETTER APPLICATIONS
- IMPROVE MANUSCRIPT QUALITY

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PREPARE FOR BETTER SCIENCE

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PILOTS



CABIN CREW



GROUND
STAFF



AIR TRAFFIC
CONTROLLERS



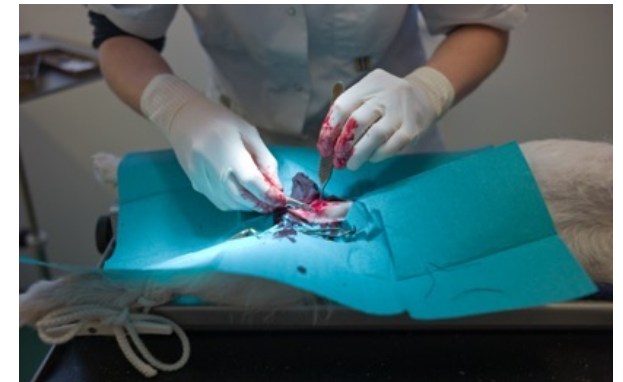
EU / National



Facility



Project



Procedure



An analogy from NASA:

Animals are complex, **tightly-coupled** organisms

Identify the **critical points**
in your experiment

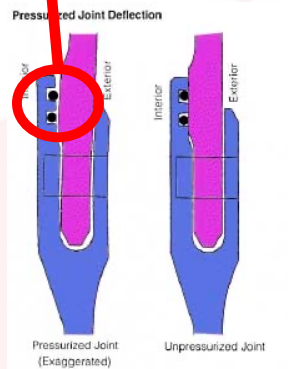
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Space Shuttle, NASA

photo: colourbox.com

Challenger, 1986



www.mahal.org



Challenger disintegrated in January 1986
killing all 7 crew members

Photo: no.wikipedia.org

Small details are important!!

Columbia, 2003

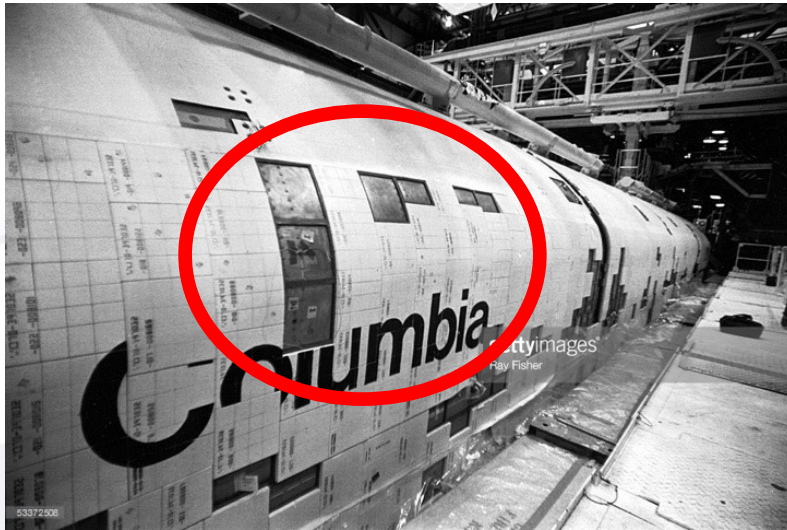
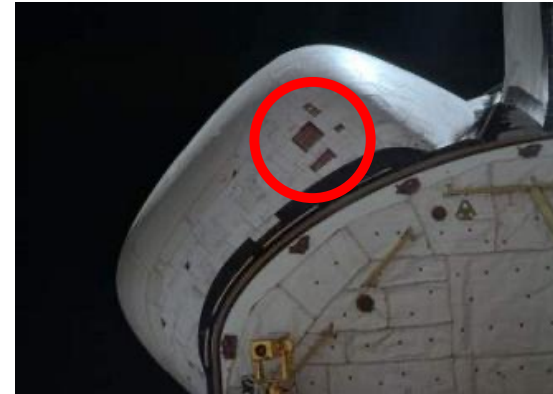


Photo: gettyimages.no

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First shuttle flight, Columbia, in April 1981
Photo: nasaspaceflight.com



Columbia burnt up in 2003, killing all 7 crew members
Photo: cbsnews.com

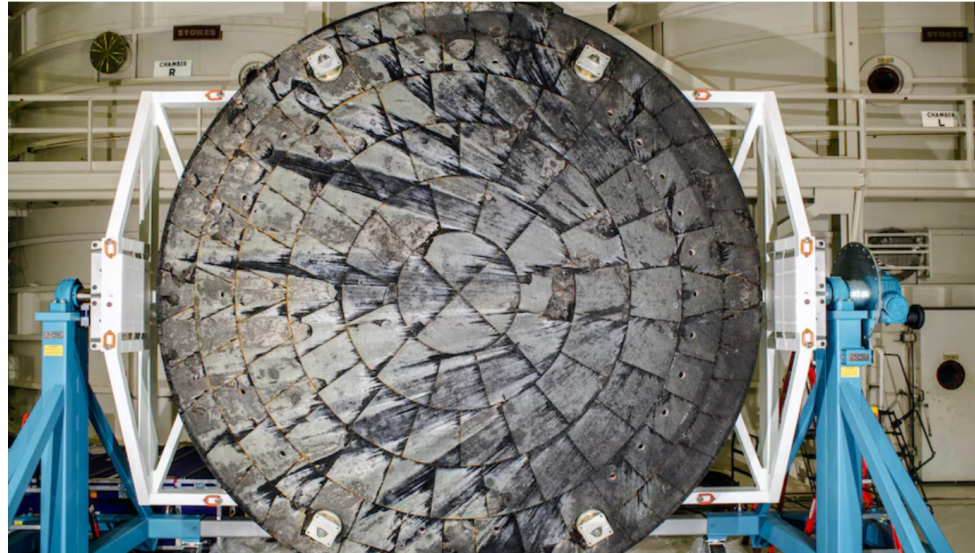
Artemis II, April 2026

Former NASA engineer warns about heat shield on Artemis II moon mission

By Fiona Pepper, James Bullen and Jacinta Bowler for The Challenger Legacy

ABC Science Space Exploration

Tue 17 Feb



Large surface cracks and craters were found on the heat shield of NASA's Orion spacecraft after the first Artemis mission. (Supplied: NASA)

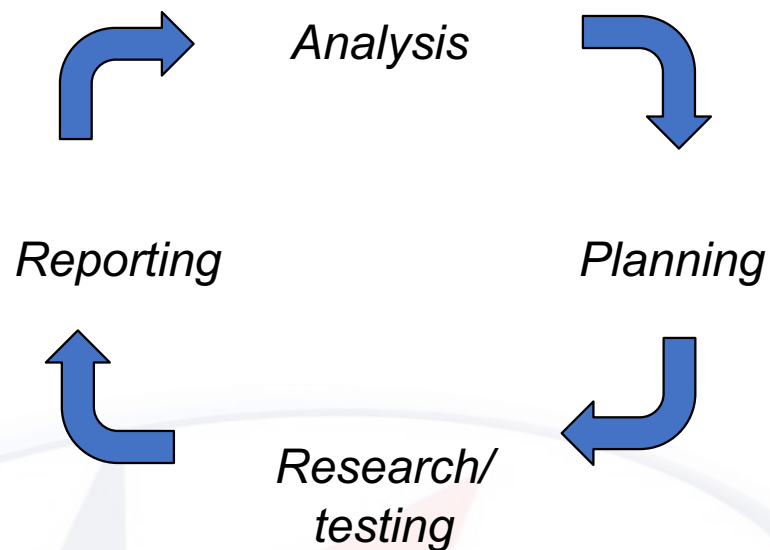
In short:

As the Artemis II mission prepares to take off in March, a retired NASA engineer and astronaut has raised concerns about the Orion spacecraft's heat shield.

The performance of the heat shield is critical to protect astronauts from the extreme temperatures of re-entry.

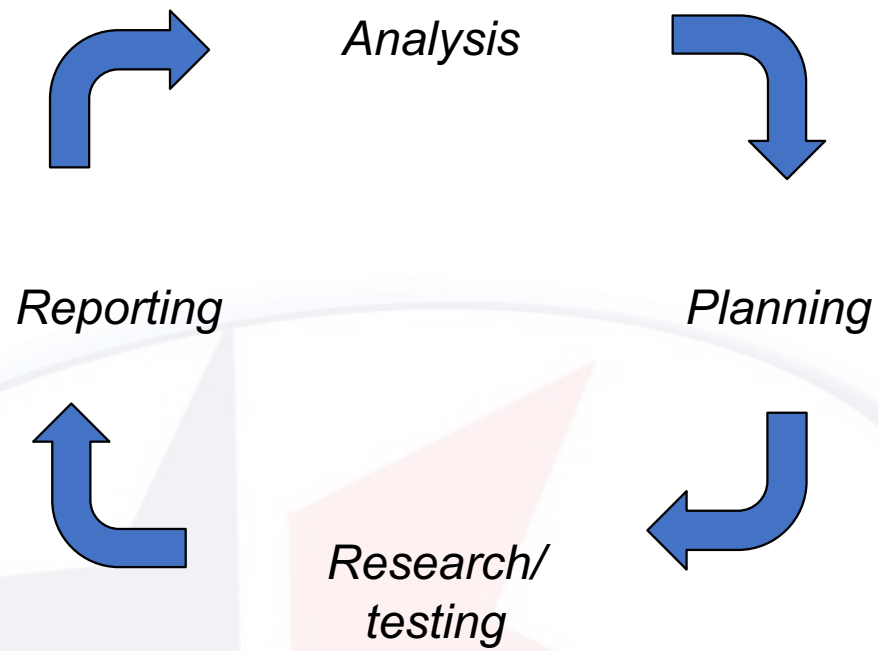
NASA's administrator Jared Isaacman has confirmed he has "full confidence" in Orion's heat shield design.

Continuous quality control



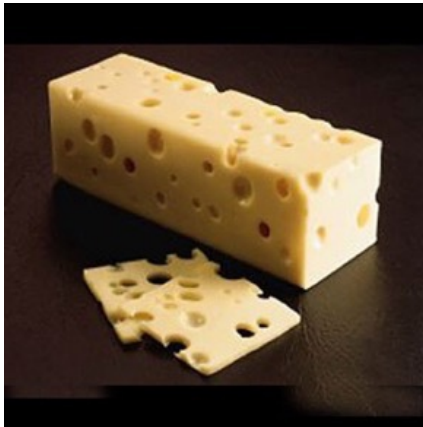
Make sure that all concerns are discussed openly between management and technical staff in an atmosphere of respectful dialogue

*Identify and ensure the quality of (at least) the **critical points** in the experiment: critical for animal welfare and scientific value*



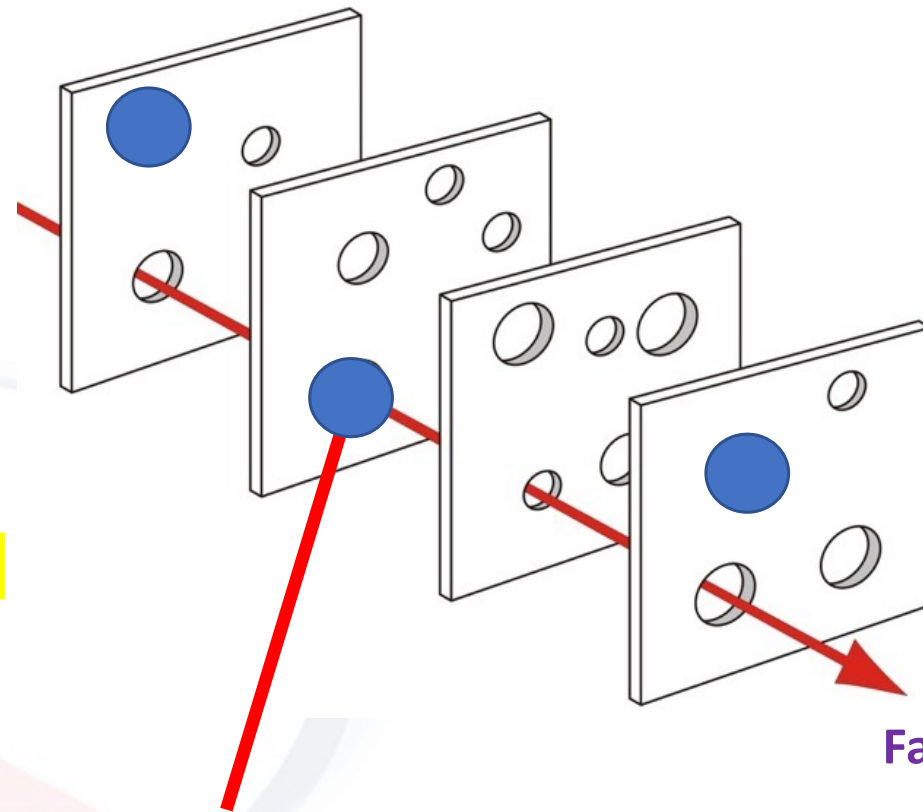
freepik.com

Threat and Error Management



eaugallecheese.com/Swiss-Cheese

Embrace these as opportunities to improve the quality of our work!



Weaknesses / dangers

Failure

wikipedia.org/wiki/Swiss_cheese_model



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colourbox.com

Contingency and redundancy

Anything that can go wrong, will go wrong (Murphy's Law)
when it's least convenient (Sod's Law)



Photo: NMBU

Dagbladet.no

Publisert fredag 23.04.2010 kl. 18:26

Solveig (38) forsket på kreft, ble selv uhelbredelig syk

**Slår alarm om arbeidsforholdene på Radiumhospitalet.
Sykehuset innrømmer rutinesvikt.**



ASLE HANSEN
ash@dagbladet.no



DIANA BADI
dba@dagbladet.no



HELSEFARLIG ARBEIDSMILJØ: Solveig Garman-Vik (38) har fått diagnosen akutt myelogen leukemi (AML) etter å ha jobbet med kreftforskning på Radiumhospitalet i elleve år. Her får hun en klem av sykepleier Elisabeth A. Saghaug før hun går hjem for helgen. Få med hvor fantastiske alle her på Lovisenberg er mot meg, sier Solveig. Foto: LARS EIVIND BONES/DAGBLADET

Health hazards: there are many people to think about

- People engaged in animal capture, transport and breeding
- Animal carers and technologists
- Security personnel
- Administrative personnel with occasional access to the animal facility
- Students
- Sales representatives and those delivering supplies or equipment
- Craftsmen carrying out facility repairs
- Other visitors, including inspectors, journalists and students
- Cleaning staff
- Waste disposal personnel
- Those who re-home research animals
- Families of those who enter research animal facilities (allergens, disease organisms)



Culture of Care

The International Culture of Care Network
norecopa.no/coc

A demonstrable commitment, throughout the establishment, to improving:

- animal welfare
- scientific quality
- care of staff
- transparency for all stakeholders, including the public

It goes beyond simply complying with the law!

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Communication and the Culture of Care

Penny Hawkins, RSPCA Research Animals Department
on behalf of the International Culture of Care Network*

Effective two-way communication between scientists and animal technologists is essential for a good Culture of Care
The European Commission suggests the 'development of formal and informal communication channels, for mutual benefit with respect to science and animal welfare'
Here are some examples from International Culture of Care network members

Regular meetings

Scheduled meetings for scientists, animal technologists, vets, unit managers and AWERB members



Regular refresher/update meetings for all organised by NTCO



Special events

Duo-talks: researcher talks about their science, and animal technologists talk about techniques and animal care within the project



ELH organises an **informal meeting** for all, in which anyone can raise welfare issues



Building communication into existing processes

Each study has a **pre-start** and **wash-up** meeting involving **everybody**



Three Rs improvements **reported to AWERB** & **shared** at external user meetings

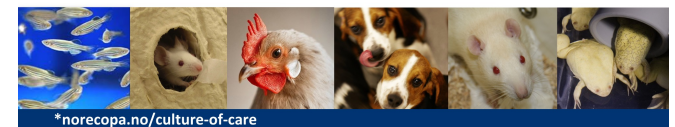


Other ideas

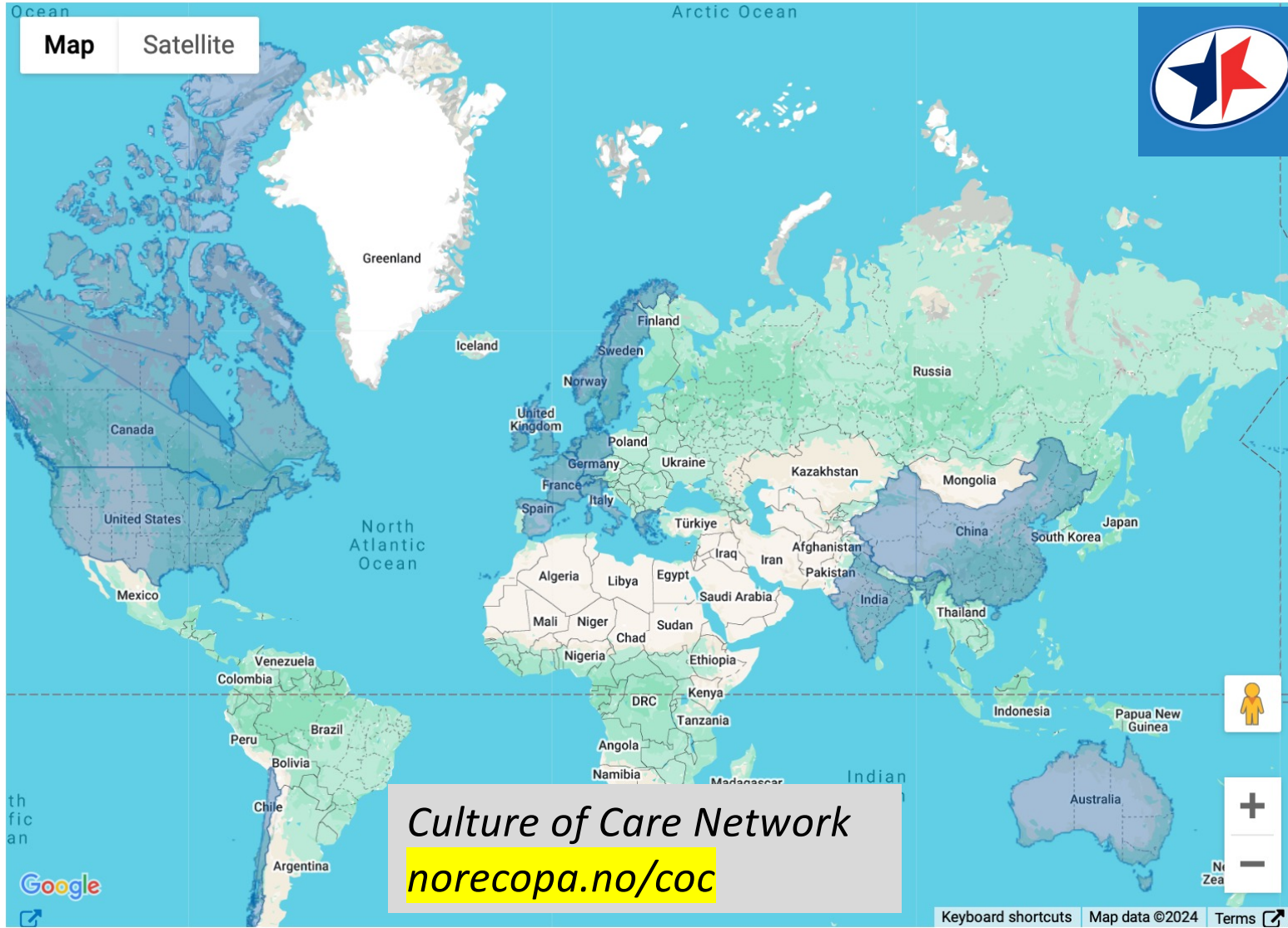
A **'boxless'** event: anyone can submit 'out of the box' ideas to improve practice



A **staff survey** for all e.g. how much do you agree with statements such as 'in our group we listen to each others' ideas about animal welfare'



*norecopa.no/culture-of-care



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norecopa.no/global3r

Culture of Care facilitates honest discussion along the path



"because we've always done it that way»

"as often as necessary"

"there are no alternatives"

Closely related to a culture of care is

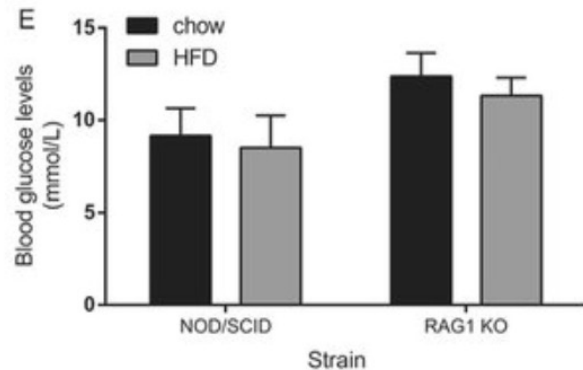
a **Culture of Challenge** (Louhimies, 2015).

Look for the acceptable, rather than choosing the accepted.





The scientist



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The mouse

Breeding

New social groups

Transportation

Acclimation to research facility

Allocation to experimental group

Adaptation to new diet

Handling and immobilisation

Blood sampling

often also:

injections, gavaging, surgery

pain and distress

developing illness and death



Project

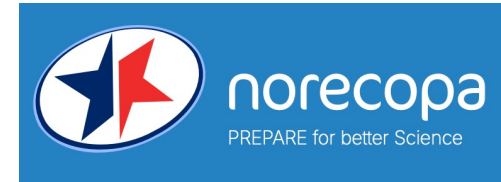
A contract between the animal facility and the research group

Division of labour, responsibilities and cost

Clarifying all stages of the experiment

Ensuring that all necessary data are recorded

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	Animal facility	Researcher	Not applicable
Animal:			
Arrival date			
Species			
Strain/stock and substrain			
Supplier (full name and address) or bred on the premises			
Number and sex			
Age, weight, stage of life cycle on arrival			
Pre-treatment (surgical or medical) from supplier			
Quality (e.g. SPF, germ-free, gnotobiotic, conventional)			
Acclimation time before the start of the experiment			
Time and duration of fasting (with/without water and bedding)			
Environment:			
Type of housing: barrier/conventional			
Temperature (mean ± variation)			
Light schedule			
Relative humidity (mean ± variation)			
Number of air changes in the animal room/cabinet per hour			
Environmental enrichment			
Housing:			
Free-range, shelf, cabinet, isolator			
Cage type and size			
Number and method of distribution of animals per cage			

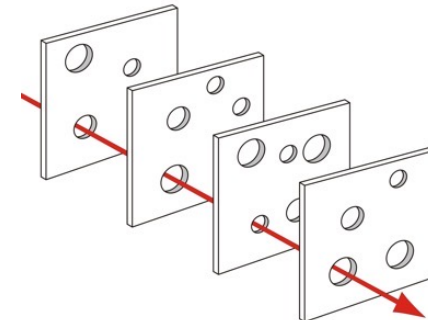
A Contingency Plan, based upon risk assessment

- Access to emergency services (police, fire, medical and veterinary help, security guards, personnel transport in cases of acute illness)
- Means of communication with staff members at all levels
- SOPs for acute illness, including
 - serious haemorrhages
 - fainting
 - allergic reactions

Many of these needed revision in the light of Covid-19
norecopa.no/be-prepared

- corrosive injuries
- and forms for reporting such injuries
- Firefighting, evacuation of personnel and animals
- Access to specialist services (e.g. ventilation system, plumbing, electrical installations, suppliers of equipment)
- Routines in cases of power failure, water leaks and (if applicable) natural disasters such as flooding
- Routines for emergency killing of animals
- Routines in cases of threats to the facility or personnel

<https://norecopa.no/prepare/6-facility-evaluation/master-plan-and-sops/contingency-plan>



Temporary staff at weekends and holidays



- A. Animal Care and Use Program
- B. Animal environment, Housing and Management
- C. Veterinary Care
- D. Physical plant

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Work in the spirit of AAALAC, even if not accredited!

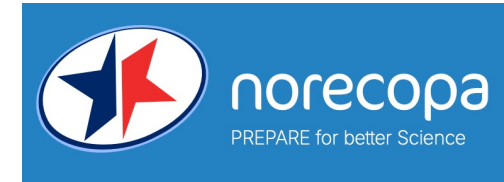
III. Veterinary Care.....	29
A. Animal Procurement and Transportation.....	29
1. Animal Procurement.....	29
2. Animal Housing and Management.....	29
3. Animal Care and Management.....	29
4. Animal Status and Species.....	30
5. Clinical Care and Management.....	30
1. Surveillance, Diagnosis, Treatment and Control of Disease.....	30
2. Emergency Care.....	31
3. Clinical Record Keeping.....	31
4. Diagnostic Resources.....	32
5. Drug Storage and Control.....	32
D. Surgery.....	32
1. Pre-Surgical Planning.....	32
2. Surgical Facilities.....	33
3. Surgical Procedures.....	33
4. Aseptic Technique.....	33
5. Intraoperative Monitoring.....	34

63 pages!

www.aaalac.org/program-description

A simple but effective Master Plan

The image shows two pages of a 'MASTER PLAN 2012' calendar grid. The top page covers January to December, and the bottom page covers January to October. The grid is divided into months and weeks. Handwritten notes and circles are scattered throughout the grid, indicating specific tasks or events. The text 'Bevillingsfrie helligdager med unntak av søndager er markert med rødt.' is visible at the bottom of each page. The grid is titled 'MASTER PLAN 2012' and includes a barcode and the number '7 045144 055072'.



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norecopa.no/more-resources/master-plan-and-sops

We need to ensure quality even if our lab hasn't the highest standard



<https://boeing.com>

←  **r/Shittyaskflying** · 1 yr. ago
DaveWick420

Flying back in the 80s on Hawaiian air looked fun!



https://www.reddit.com/r/Shittyaskflying/comments/13b67ut/flying_back_in_the_80s_on_hawaiian_air_looked_fun



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How do you tackle failure?



[wikipedia](#)

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CIRS-LAS Portal

Critical incident reporting system in laboratory animal science

Refine - Reduce - Replace

Homepage

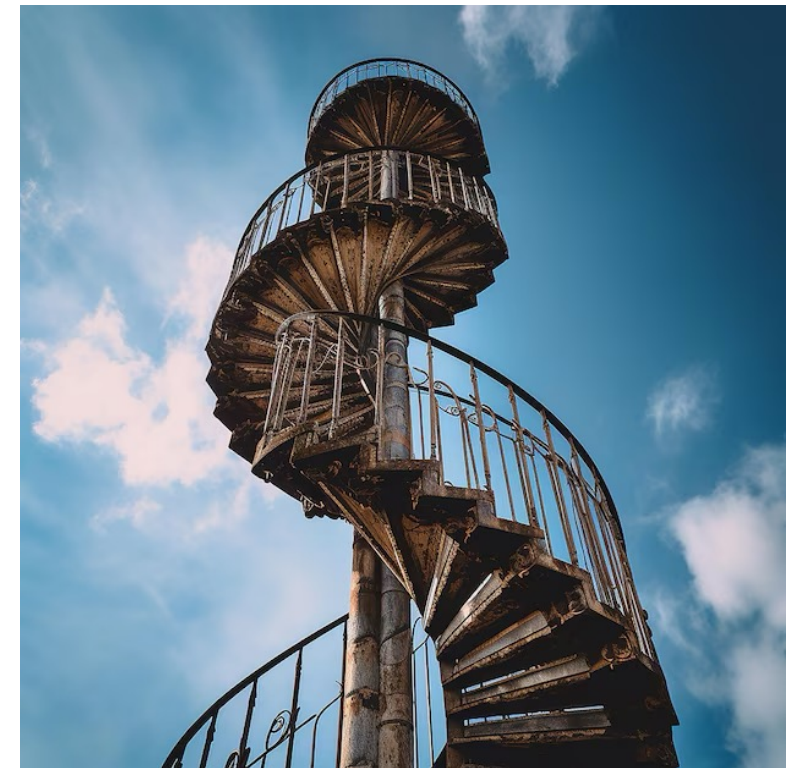
Project

Team

FAQ

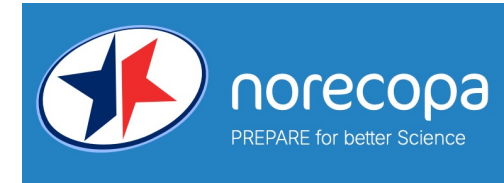


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freepik.com





*Don't give up!
Ask for help!*

The difficulty is, that changing a university is like moving a graveyard, you get no help from the people inside!

Geoffrey Boulton, University of Edinburgh

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<https://echer.org/changing-a-university-is-like-moving-a-graveyard>

<https://www.weedonbucks.org.uk/index.php/parish-council/weedon-chapel-graveyard>

FELASA Congress, 2 June 2025

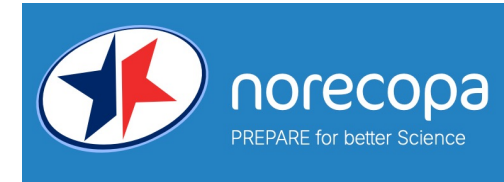
You All Shouldn't Be Here! How to Burst the 3R Bubble

This has led to the somewhat frustrating situation that conferences focusing on 3R science may feel like mere echo chambers.

In this session we aim to penetrate virtual walls between the “3R bubble” and other areas of basic research with a focus on neuroscience and immunology, which together account for more than one fifth of animals used in the EU/UK (2019/2020).



fourwaves.com/blog/how-to-make-a-scientific-poster



Guidelines for the reporting of anaesthesia and analgesia in poster presentations of surgical research

Experiments were performed on spontaneously breathing adult male Wistar rats (anesthetized with sodium thiopentone 100 mg/kg i.p.). Two trephinations were made over the left parieto-occipital cortex, the dura mater was opened, and the exposed brain areas were superfused with regular artificial cerebrospinal fluid (ACSF, warmed to 37 °C equilibrated with carbogen). DC potentials were recorded at two sites in the cerebral cortex with pairs of glass microelectrodes (tip diameter 5 µm) in cortical layers II and V. The frontal trephination hole was surrounded by a wall of dental acrylic, and there Gal was applied topically to the cortical surface (see Figure). The electrocardiogram and the systemic blood pressure were continuously monitored.

Germany

no mention of analgesia

PCOS for 21 days. Exercise groups were trained for 38 min/day five days a week for 12 weeks. After experimental protocol, thoracotomy was performed under 50 mg/kg sodium thiopental anesthesia. HOMA-IR, FSH, LH, thiol levels were analyzed in blood. Myokines were analyzed in

Turkey

no mention of analgesia

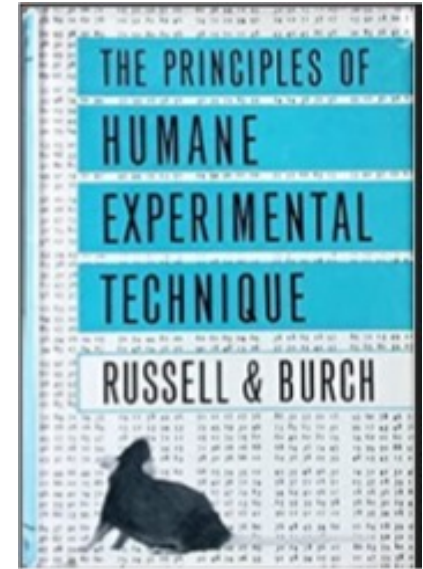
Bad habits have been around for a long time...

Russell & Burch (1959) quoted Visscher (1951):

"In general, methodology is usually relegated to a place of smaller type and sharply abbreviated importance in journal publication of research.

Numerous essential details are customarily omitted, either because they are considered to be common knowledge, or simply for lack of space."

...or maybe because they didn't do good science...?



Russell WMS & Burch RL (1959)



<https://tenor.com/en-GB/view/hamster-run-wheel-gif-4347247778461426620>

Publish or perish



My project has been funded, and the method has been published before, so why should I change the protocol?

The pathway to open (better) science



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<https://riojournal.com/article/105198>

We cannot improve our research or teaching by better reporting alone...

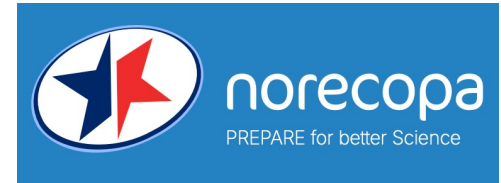


reddit.com



ChatGPT

PREPARE



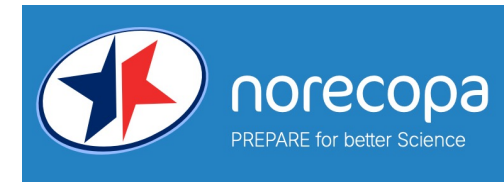
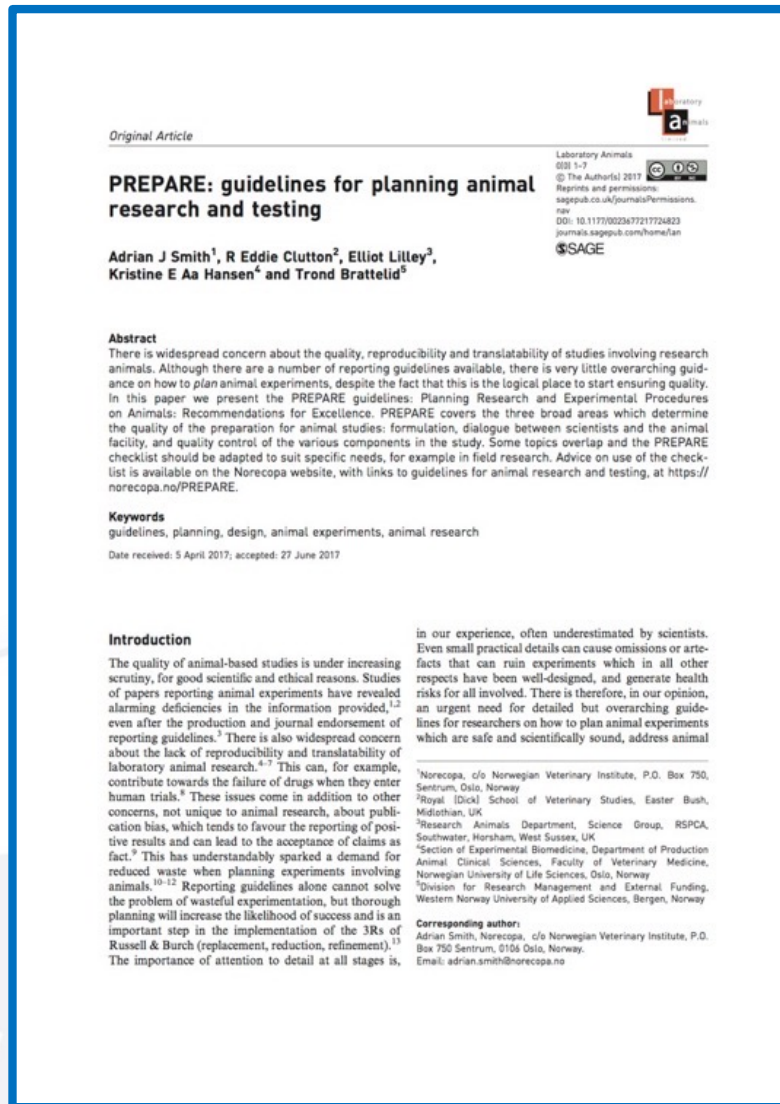
bls.gov/ooh/images/3077.jpg

ARRIVE



[dreamstime.com](https://www.dreamstime.com)

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Eddie Clutton, Elliot Lilley, Kristine Hansen & Trond Brattelid

Pre-published under Open Access on 3 August 2017, sponsored by the Universities Federation for Animal Welfare (UFAW), UK

<https://doi.org/10.1177/0023677217724823>



Over 20,000 downloads from the journal website so far

Norecoba: PREPARE for better Science

PREPARE:

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

PREPARE covers 15 topics:

Formulation of the study

1. Literature searches
2. Legal issues
3. Ethical issues, harm-benefit assessment and humane endpoints
4. Experimental design and statistical analysis

Dialogue between scientists and the animal facility

5. Objectives and timescale, funding and division of labour
6. Facility evaluation
7. Education and training
8. Health risks, waste disposal and decontamination

Methods

9. Test substances and procedures
10. Experimental animals
11. Quarantine and health monitoring
12. Housing and husbandry
13. Experimental procedures
14. Humane killing, release, reuse or rehoming
15. Necropsy

Maybe the study
should not go ahead

Systematic review of
published research?

norecopa.no/PREPARE

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Items in pink are
not typically
highlighted in
reporting guidelines

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PREPARE

The PREPARE Guidelines Checklist
Planning Research and Experimental Procedures on Animals: Recommendations for Excellence
Adrian J. Smith¹, R. Eddie Clutton², Elliot Lilley³, Kristine E. Aa. Hansen⁴ & Trond Bratteli⁵
¹Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; ²Royal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; ³Research Animals Department, Science Group, RSPCA, Wilberforce Way, Southwater, Herts, West Sussex, RH13 9RS, U.K.; ⁴Section of Experimental Biomedicine, Department of Production Animal Clinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences, P.O. Box 8146 Dep., 0033 Oslo, Norway; ⁵Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

PREPARE¹ consists of planning guidelines which are complementary to reporting guidelines such as ARRIVE².

Fillable Word file that can be used to write a Study Plan

Topic	Recommendation
(B) Dialogue between scientists and the animal facility	
5. Objectives and timescale, funding and division of labour	<input type="checkbox"/> Arrange meetings with all relevant staff when early plans for the project exist. <input type="checkbox"/> Construct an approximate timescale for the project, indicating the need for assistance with preparation, animal care, procedures and waste disposal/decontamination. <input type="checkbox"/> Discuss and disclose all expected and potential costs. <input type="checkbox"/> Construct a detailed plan for division of labour and expenses at all stages of the study.
6. Facility evaluation	<input type="checkbox"/> Conduct a physical inspection of the facilities, to evaluate building and equipment standards and needs. <input type="checkbox"/> Discuss staffing levels at times of extra risk.
7. Education and training	<input type="checkbox"/> Assess the current competence of staff members and the need for further education or training prior to the start of the project.
10. Experimental animals	<input type="checkbox"/> Decide upon the characteristics of the animals that are essential for the study and for reporting. <input type="checkbox"/> Avoid generation of surplus animals.
11. Quarantine and health monitoring	<input type="checkbox"/> Discuss the animals' likely health status, any needs for transport, quarantine and isolation, health monitoring and consequences for the personnel.
12. Housing and husbandry	<input type="checkbox"/> Attend to the animals' specific instincts and needs, in collaboration with expert staff. <input type="checkbox"/> Discuss acclimatization, optimal housing conditions and procedures, environmental factors and any experimental limitations on these (e.g. food deprivation, solitary housing).
13. Experimental procedures	<input type="checkbox"/> Develop refined procedures for capture, immobilisation, marking, and release or rehoming. <input type="checkbox"/> Develop refined procedures for substance administration, sampling, sedation and anaesthesia, surgery and other techniques.
14. Humane killing, release, reuse or rehoming	<input type="checkbox"/> Consult relevant legislation and guidelines well in advance of the study. <input type="checkbox"/> Define primary and emergency methods for humane killing. <input type="checkbox"/> Assess the competence of those who may have to perform these tasks.
15. Necropsy	<input type="checkbox"/> Construct a systematic plan for all stages of necropsy, including location, and identification of all animals and samples.

References

- Smith AJ, Clutton RE, Lilley E, Hansen KEA & Bratteli T. PREPARE: Guidelines for Planning Animal Research and Testing. *Laboratory Animals*, 2017. DOI: 10.1177/002367217724823.
- Kilkenny C, Browne WJ, Cuthill IC et al. Improving Bioscience Research Reporting: The ARRIVE Guidelines for Reporting Animal Research. *PLoS Biology*, 2010. DOI: 10.1371/journal.pbio.1000412.

Further information
<https://norecopa.no/PREPARE> | post@norecopa.no | [@norecopa](https://twitter.com/norecopa)

- 3-Ethical issues, harm-benefit assessment and humane endpoints
 - 3a Construct a lay summary.
 - 3b In dialogue with ethics committees, consider whether statements about this type of research have already been produced.
 - 3c Address the 3Rs (Replacement, Reduction, Refinement) and the

- 5. Have the experiments been carried out before, and is any repetition justifiable?
- 6. What [approaches to reduce distress](#) have been considered?

3a Construct a lay summary.

- General principles
- For fish researchers

- 1. Have national or local research ethics committees already produced statements relevant to the research being planned? Consideration should also be paid to the broader context of the research. For example,

Links to quality guidelines and scientific papers worldwide on e.g. blood sampling, injection volumes, housing and husbandry, analgesia, humane endpoints, experimental design

We need more species-specific and situation-specific guidelines that supplement PREPARE!

- 3f Discuss the learning objectives, if the animal use is for educational or training purposes.
- 3g Allocate a severity classification to the project.
- 3h Define objective, easily measurable and unequivocal humane endpoints.
- 3i Discuss the justification, if any, for death as an end-point.
- 4-Experimental design and statistical analysis

- use of commonsense and critical anthropomorphism are justifiably part of the work to assess the impact of research on animals, not least when a scientific evidence base does not exist.
- 4. Does the proposed study have a clear rationale and scientific relevance, and what will be the next step if the hypothesis is supported or rejected?
- 5. Have the experiments been carried out before and is any repetition justifiable?
- 6. What [approaches to reduce distress](#) have been considered?
- 7. Will the project undergo [pre-registration](#) and will negative results be published, to avoid publication bias?
- Many more [links to resources on ethics are available here](#).
- Details about [pre-registration of animal studies and reporting of critical incidents](#) are to be found in the section on [Experimental Design and Statistical Analysis](#).

Harm-Benefit Assessment

PREPARE encourages scientists to collaborate with animal carers and technicians from Day 1

- they have a right to know and will be more motivated
- they know the possibilities (and limitations) in the animal facility
- they often possess a large range of practical skills and are good at lateral thinking
- they know the animals best
- the animals know them best
- lack of involvement creates anxiety, depression and opposition to animal research, as well as limiting creativity which might improve the experiments

arriveguidelines.org

The ARRIVE guidelines 2.0

This section of the website provides detailed explanations about each item of the guidelines. Use the left-hand side menu to navigate to each item.

To facilitate a step-wise approach to improving reporting, the guidelines are organised into two prioritised sets:

ARRIVE Essential 10

These ten items are the basic minimum that must be included in any manuscript describing animal research. Without this information readers and reviewers cannot assess the reliability of the findings.

Recommended Set

These items complement the Essential 10 set and add important context to the study described. Reporting the items in both sets represents best practice.

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Reporting guidelines

The screenshot shows the ARRIVE guidelines website. The top navigation bar includes 'Home', 'About', 'ARRIVE guidelines', 'Supporters', 'Resources', 'Publications', and 'News'. A left sidebar contains a menu with items like 'ARRIVE guidelines', 'Essential 10', and 'Recommended Set'. The main content area is titled '11. Abstract' under a 'RECOMMENDED SET' header. A purple callout box contains the text: '11 Provide an accurate summary of the research objectives, animal species, strain and sex, key methods, principal findings, and study conclusions.' Below this are tabs for 'Explanation' and 'Examples'. The 'Explanation' tab is active, showing a paragraph about the utility of abstracts and a 'References' section with two citations.

ARRIVE

Home About ARRIVE guidelines Supporters Resources Publications News

ARRIVE guidelines

Essential 10

1. Study design

2. Sample size

3. Inclusion and exclusion criteria

4. Randomisation

5. Blinding

6. Outcome measures

7. Statistical methods

8. Experimental animals

9. Experimental procedures

10. Results

Recommended Set

11. Abstract

12. Background

13. Objectives

14. Ethical statement

RECOMMENDED SET

11. Abstract

11 Provide an accurate summary of the research objectives, animal species, strain and sex, key methods, principal findings, and study conclusions.

Explanation Examples

A transparent and accurate abstract increases the utility and impact of the manuscript, and allows readers to assess the reliability of the study [1]. The abstract is often used as a screening tool by readers to decide whether to read the full article or whether to select an article for inclusion in a systematic review. However, abstracts often either do not contain enough information for this purpose [2], or contain information that is inconsistent with the results in the rest of the manuscript [3,4]. In systematic reviews, initial screens to identify papers are based on titles, abstracts and keywords [5]. Leaving out of the abstract information such as the species of animal used or the drugs being tested, limits the value of preclinical systematic reviews as relevant studies cannot be identified and included. For example, in a systematic review of the effect of the MVA85A vaccine on tuberculosis challenge in animals, the largest preclinical trial did not include the vaccine name in the abstract or keywords of the publication, the paper was only included in the systematic review following discussions with experts in the field [6].

To maximise utility, include details of the species, sex and strain of animals used, and accurately report the methods, results and conclusions of the study. Also describe the objectives of the study, including whether it was designed to either test a specific hypothesis or to generate a new hypothesis (see [item 13 – Objectives](#)). Incorporating this information will enable readers to interpret the strength of evidence, and judge how the study fits within the wider knowledge base.

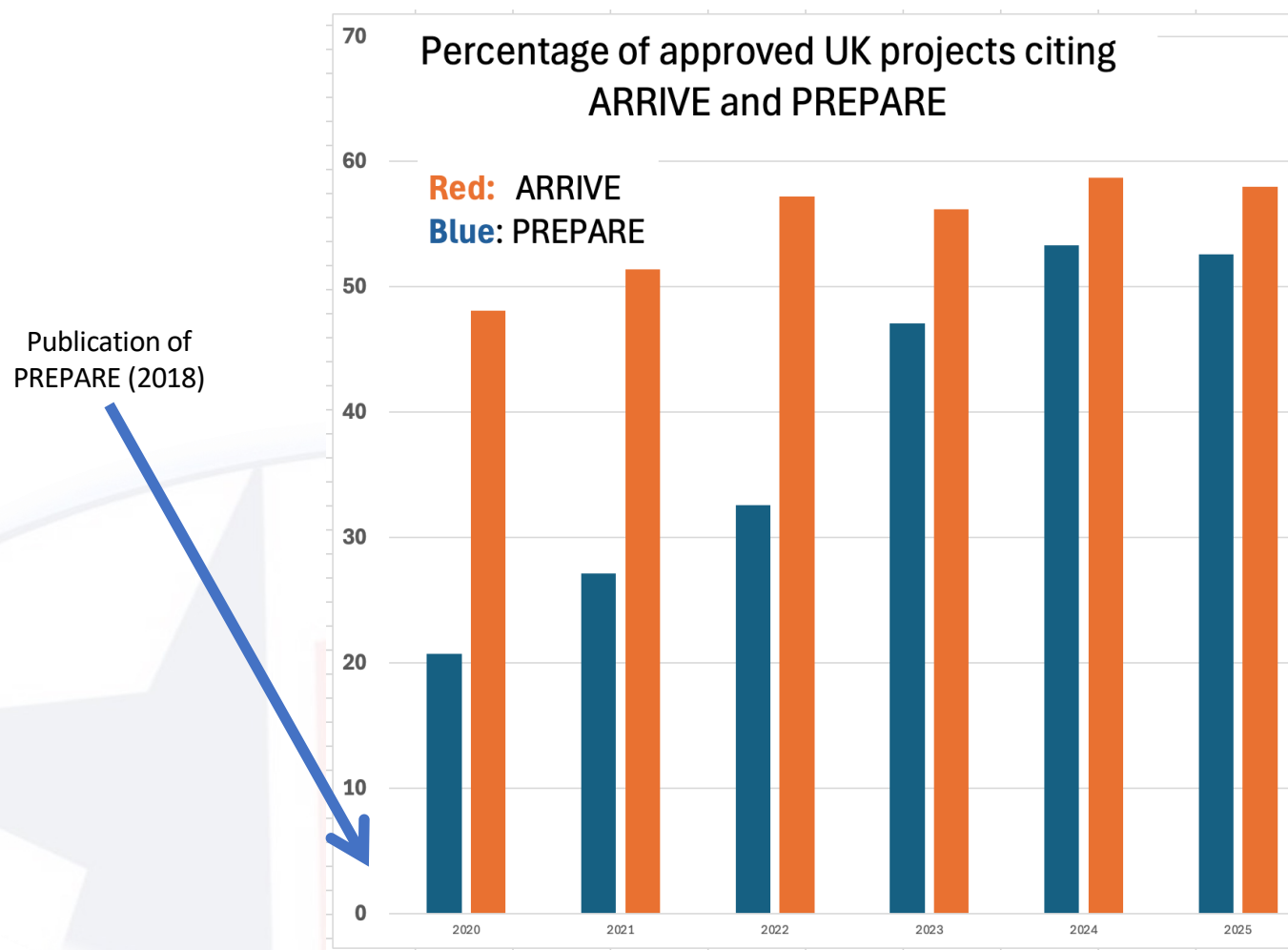
References

- Haynes RB, Mulrow CD, Huth EJ, Altman DG and Gardner MJ (1990). More informative abstracts revisited. *Ann Intern Med.* doi: [10.7326/0003-4819-113-1-69](https://doi.org/10.7326/0003-4819-113-1-69)
- Hair K, Macleod MR, Sena ES, Sena ES, Hair K, Macleod MR, Howells D, Bath P, Irvine C, MacCallum C, Morrison G, ...

arriveguidelines.org

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Percentage of UK approved projects that cite ARRIVE & PREPARE in their Non-Technical Summaries

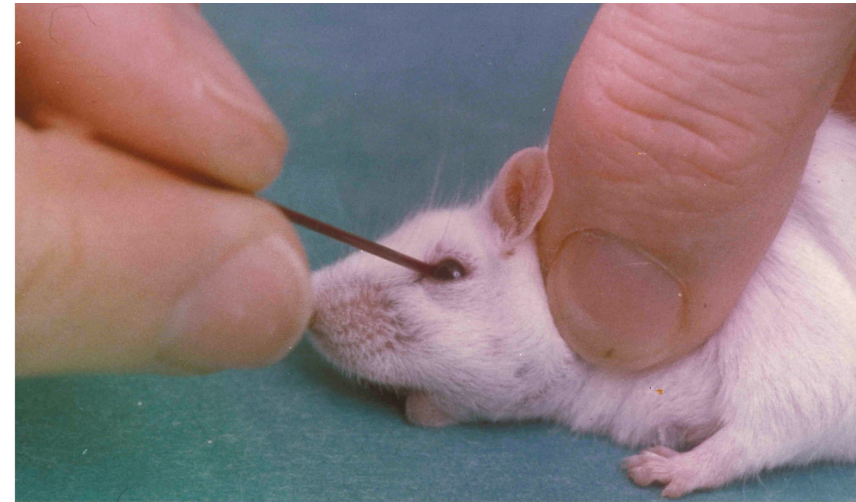


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Better reporting of 3R advances



foto: NMBU



SCID-Hu mice immunized with a pneumococcal vaccine produce specific human antibodies and show increased resistance to infection.

Saphenous vein puncture for blood sampling of the mouse, rat, hamster, gerbil, guineapig, ferret and mink

Annelise Hem¹, Adrian J. Smith² & Per Solberg¹

¹Laboratory Animal Unit, National Institute of Public Health, PO Box 4404 Torshov, N-0403 Oslo and

²Laboratory Animal Unit, Norwegian School of Veterinary Science, PO Box 8146 Dep., N-0033 Oslo, Norway

© Laboratory Animals Ltd. *Laboratory Animals* (1998) 32, 364–368

Summary

A method is described for blood collection from the lateral saphenous vein. This enables rapid sampling, which if necessary can be repeated from the same site without a need for new puncture wounds. The method is a humane and practical alternative to cardiac and retro-orbital puncture, in species where venepuncture has traditionally been regarded as problematic.

Keywords Saphenous vein; blood sampling; mouse; rat; hamster; gerbil; guineapig; rodent; ferret; mink

Not necessarily a high-impact journal

The Refinement Wiki



wiki.norecopa.no

Born from the knowledge that a lot of good ideas on refinement circulate on discussion forums, but never get published.

Designed to be

- a portal for rapid publication and dissemination of these ideas
- a place to identify experts on specific refinement techniques



Susanna Louihimies



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Clicker training

Clicker training is an operant conditioning based on positive reinforcement. When the animal offers the desired behavior, a *click* or another distinctive sound (secondary reinforcer) is delivered and within the following few seconds the reward is presented (primary reinforcer)^[1]. The *click* bridges the time between the desired behavior and the presentation of the reward^[1]. A target stick providing a visual guide for the animal can be used for the training.

Animals are usually trained individually, though it is also possible to perform clicker training in a groups, e.g. in mice, rats, and rabbits. For rats, it was demonstrated that they learned tasks by observing the clicker training of their cage mates^[2].

Clicker training can be used to train animals in a stress-free way. The following behaviours are examples for what this technique can be used for:

Mice: entering a tunnel, following a target stick, climbing on the palm of the hand^[3]

Rats: following a target stick, voluntarily change to a cage, observational learning^[2]

Rabbits: following a target stick, rearing/standing up to inspect the abdomen, approaching a human, being touched and lifted by a human, trimming nails, coming on command

Pigs: Pigs can be easily trained to cooperate if they are treated empathetically and desired behavior is reinforced by providing food stuff in form of treats and apple juice^[4].



Clicker training with mice using a target stick. *Left:* The mouse is following the target stick and is climbing on the experimenter's hand. If the hand is lifted, the mouse will remain on the palm of the hand. *Right:* The mice are trained in a group. Two mice are following the target stick on the palm of the experimenter's hand.

1. ↑ ^{1.0} ^{1.1} Feng, Lynna C.; Howell, Tiffani J.; Bennett, Pauleen C. (1 August 2016). "How clicker training works: Comparing Reinforcing, Marking, and Bridging Hypotheses"[ⓘ]. *Applied Animal Behaviour Science*. **181**: 34–40. doi:10.1016/j.applanim.2016.05.012[ⓘ]. ISSN 0168-1591[ⓘ].
2. ↑ ^{2.0} ^{2.1} Leidinger, Charlotte Sophie; Kaiser, Nadine; Baumgart, Nadine; Baumgart, Jan (25 October 2018). "Using Clicker Training and Social Observation to Teach Rats to Voluntarily Change Cages"[ⓘ]. *JoVE (Journal of Visualized Experiments)* (140): e58511. doi:10.3791/58511[ⓘ]. ISSN 1940-087X[ⓘ]. PMC 6235608[ⓘ]. PMID 30417890[ⓘ].
3. ↑ Leidinger, Charlotte; Herrmann, Felix; Thöne-Reineke, Christa; Baumgart, Nadine; Baumgart, Jan (6 March 2017). "Introducing Clicker Training as a Cognitive Enrichment for Laboratory Mice"[ⓘ]. *JoVE (Journal of Visualized Experiments)* (121): e55415. doi:10.3791/55415[ⓘ]. ISSN 1940-087X[ⓘ]. PMC 5408971[ⓘ]. PMID 28287586[ⓘ].
4. ↑ "Positive Reinforcement Training in Large Experimental Animals"[ⓘ] (PDF).

Experts for clicker training in mice and rats: [TARC](#)[ⓘ], Mainz, Germany

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c. 75 topics (April 2026)

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- Acclimatisation
- Adrian Smith
- Alphaxalone
- Anaesthesia in neonates
- Analgesia
- Asepsis
- Blood sampling of hamsters
- Blood sampling of pigs
- Blood sampling of rainbow trout
- Breeding strategies for mice
- Clicker training
- Contingency plans
- Decapitation
- Dehydration
- Detecting early onset of clinical signs in the mouse model of Covid-19
- Detection of pain and distress in mice
- EMLA cream
- Embryo transfer
- Experimental Autoimmune Encephalomyelitis (EAE)
- Facial expression analysis
- Food crunchers
- Forced swim test
- General discussion on use of analgesics
- Genotyping mice
- Geriatric mice
- Habituation training
- Health monitoring
- High-fat diets
- Hot Bead Sterilisers
- Housing nude mice
- Housing research fish
- Humane endpoints
- Hydrodynamic gene delivery
- Intra-ocular injections
- Intranasal administration
- Intraperitoneal injection
- Intraperitoneal pentobarbitone
- Irradiation for haematology studies
- Ketamine and alpha-2 agonist combinations
- Lockbox enrichment
- Long-term anaesthesia in rodents
- Lumpfish
- MDA (micropipette-guided drug administration) Method
- Main Page
- Marble Burying Test
- Metabolic cages
- Microchipping rats and mice
- Minipumps
- Montanide adjuvant
- Mouse Grimace Scale
- Mouse handling
- Nest building material
- Non-invasive genetic sampling in wildlife research
- Oestrus suppression in ferrets
- Pneumocystis murina
- Recapping needles
- Refinement of oral gavage
- Rotarod Test
- Screening cell lines
- Sedation of cattle
- Splenectomy
- Sterilisation of instruments
- TTEAM and TTouch
- Tail vein injection
- Tamoxifen
- Tamoxifen information sheet V4.pdf
- The use of DMSO
- Tramadol
- Transport stress
- Tumour cell implant into mammary fat pad
- Ulcerative Dermatitis in Mice
- Water quality
- Xenopus laevis
- Zebrafish swabbing

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Enhancing **Q**uality in **P**reclinical **D**ata

EQIPD operationalises ARRIVE and PREPARE:

Connects planning, practice and reporting

EQIPD ensures consistency and traceability during study conduct

norecopa.no/3r-guide/equipd



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"We ARRIVED, because we were PREPARED"

- ✓ *Better Science*
- ✓ *Improved animal welfare*
- ✓ *Advancement of the 3Rs*
- ✓ *Safer working environment*

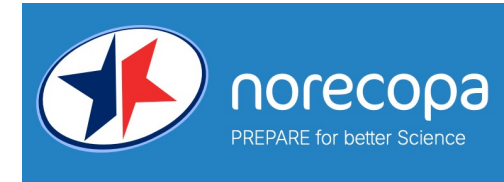


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[Aurora Brønstad wins Norecopa's 3R Prize](#)

We congratulate Aurora Brønstad, laboratory animal veterinarian at the University of Bergen, who was awarded [Norecopa's annual 3R Prize](#) on 4 June, after the annual meeting.

There were two nominees for this year's prize in addition to Aurora Brønstad:

- [Cesilie Røtnes Amundsen](#) at Nord University was nominated for her contributions to fish welfare, teaching and implementation of the 3Rs, including the initiative to start a [Nordic Zebrafish Network](#), of which she is the leader.



[Website of the Nordic Zebrafish Network](#)

In a previous newsletter we informed of the creation of a Nordic Zebrafish Network, founded in November 2023.

The Network has [started to build its website](#), which is hosted by the Karolinska Institutet in Stockholm.

The Network will arrange its second course on the husbandry and use of zebrafish in November, followed (like last year) by a Network meeting to discuss the way ahead.

Suggestions for resources to add to the website are very welcome.

The Nordic zebrafish network

The Nordic Zebrafish Network (NZN) was established as a result of a workshop meeting in Stockholm, with the aim to bring together scientists and animal caretaker staff to improve the quality of husbandry and science.

In November 2023, almost all zebrafish facilities from the Nordic countries met in Stockholm. For two days, animal caretakers, facility heads and scientists discussed how research in zebrafish and husbandry of this laboratory animal can be optimized and harmonized to facilitate animal welfare and improve the significance and reproducibility of scientific data.



Photo: Getty Images



April 2026

- > [Laboratory Animal Management Association \(LAMA\) Annual Meeting](#), San Antonio, 13-16 April 2026
- > [Cancer-SOLES: A Systematic Online Living Evidence Summary of Preclinical Cancer Research](#), webinar (Maria Economou & Julia Steiz), 14 April 2026
- > [The Global Education Hub for animal-free innovation: on a mission to make education on non-animal research the norm worldwide](#), webinar (Janneke Hogervorst), 14 April 2026
- > [Anaesthesia for minor procedures](#), online course (Paul Flecknell), 14-15 April 2026
- > [AAALAC Findings and Trends in the European region](#), webinar, 15 April 2026
- > [Systematic Review and Meta-Analysis of Preclinical Studies](#), workshop, Nijmegen, 15 April 2026
- > [Navigating the 3P's within the lab animal sciences: policies, practices and procedures](#), webinar (Gilly Gr)
- > [NRP 79 3R Fair: Research meets practice](#), Fribourg, 15 April 2026
- > [Virtual Anesthesia and Analgesia Symposium](#), online event, 15-16 April 2026
- > [2nd International Congress of the European Academy of Lab Animal Surgery \(EALAS\) & Workshops](#), Aachen, 15-17 April 2026
- > [Mouse Genetics and Colony Management for Animal Technologists](#), Harwell, 16-17 April 2026
- > [Fish as experimental animals - zebrafish CRISPR and *in vivo* imaging](#), 16-24 April 2026
- > [Open Questions in Laboratory Animal Science: The Next 25 Years](#), National Academies webinar, 17 April 2026
- > [Establishing a new animal model for aging research: An animal welfare point of view](#), webinar (Beate Hoppe), 17 April 2026
- > [Designing an Animal-Free Solution](#), webinar, 20 April 2026
- > [German Biotech Days](#), Leipzig, 21-22 April 2026
- > [Expanding Access to Non-Animal-Derived Antibodies in Research and Industry](#), webinar, 21-22 April 2026 (Registration)
- > [Habituation and Welfare of Laboratory Animals and Staff](#), webinar (Evelyn Skou)
- > [AAALAC Findings and Trends in the European region](#), webinar, 22 April 2026 (replay of 15 April webinar)
- > [Pain and Distress in Rodents - what everyone must know!](#), webinar (Paul Flecknell), 22 April 2026
- > [Invertebrate and *in vitro* models](#), NC3Rs Technology Partn3Ring webinar series, 22 April 2026
- > [BCLAS Symposium: Empowering the 3Rs: Innovation for Better Science and Care](#), Brussels, 22-23 April 2026
- > [The Human Cost of Animal Research: When Compassion Becomes Moral Injury](#), Justify webinar, 23 April 2026
- > [Managing Aquatic Colonies: A Different Kettle of Fish](#), Charles River webinar, 23 April 2026
- > [The Human Cost of Animal Research: When Compassion Becomes Moral Injury](#), Justify webinar, 23 April 2026
- > [3Rs in One Health Preclinical Research](#), LAVA-APHA meeting, South East England, 23-24 April 2026
- > [Publishing animal use statistics](#), UAR webinar (Hannah Hobson), 24 April 2026
- > [An Introduction to Openness on Animal Research](#), UAR Oceania Asia Network webinar (Bella Lear), 24 April 2026
- > [Moving Beyond Animal Testing: An Introduction to New Approach Methodologies in Research](#), panel discussion (Tara Barton-Maclaren, Lorna Ewart & Troy Siedle), 24 April 2026
- > [Forsøgsdyrenes Dag](#), Copenhagen, 26 April 2026



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