# The Path to Better Science:

## Practical advice on implementing the 3Rs and related principles in animal research

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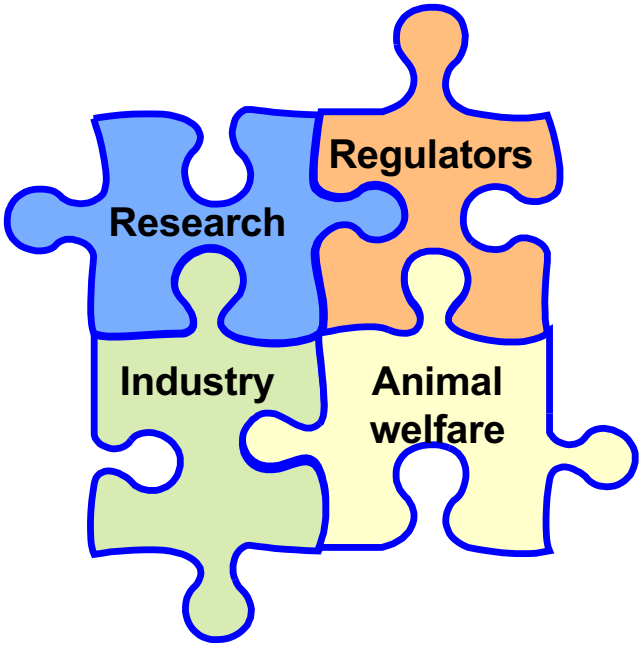
***norecopa.no/WC13-Path***

# Norecopa

Norway's National Consensus Platform for the 3Rs




**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

colourbox.com

## *Disclosures*

norecopa.no/Tour

# "Norecopa: A one-stop-shop for global 3R resources"

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

Manager of the Norecopa website

- 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!*

# The Path to Better Science:

Norecopa: PREPARE for better Science

https://nrkbeta.no/2010/09/28/mediebransjens-svar-paa-elg-i-solnedgang

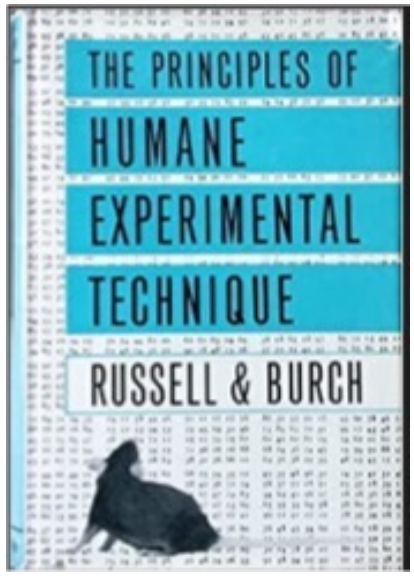
**Bad habits have been around for a long time…**

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 is it because they didn't do good science?***




Russell WMS & Burch RL (1959)

FELASA, 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).

The three session talks will discuss mutual benefits, the specific needs and limitations of the selected life science fields regarding 3R methods, and the implementation of new concepts and methods. Finally, together with the speakers and the audience we want to explore ideas on how to improve exchange across different life sciences communities to inform and accelerate the implementation of new 3R advancements.

**Vootele Voikar**
@VVoikar

After #FELASA2022 preparing for #FENS2022 two largest conferences of European societies close to my work on the same year. Collaboration and dialogue between two is crucial for the success in #animalresearch

Käännä julkaisu

| | FELASA-2022 | FENS-2022 |
|---|---|---|
| Attendees | 2208 | >7500 |
| **Count of some key words in abstract books:** | | |
| Mice | 433 | 8716 |
| Rats | 112 | 3346 |
| Welfare | 399 | 28 |
| 3Rs | 122 | 5 |

10.54 ap. · 8. heinäk. 2022

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

norecopa

# *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 ºC 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*

Norecopa: PREPARE for better Science

# The Path to Better Science:

We cannot improve our research by

better reporting alone...

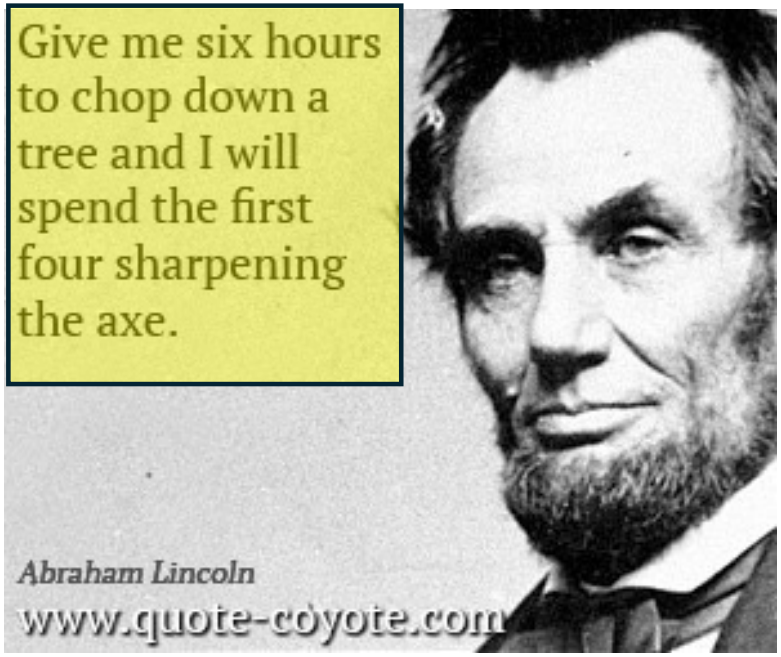
This may not be sufficiently obvious to scientists who are not familiar with the challenges of running an animal facility ... or they assume that we have thought of everything...

The reproducibility/translatability devil is often in the practical details...

reddit.com

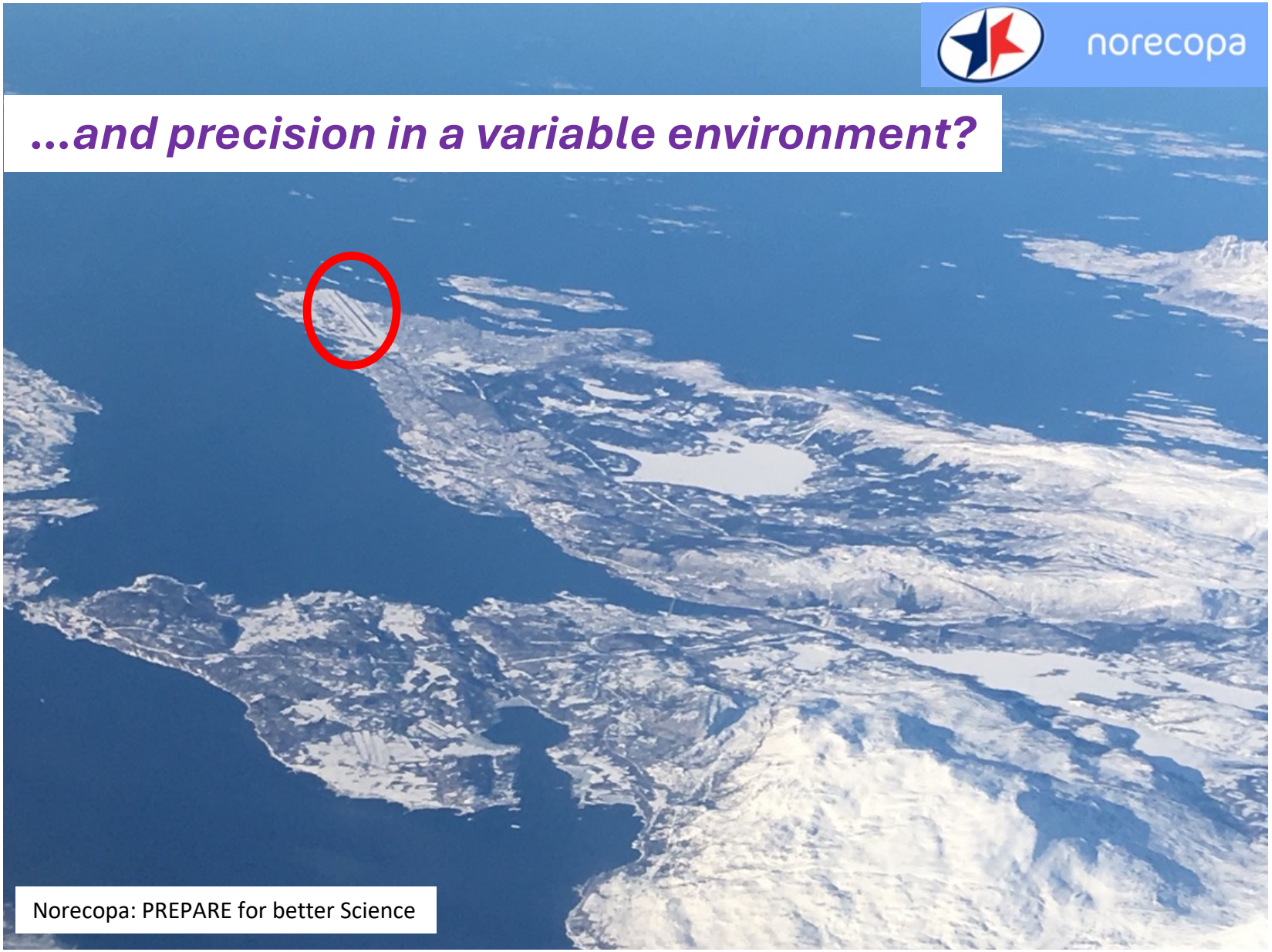
norecopa


leaderonomics.com



# *How do others achieve reproducibility?*

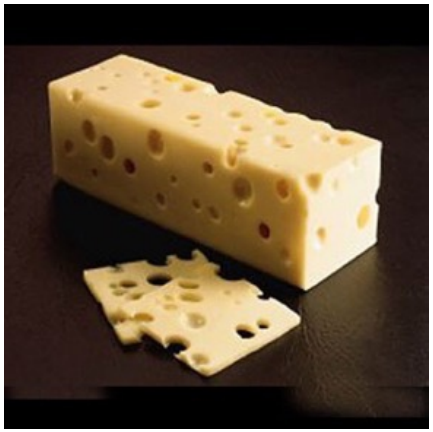

https://www.meonuk.com/runway-markings-explained


norecopa
...and precision in a variable environment?
Norecopa: PREPARE for better Science

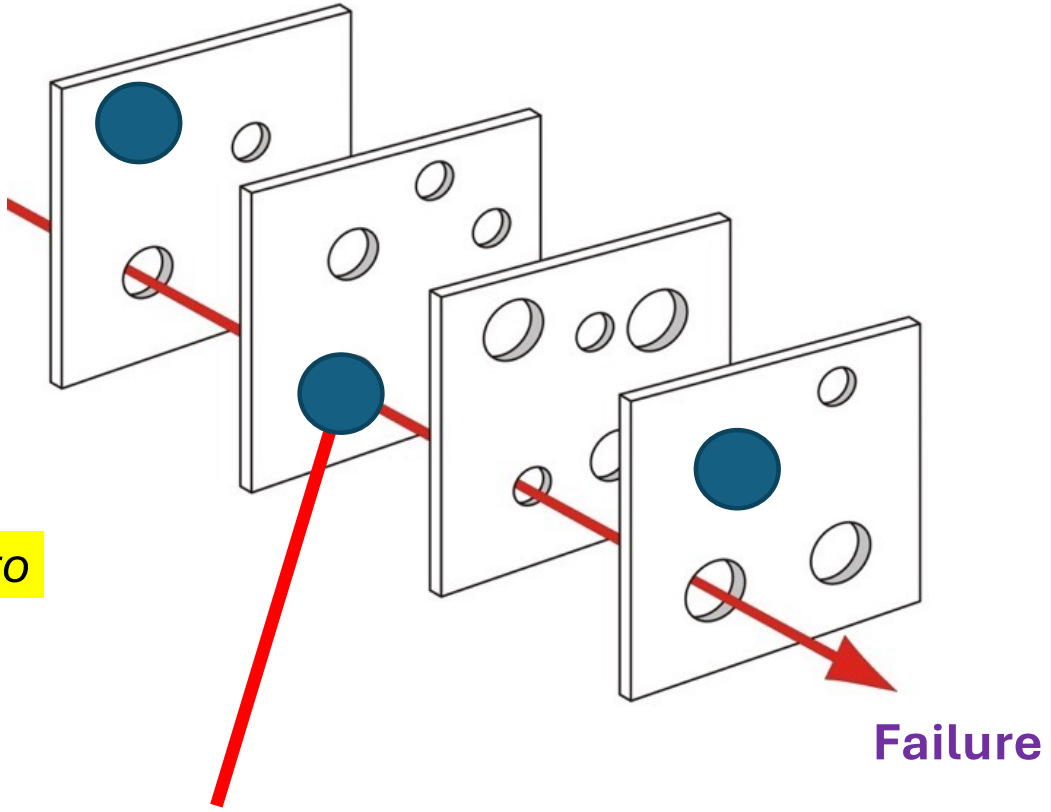
# Checklists!

- 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 and ground staff
- Make sure that everyone is "**on the same page**”
- Reports from crash investigations are used actively to improve procedures

## Threat and Error Management



eaugallecheese.com/Swiss-Cheese




wikipedia.org/wiki/Swiss_cheese_model

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

# *Quality assurance of animal facilities*

aaalac INTERNATIONAL

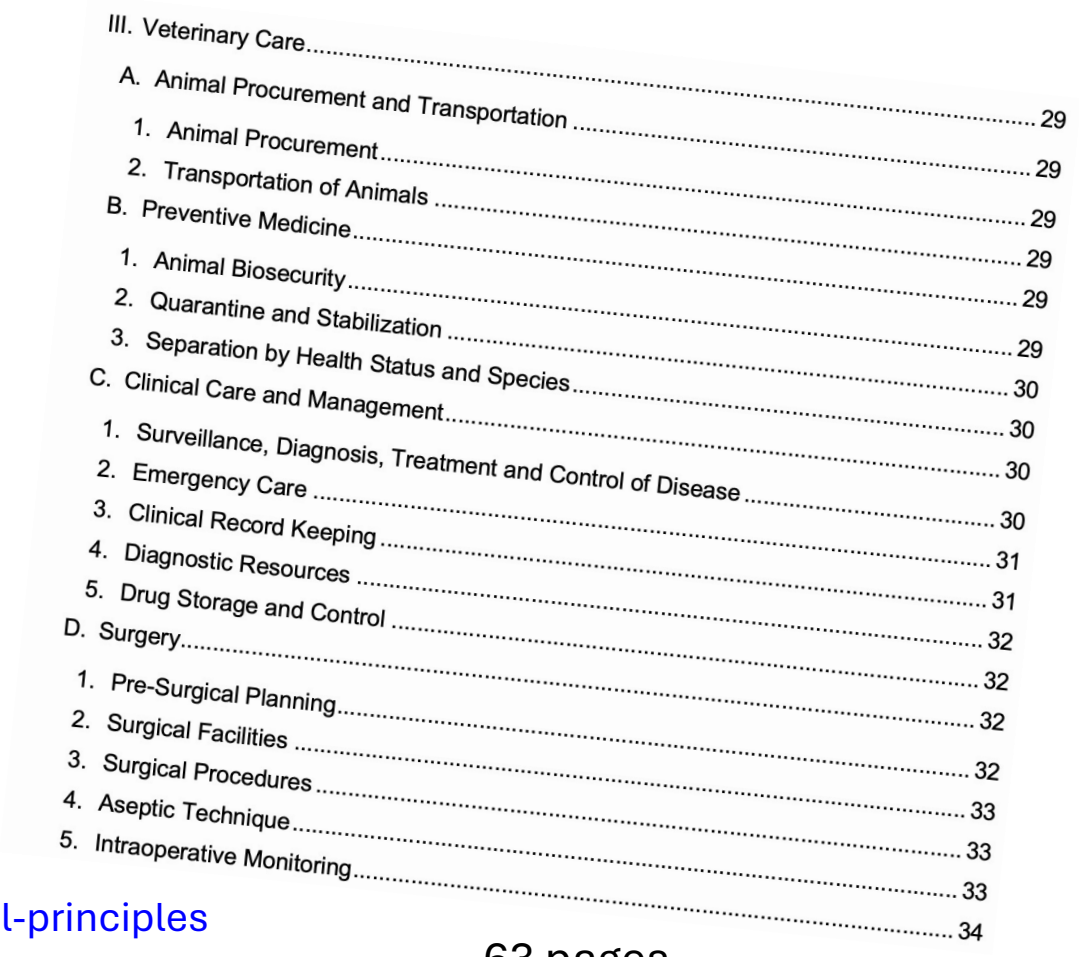
**Program Description**

**A. Animal Care and Use Program**

**B. Animal environment, Housing and Management**

**C. Veterinary Care**

**D. Physical plant**




63 pages

norecopa.no/prepare/6-facility-evaluation/6a/general-principles

# A simple but effective Master Plan


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

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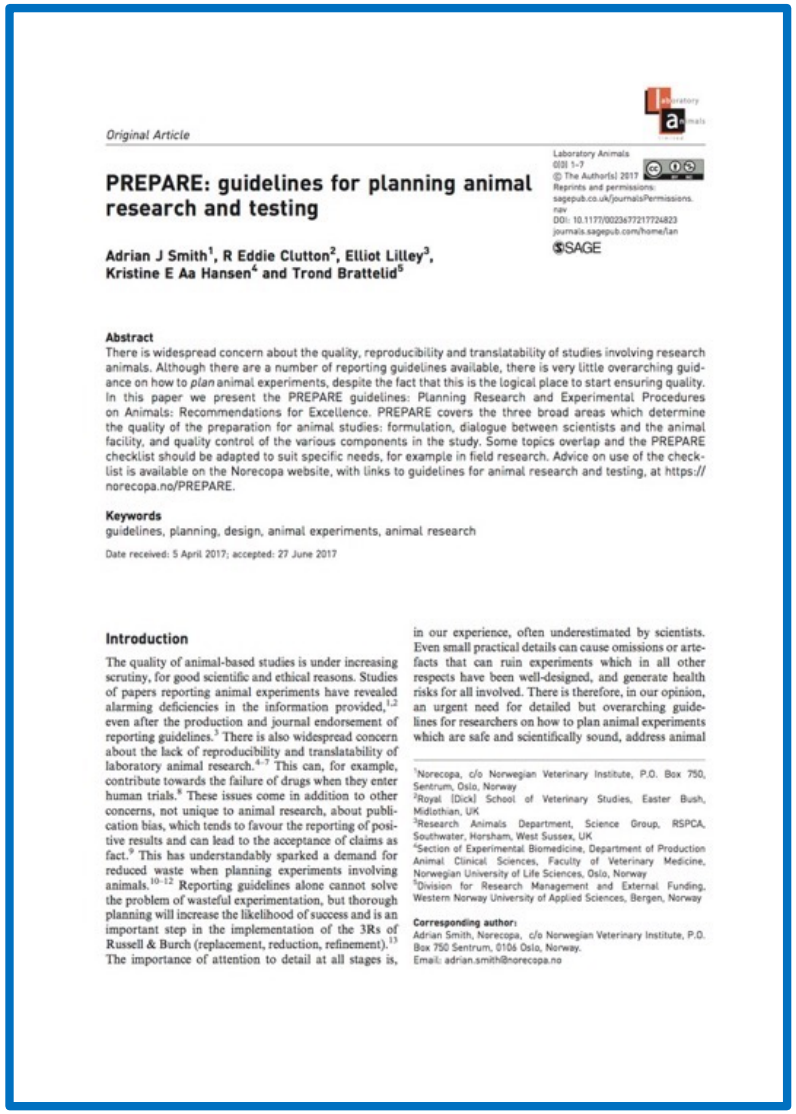
# A Contingency Plan, based upon risk assessment

- 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
  - 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

Many of these were revised in the light of Covid-19
**norecopa.no/be-prepared**

Temporary staff at weekends and holidays

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



*Original Article*

# PREPARE: guidelines for planning animal research and testing

**Adrian J Smith[1], R Eddie Clutton[2], Elliot Lilley[3], Kristine E Aa Hansen[4] and Trond Brattelid[5]**

Laboratory Animals
0(0) 1–7

DOI: 10.1177/0023677217724823
journals.sagepub.com/home/lan
SAGE

**Abstract**

There is widespread concern about the quality, reproducibility and translatability of studies involving research animals. Although there are a number of reporting guidelines available, there is very little overarching guidance on how to *plan* animal experiments, despite the fact that this is the logical place to start ensuring quality. In this paper we present the PREPARE guidelines: Planning Research and Experimental Procedures on Animals: Recommendations for Excellence. PREPARE covers the three broad areas which determine the quality of the preparation for animal studies: formulation, dialogue between scientists and the animal facility, and quality control of the various components in the study. Some topics overlap and the PREPARE checklist should be adapted to suit specific needs, for example in field research. Advice on use of the checklist is available on the Norecopa website, with links to guidelines for animal research and testing, at https://norecopa.no/PREPARE.

**Keywords**

guidelines, planning, design, animal experiments, animal research

Date received: 5 April 2017; accepted: 27 June 2017

## Introduction

The quality of animal-based studies is under increasing scrutiny, for good scientific and ethical reasons. Studies of papers reporting animal experiments have revealed alarming deficiencies in the information provided,[1,2] even after the production and journal endorsement of reporting guidelines.[3] There is also widespread concern about the lack of reproducibility and translatability of laboratory animal research.[4–7] This can, for example, contribute towards the failure of drugs when they enter human trials.[8] These issues come in addition to other concerns, not unique to animal research, about publication bias, which tends to favour the reporting of positive results and can lead to the acceptance of claims as fact.[9] This has understandably sparked a demand for reduced waste when planning experiments involving animals.[10–12] Reporting guidelines alone cannot solve the problem of wasteful experimentation, but thorough planning will increase the likelihood of success and is an important step in the implementation of the 3Rs of Russell & Burch (replacement, reduction, refinement).[13] The importance of attention to detail at all stages is, in our experience, often underestimated by scientists. Even small practical details can cause omissions or artefacts that can ruin experiments which in all other respects have been well-designed, and generate health risks for all involved. There is therefore, in our opinion, an urgent need for detailed but overarching guidelines for researchers on how to plan animal experiments which are safe and scientifically sound, address animal

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**All those who contributed to the development of PREPARE, and in particular the co-authors:**

**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

## PREPARE:

**P**lanning **R**esearch and **E**xperimental **P**rocedures on **A**nimals: **R**ecommendations for **E**xcellence

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/prepare-checklist

# PREPARE

## The PREPARE Guidelines Checklist

**P**lanning **R**esearch and **E**xperimental **P**rocedures on **A**nimals: **R**ecommendations for **E**xcellence

Adrian J. Smith[a], R. Eddie Clutton[b], Elliot Lilley[c], Kristine E. Aa. Hansen[d] & Trond Brattelid[e]

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PREPARE[1] consists of planning guidelines which are complementary to reporting guidelines such as ARRIVE[2].

**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 | ☐ Arrange meetings with all relevant staff when early plans for the project exist.<br>☐ Construct an approximate timescale for the project, indicating the need for assistance with preparation, animal care, procedures and waste disposal/decontamination.<br>☐ Discuss and disclose all expected and potential costs.<br>☐ Construct a detailed plan for division of labour and expenses at all stages of the study. |
| 6. Facility evaluation | ☐ Conduct a physical inspection of the facilities, to evaluate building and equipment standards and needs.<br>☐ Discuss staffing levels at times of extra risk. |
| 7. Education and | ☐ Assess the current competence of staff members and the need for further education or training prior |
| 1. Literature searches | ☐ Form a clear hypothesis, with primary and secondary outcomes.<br>☐ Consider the use of systematic reviews.<br>☐ Decide upon databases and information specialists to be consulted, and construct search terms.<br>☐ Assess the relevance of the species to be used, its biology and suitability to answer the experimental questions with the least suffering, and its welfare needs.<br>☐ Assess the reproducibility and translatability of the project. |
| 2. Legal issues | ☐ Consider how the research is affected by relevant legislation for animal research and other areas, e.g. animal transport, occupational health and safety.<br>☐ Locate relevant guidance documents (e.g. EU guidance on project evaluation). |
| 3. Ethical issues, harm-benefit assessment and humane endpoints | ☐ Construct a lay summary.<br>☐ In dialogue with ethics committees, consider whether statements about this type of research have already been produced.<br>☐ Address the 3Rs (replacement, reduction, refinement) and the 3Ss (good science, good sense, good sensibilities).<br>☐ Consider pre-registration and the publication of negative results.<br>☐ Perform a harm-benefit assessment and justify any likely animal harm.<br>☐ Discuss the learning objectives, if the animal use is for educational or training purposes.<br>☐ Allocate a severity classification to the project.<br>☐ Define objective, easily measurable and unequivocal humane endpoints.<br>☐ Discuss the justification, if any, for death as an end-point. |
| 4. Experimental design and statistical analysis | ☐ Consider pilot studies, statistical power and significance levels.<br>☐ Define the experimental unit and decide upon animal numbers.<br>☐ Choose methods of randomisation, prevent observer bias, and decide upon inclusion and exclusion criteria. |
| 10. Experimental animals | ☐ Decide upon the characteristics of the animals that are essential for the study and for reporting.<br>☐ Avoid generation of surplus animals. |
| 11. Quarantine and health monitoring | ☐ Discuss the animals' likely health status, any needs for transport, quarantine and isolation, health monitoring and consequences for the personnel. |
| 12. Housing and husbandry | ☐ Attend to the animals' specific instincts and needs, in collaboration with expert staff.<br>☐ Discuss acclimatization, optimal housing conditions and procedures, environmental factors and any experimental limitations on these (e.g. food deprivation, solitary housing). |
| 13. Experimental procedures | ☐ Develop refined procedures for capture, immobilisation, marking, and release or rehoming.<br>☐ Develop refined procedures for substance administration, sampling, sedation and anaesthesia, surgery and other techniques. |
| 14. Humane killing, release, reuse or rehoming | ☐ Consult relevant legislation and guidelines well in advance of the study.<br>☐ Define primary and emergency methods for humane killing.<br>☐ Assess the competence of those who may have to perform these tasks. |
| 15. Necropsy | ☐ Construct a systematic plan for all stages of necropsy, including location, and identification of all animals and samples. |

*References*

1. Smith AJ, Clutton RE, Lilley E, Hansen KEA & Brattelid T. PREPARE:Guidelines for Planning Animal Research and Testing. *Laboratory Animals*, 2017, DOI: 10.1177/0023677217724823.
2. 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

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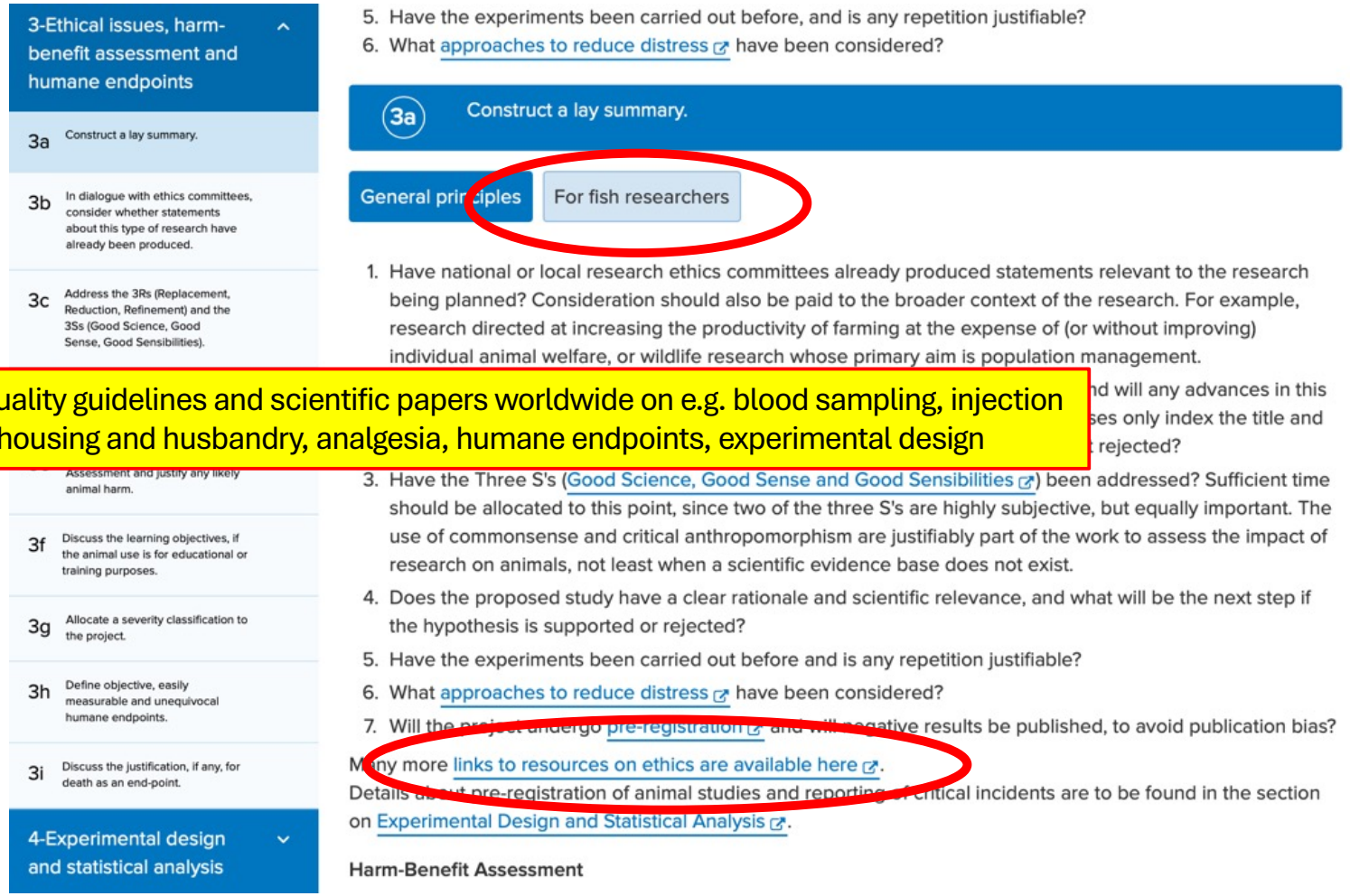
norecopa.no/PREPARE




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

# *norecopa.no : an updated overview of global 3R resources*


Norecopa: PREPARE for better Science

**3R-Guide** (over 400 guidelines for implementation of the 3Rs)

norecopa.no/3r-guide

norecopa.no/Tour

*Working Party Report*

**Guidance on the severity classification of scientific procedures involving fish: report of a Working Group appointed by the Norwegian Consensus-Platform for the Replacement, Reduction and Refinement of animal experiments (Norecopa)**

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**Abstract**

The severity classification of procedures using animals is an important tool to help focus the implementation of refinement and to assist in reporting the application of the 3Rs (replacement, reduction and refinement). The recently revised Directive that regulates animal research and testing within the European Union requires Member States to ensure that all procedures are classified as 'non-recovery', 'mild', 'moderate' or 'severe', using assignment criteria set out by the European Commission (EC). However, these are focused upon terrestrial species, so are of limited relevance to fish users. A Working Group set up by the Norwegian Consensus-Platform for the 3Rs (Norecopa) has produced guidance on the classification of severity in scientific procedures involving fish, including examples of 'subthreshold', 'mild', 'moderate', 'severe' and 'upper threshold' procedures. The aims are to complement the EC guidelines and help to ensure that suffering in fish is effectively predicted and minimized. Norecopa has established a website (www.norecopa.no/categories) where more information on severity classification for procedures using fish, including field research, will be made available.

**Keywords:** Fish, harm–benefit assessment, humane endpoints, refinement, severity

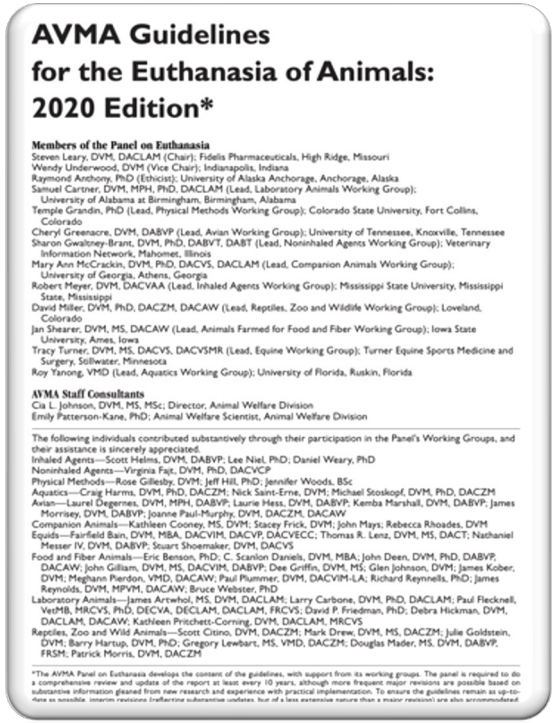
*Laboratory Animals* 2011; 1–6. DOI: 10.1258/la.2011.010181

**Background**

An effective prediction of the effects of a research protocol on the animals concerned helps to ensure that any pain, suffering or distress they may experience will be effectively anticipated, recognized and alleviated. This is essential not only for animal welfare but also for scientific validity, because physiological and behavioural responses to suffering can significantly affect data quality. Severity classification is thus an important tool to help focus the implementation of refinement, including monitoring its progress, and to assist in reporting the application of the 3Rs (replacement, reduction and refinement) of Russell and Burch,[1] which is now an integral part of the legislation on animal research and testing in many countries. Predictions of severity are also fundamental to the harm–benefit assessments undertaken by bodies such as regulatory authorities and ethical committees when deciding whether or not a project should be licensed or funded.

There may also be a legal requirement to predict and classify severity. For example, the new Directive regulating animal use within the European Union, which must be implemented within all Member States by January 2013, requires the severity of each procedure to be classified on the basis of the 'degree of pain, suffering, distress or lasting harm expected to be experienced by an individual animal during the course of the procedure', with the aim of enhancing transparency, facilitating the project authorization process and providing tools for monitoring compliance.[2] Member States will have to ensure that all procedures are classified as 'non-recovery', 'mild', 'moderate' or 'severe' on a case-by-case basis, using the assignment

*Laboratory Animals* 2011; 1–6



**AVMA Guidelines for the Euthanasia of Animals: 2020 Edition***

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*The AVMA Panel on Euthanasia develops the content of the guidelines, with support from its working groups. The panel is required to do a comprehensive review and update of the report at least every 10 years, although more frequent major revisions are possible based on substantive information gleaned from new research and experience with practical implementation. To ensure the guidelines remain as up-to-date as possible, interim revisions (ie, those with substantive updates, but of a less extensive nature than a major revision) are also recommended

ATLA 38, 167–182, 2010

**A Gold Standard Publication Checklist to Improve the Quality of Animal Studies, to Fully Integrate the Three Rs, and to Make Systematic Reviews More Feasible**

**Carlijn R. Hooijmans, Marlies Leenaars and Merel Ritskes-Hoitinga**

*Radboud University Nijmegen Medical Centre, Central Animal Laboratory and 3R Research Centre, Nijmegen, The Netherlands*

**Summary** — Systematic reviews are generally regarded by professionals in the field of evidence-based medicine as the highest level of medical evidence, and they are already standard practice for clinical studies. However, they are not yet widely used nor undertaken in the field of animal experimentation, even though there is a lot to be gained from the process. Therefore, a gold standard publication checklist (GSPC) for animal studies is presented in this paper. The items on the checklist have been selected on the basis of a literature analysis and the resulting scientific evidence that these factors are decisive in determining the outcome of animal studies. In order to make future systematic reviews and meta-analyses of animal studies possible, to allow others to replicate and build on work previously published, diminish the number of animals needed in animal experimentation (*reduction*), improve animal welfare (*refinement*) and, above all, improve the quality of scientific papers on animal experimentation, this publication checklist needs to be used and followed. We have discussed and optimised this GSPC through feedback from interviews with experts in the field of animal experimentation. From these interviews, it became clear that scientists will adopt this GSPC when journals demand it. The GSPC was compared with the current instructions for authors from nine different journals, selected on the basis that they featured a high number of publications on animal studies. In general, the journals' demands for the description of the animal studies are so limited that it is not possible to repeat the studies, let alone carry out a systematic review. By using the GSPC for animal studies, the quality of scientific papers will be improved. The use of the GSPC and the concomitant improvement in the quality of scientific papers will also contribute to decreased variation and increased standardisation and, as a consequence, a reduction in the numbers of animals used and a more reliable outcome of animal studies. It is of major importance that journal editors become convinced of and adopt these recommendations, because only then will scientists follow these guidelines to the full extent.

**Key words:** *animal experimentation, meta-analysis, publication checklist, scientific quality, systematic review.*

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*E-mail: C.Hooijmans@cdl.umcn.nl*

**Introduction**

A systematic review (SR) is a literature review focused on a single question which tries to identify, appraise, select and synthesise all available high-quality research evidence relevant to that question (1). SRs are generally regarded by evidence-based medicine professionals as the highest level of medical evidence, and they are already standard practice in clinical studies. However, SRs are not yet widely used nor undertaken in the animal experimentation field, although there would be a lot to be gained from the process. A systematic approach to incorporate all available relevant literature into the design of an animal experiment is a prerequisite for research which is of high scientific quality. Good science, from a scientific as well as an animal welfare point of view, is the basis of the book. *The Principles of Humane Experimental Technique*, by Russell and Burch (2). In this book, they recommend that the Three Rs principles (*Refinement, Reduction* and *Replacement*) should be applied whenever possible in animal studies. Besides producing high-quality research, SRs of animal experiments will result in direct implementation of the Three Rs. SRs may provide the proper argumentation to decide which animal model will give the best answer to the (clinical) research question (3, 4) and to detect whether there are gaps in scientific knowledge that require new animal experiments (*replacement* and *refinement*). This will also aid in preventing unnecessary duplication of animal experiments (*reduction*), and thus discourage unnecessary animal use and time loss. A SR of animal studies will also lead to a better interpretation of the already existing scientific results from animal experiments, through which a better


Tim Allen, USDA

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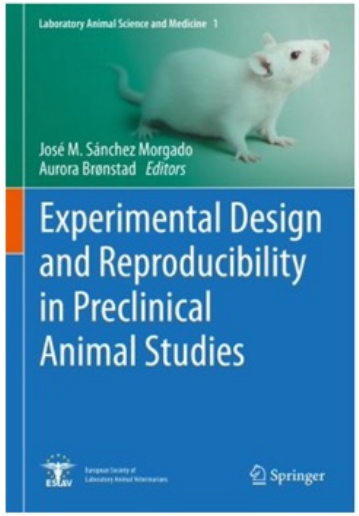
## Experimental Design and Reproducibility in Preclinical Animal Studies

By José M. Sánchez Morgado & Aurora Brønstad (Eds.)

**Record number:** 8619d

This book provides grounds on how to plan and conduct animal experiments that can be reproduced by others. It touches on factors that may impact the reproducibility of animal studies including: the animal genetic background, the animal microbial flora, environmental and physiological variables affecting the animal, animal welfare, statistics and experimental design, systematic reviews of animal studies, and the publishing process.

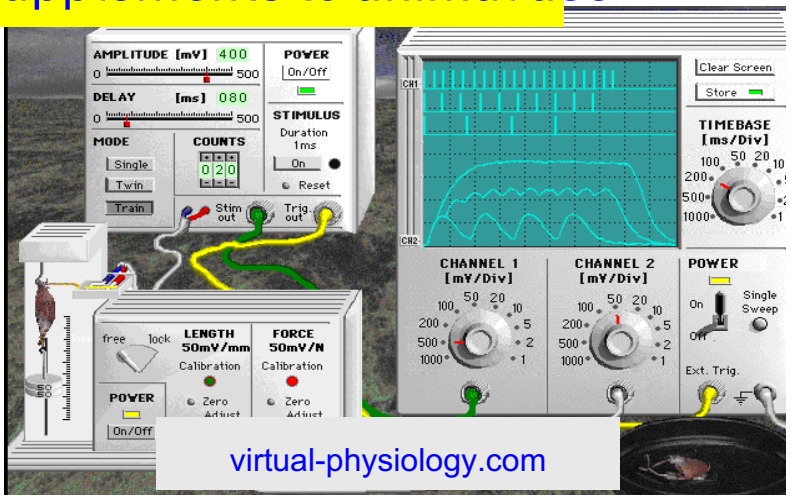
The book addresses advanced undergraduates, graduate students and all scientists working with animals.




*norecopa.no/textbase/experimental-design-and-reproducibility-in-preclinical-animal-studies*

norecopa.no/NORINA 3,400 alternatives/supplements to animal use


frogvirtualdissection.com




virtual-physiology.com

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Session 144 on Thursday, Room 203, 09:30

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# Databases & Guidelines

## norecopa.no/databases-guidelines

- 3R Guide: a global overview of **databases, guidelines, information centres, journals, email lists, regulations and policies** which may be of use when planning experiments which might include animals. A quick overview of all the guidelines can be accessed here. Norecopa has written several of these, including the PREPARE guidelines for planning animal research and testing.
- NORINA: a global overview of audiovisual aids and other items which may be used as **alternatives or supplements to animals in education and training** at all levels from junior school to University, including dissection alternatives and surgical simulators.
- TextBase: a global overview of **textbooks and other literature within laboratory animal science** and related topics.
- Classic AVs: a subset of NORINA covering **audiovisual aids that are based on older technology**.

These databases are updated regularly. Please give us feedback if you discover errors or omissions.

**The Norecopa website also includes five other collections:**

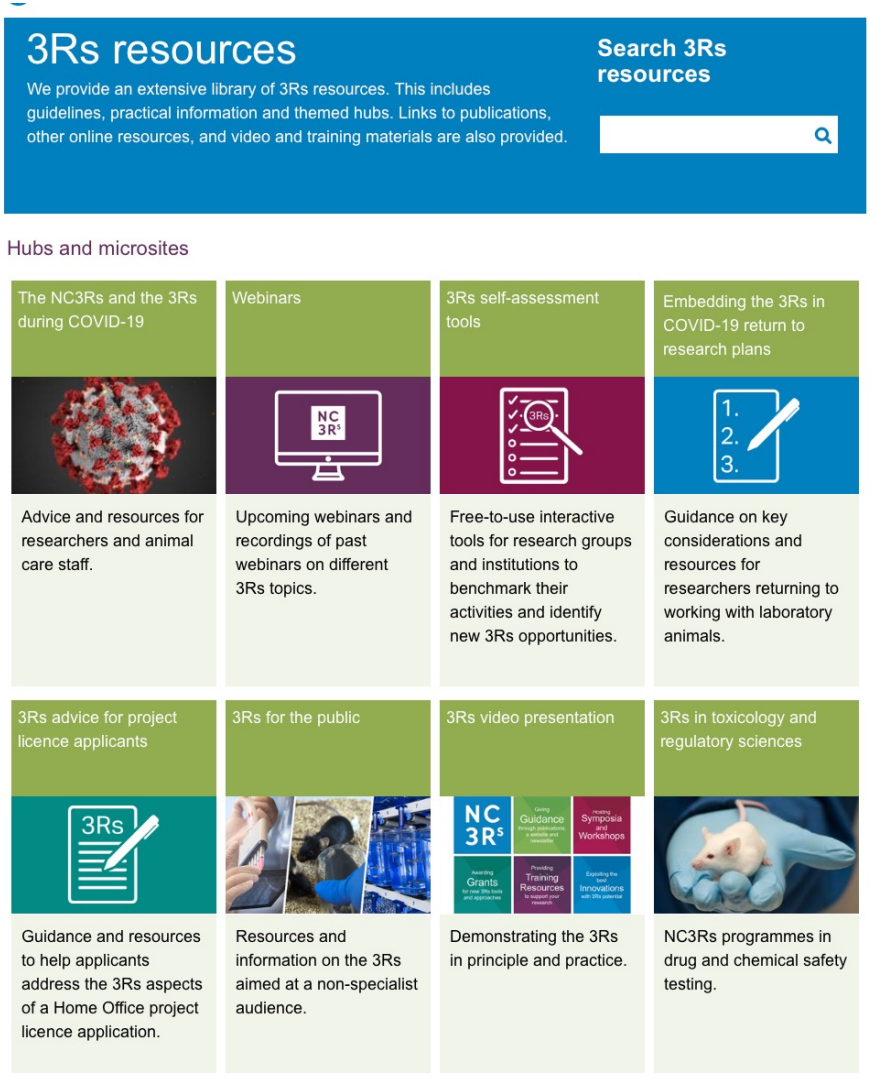
- NAL: a collection of literature references relating to the 3Rs from the US National Agricultural Library
- European Commission datasets:
  - 3Rs Knowledge Sources: over 800 resources collected by the Commission in 2016
  - 3Rs Education and Training Resources, over 560 items collected in 2018
  - Non-animal models for respiratory tract diseases, over 280 models identified in a literature review of over 21,000 papers, published in 2020
  - Non-animal models for cardiovascular diseases, citing over 400 models, identified in a literature review of over 14,000 papers, published in 2022

The EU Commission has now published 30 datasets of this type.

**links to over 70 other databases**

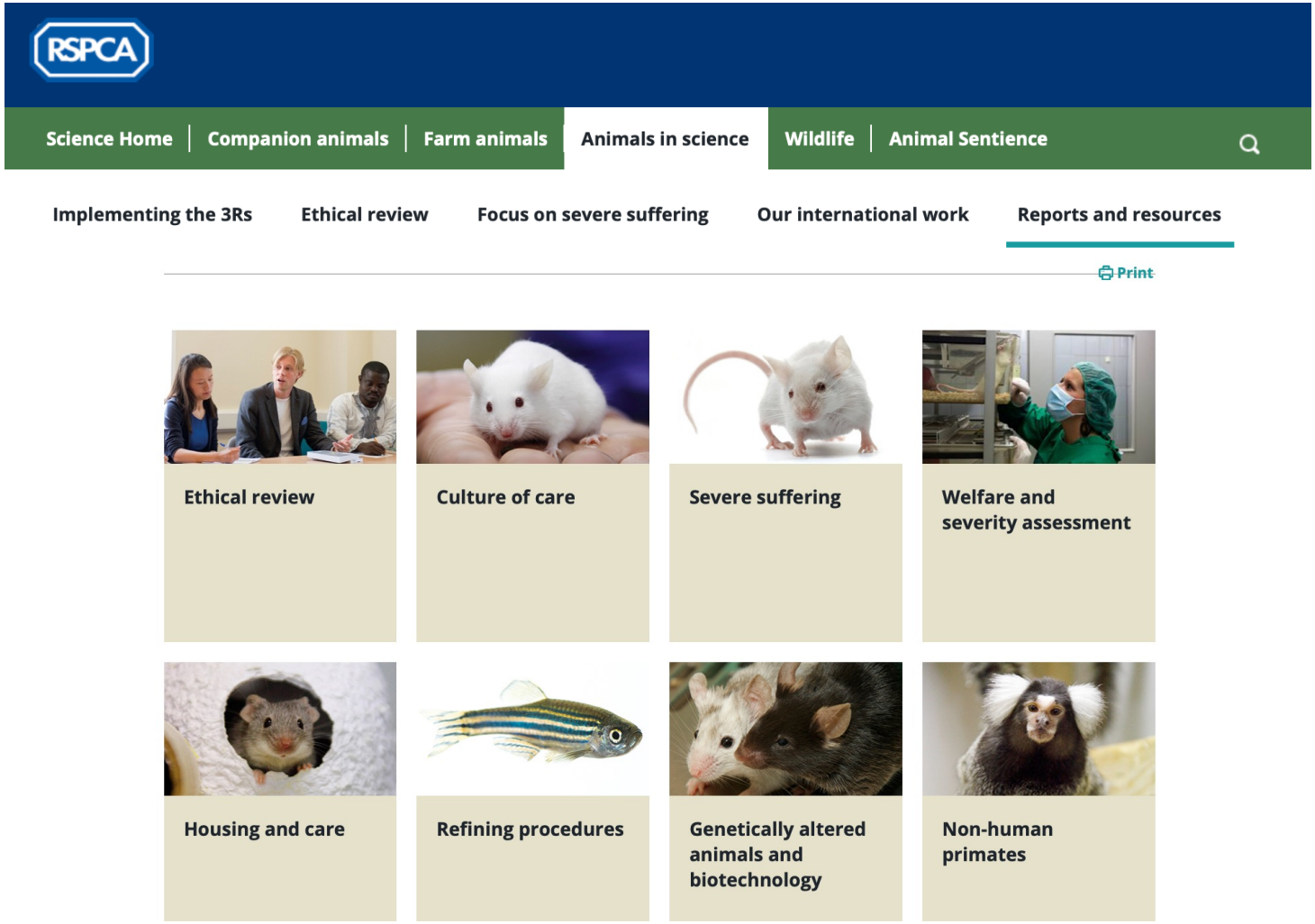
Here is an alphabetical global list of all the databases cited on the Norecopa website.

# Resource hubs




nc3rs.org.uk/3rs-resources

# Resource hubs




*science.rspca.org.uk/sciencegroup/researchanimals/reportsandresources*

*Guided tour webinar (50 min.)*

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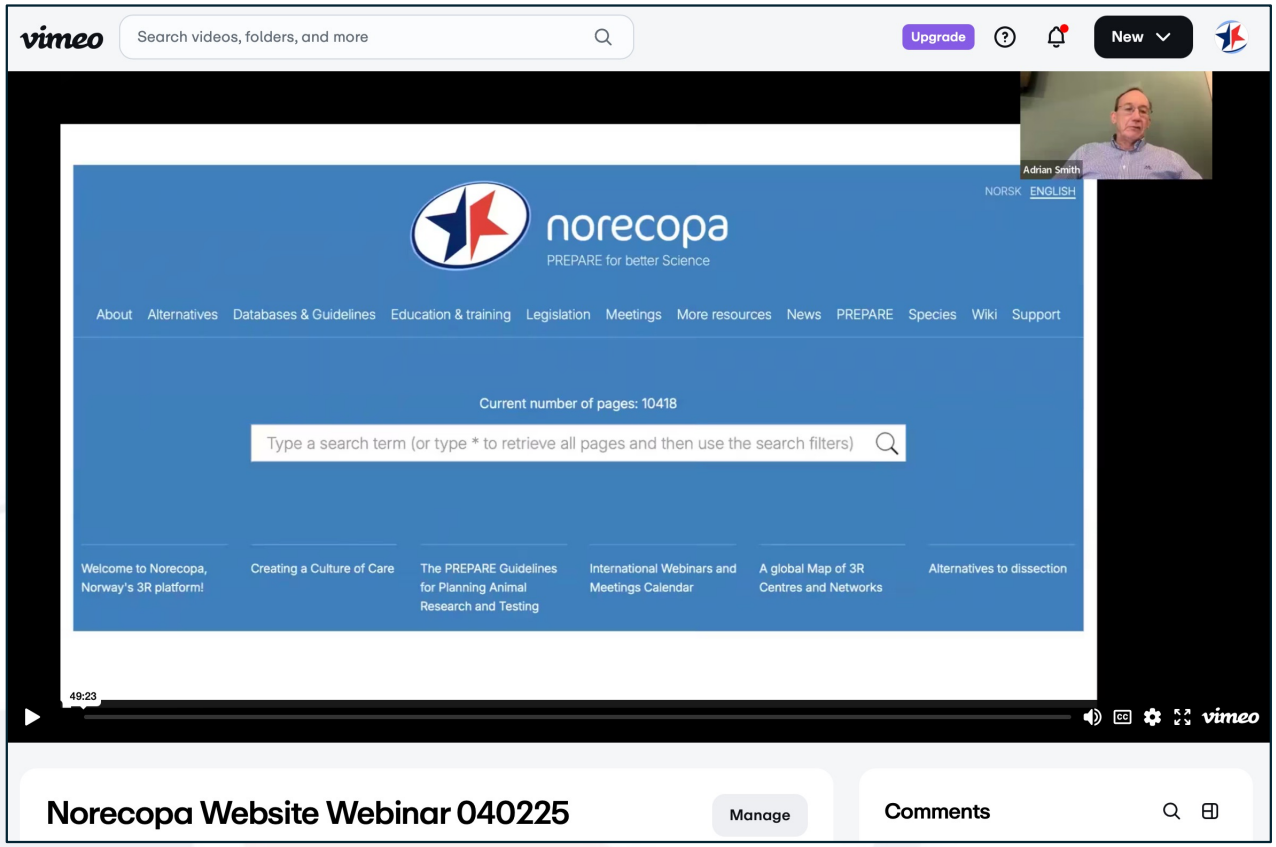


**vimeo.com/1053518017**

*part of vimeo.com/Norecopa*

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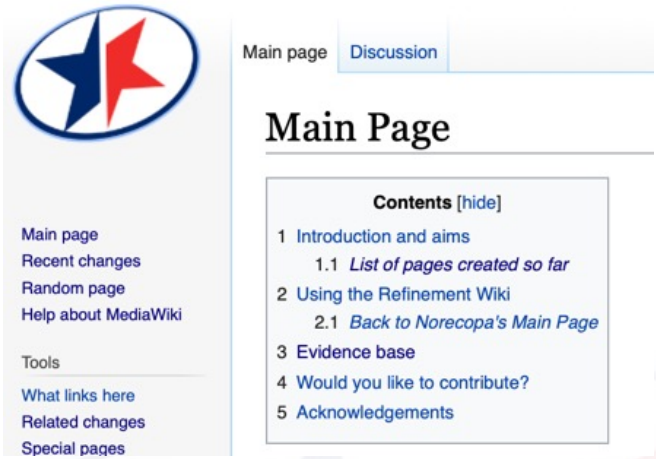
**Another great source of 3R resources:**

**Christine, Ontario**

speakingofresearch.com/2016/12/08/why-i-am-proud-to-be-a-registered-veterinary-technician-in-animal-research

## The Refinement Wiki




Susanna Louihimies

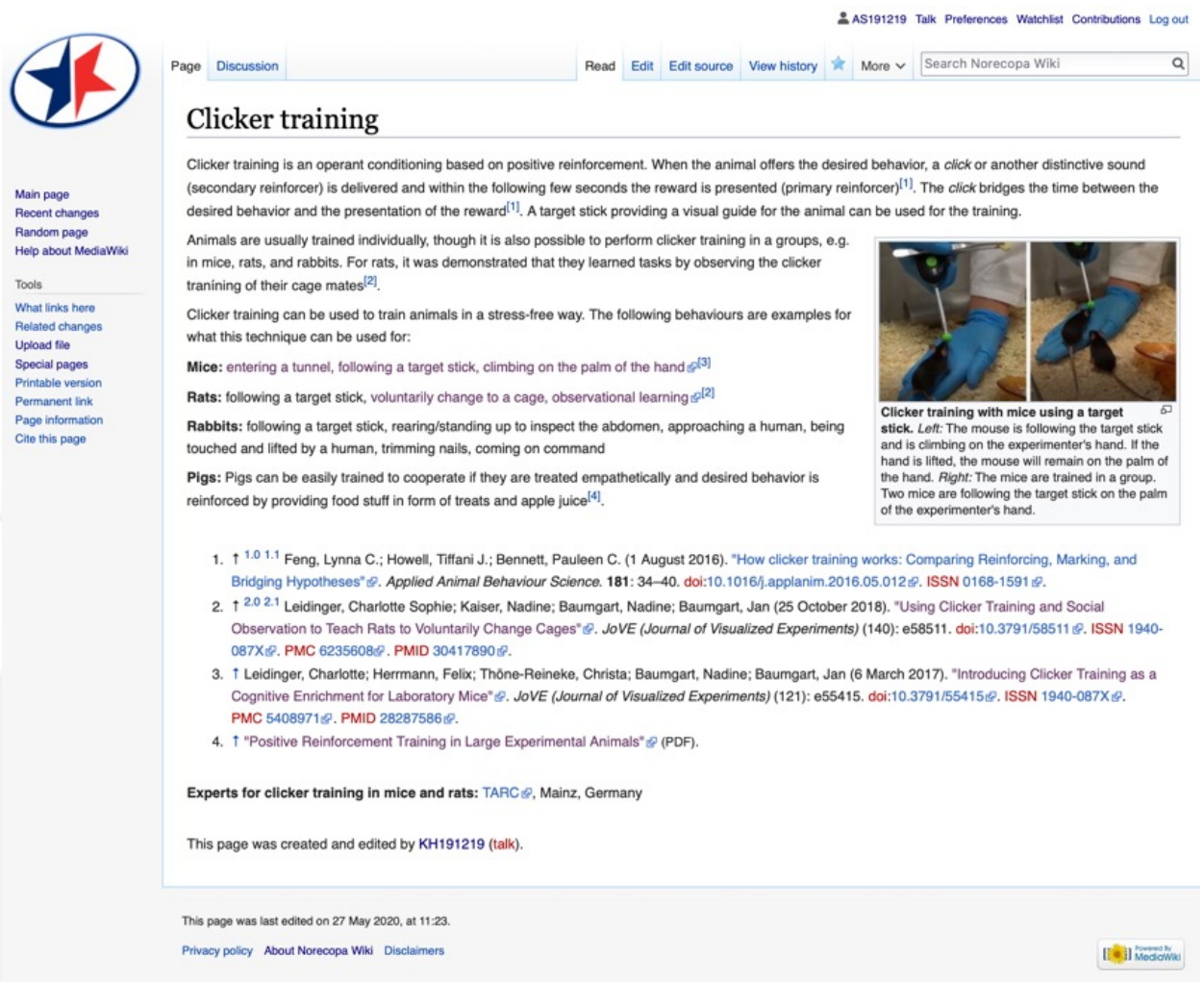
wiki.norecopa.no

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

# Refinement Wiki: wiki.norecopa.no



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## Clicker training

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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 tranining 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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This page was last edited on 27 May 2020, at 11:23.

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## c. 75 topics (August 2025)

- 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 Encephalomyeltis (EAE)
- Facial expression analysis
- Food crunchers
- Forced swim test
- General discusson 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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# The excitement over NAMs (& NATs)

**NAMs: New Approach Methodologies**

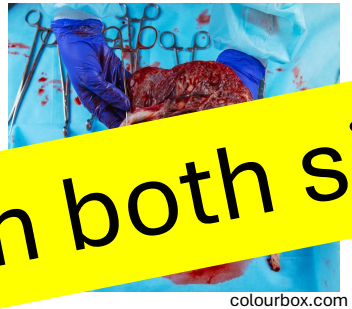
***Avoidance*** (methods which don't directly replace animal experimer

e.g. studies on the human placenta
"Read-Across"

**NATs: Non-Animal Technologies**

***Alternatives*** to ani

e.g. organoids
organs-on-
experiments on fruit flies



colourbox.com

| | Chemical 1 | Chemical 2 | Chemical 3 | Chemical 4 |
|---|---|---|---|---|
| Structure | xxxxxxxxx | xxxxxxxxx | xxxxxxxxx | xxxxxxxxx |
| Property 1 | ● ⇨ ○ | | ● ⇨ ○ | |
| Propert | ⇨ ○ | | ○ ⇦ ● | |
| | ⇦ ● | | ● ⇨ ○ | |
| | ⇨ ○ | | ● ⇨ ○ | |
| | ● ⇨ ○ | | ○ ⇦ ● | |
| Activity 3 | ○ ⇦ ● | | ● ⇨ ○ | |

● Existing data point ○ Missing data point

**Oversell from both sides?!**

**norecopa.no/nams-and-nats**

**NB. Those who work with NAMs may not even be aware that they use a method that can reduce animal use.**
**It is therefore important to build bridges between the lab animal community and the NAMs/NATs-communities !**



https://www.oecd.org/chemicalsafety/risk-assessment/groupingofchemicalschemicalcategoriesandread-across.htm

https://nc3rs.org.uk/sites/default/files/documents/NonAnimalTechCO082_RYE_4_nrfinal2.pdf

## *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.**

*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


## Centres

- Replacement
- Reduction
- Refinement
- ecopa

## Associations

- ACURET
- AFLAS (includes South Korea)
- Concordat on Openness
- Culture of Care Network
- ecopa
- ENAWB
- EU-NETVAL
- EU3Rnet
- FELASA
- FESSACAL
- ICLAS (includes South Korea)
- Scand-LAS
- Presentations by Norecopa

# The Path to Better Science:


norecopa.no/PREPARE *and*
https://riojournal.com/article/105198

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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:

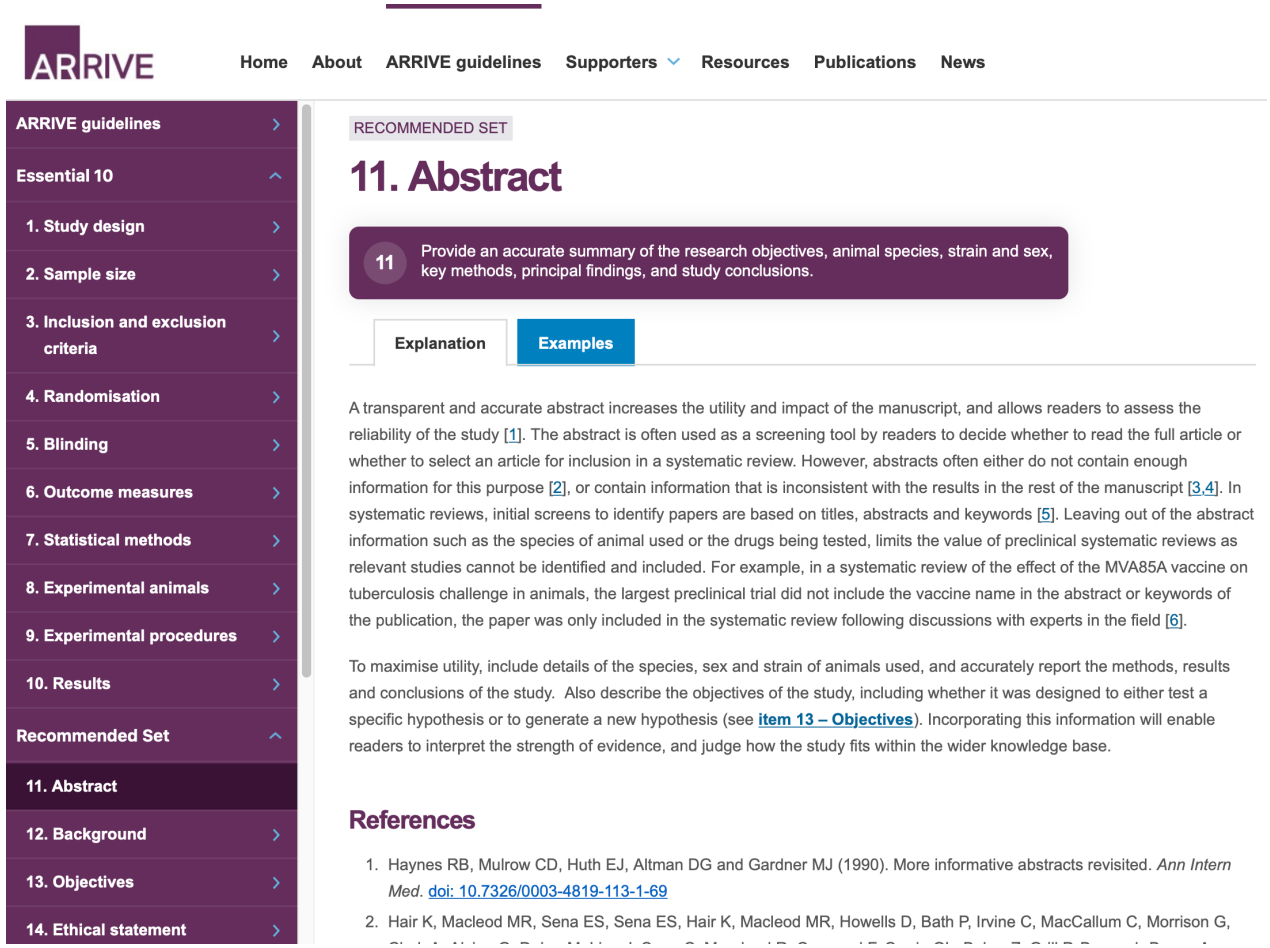
## ARRIVE Essential 10

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

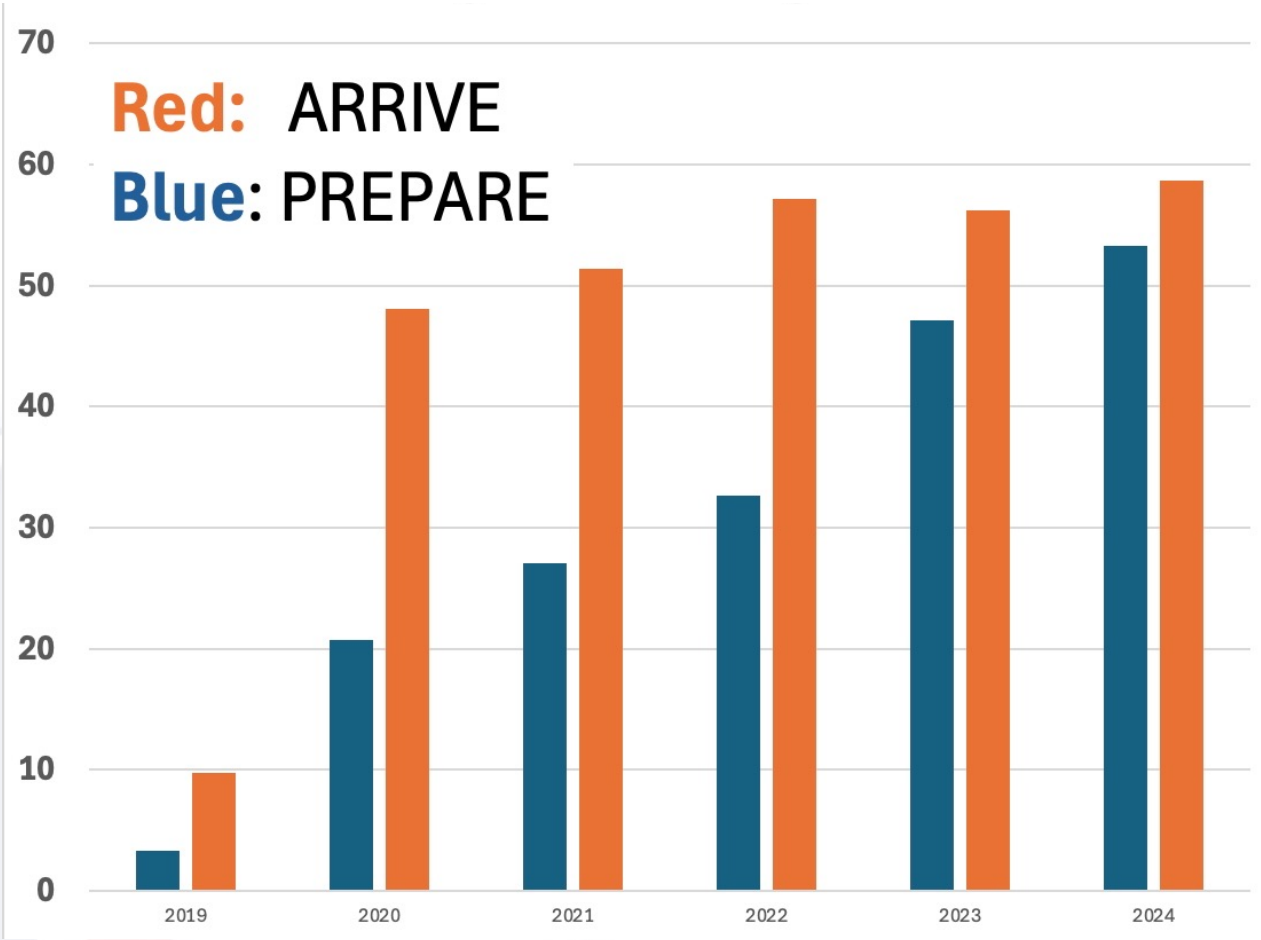
These items complement the Essential 10 set and add important context to the study described. Reporting the items in both sets represents best practice.

# *Reporting guidelines*




arriveguidelines.org

# Percentage of projects approved in the UK that use ARRIVE & PREPARE

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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.*

We need more species- and situation-specific guidelines!!

Aaberge I.S. *et al.*, Infection & Immunity, 1992, 60 (10): 4146-4153
https://journals.asm.org/doi/10.1128/iai.60.10.4146-4153.1992

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

**Annelise Hem[1], Adrian J. Smith[2] & Per Solberg[1]**

[1]Laboratory Animal Unit, National Institute of Public Health, PO Box 4404 Torshov, N-0403 Oslo and [2]Laboratory 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

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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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*40-slide powerpoint presentation about the 3Rs*


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***All three Rs of Russell and Burch:***

**Replacement, Reduction & Refinement**

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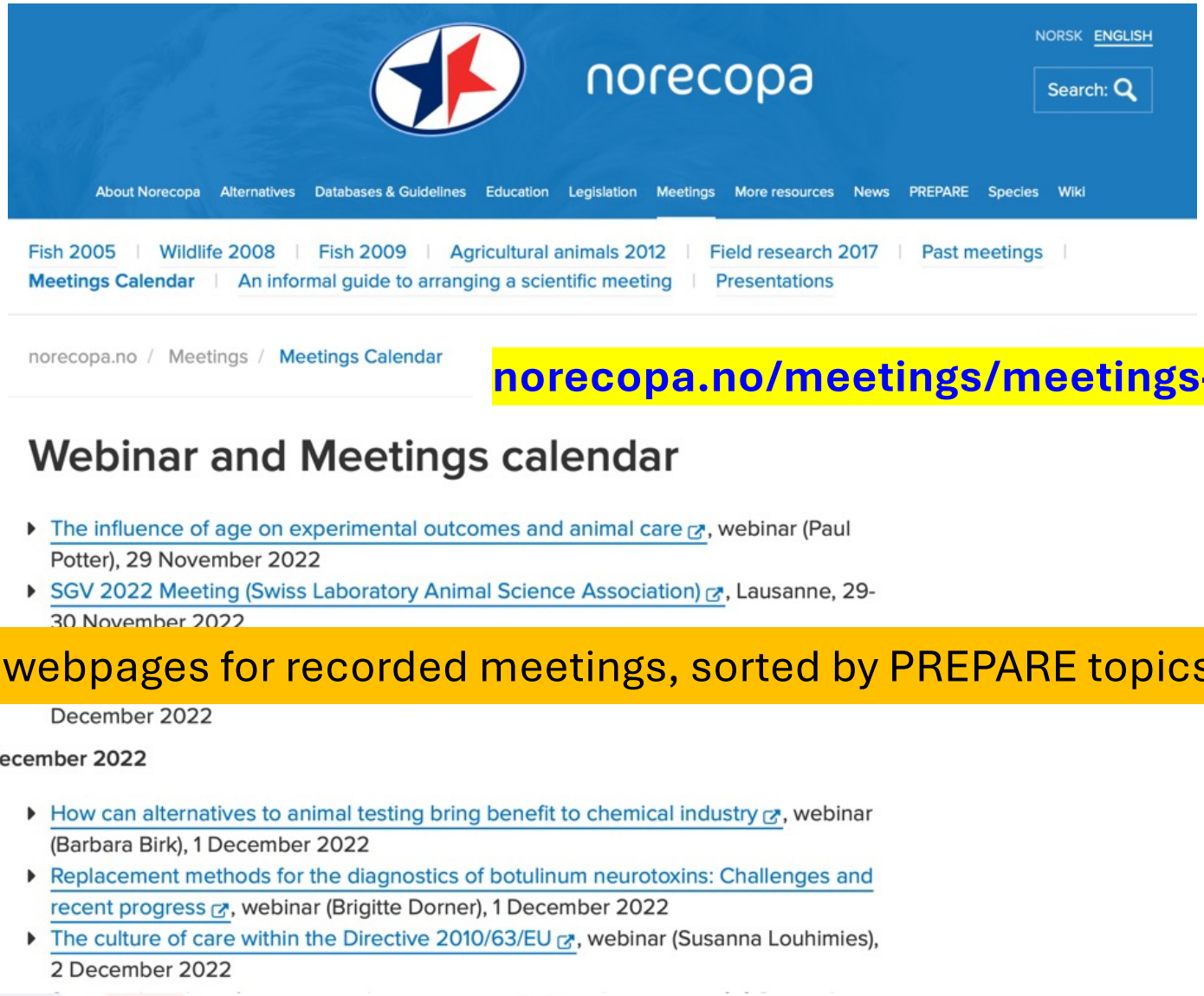
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Webinar and Meetings calendar
The influence of age on experimental outcomes and animal care, webinar (Paul Potter), 29 November 2022
SGV 2022 Meeting (Swiss Laboratory Animal Science Association), Lausanne, 29-30 November 2022
+ webpages for recorded meetings, sorted by PREPARE topics
December 2022
December 2022
How can alternatives to animal testing bring benefit to chemical industry, webinar (Barbara Birk), 1 December 2022
Replacement methods for the diagnostics of botulinum neurotoxins: Challenges and recent progress, webinar (Brigitte Dorner), 1 December 2022
The culture of care within the Directive 2010/63/EU, webinar (Susanna Louhimies), 2 December 2022

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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.

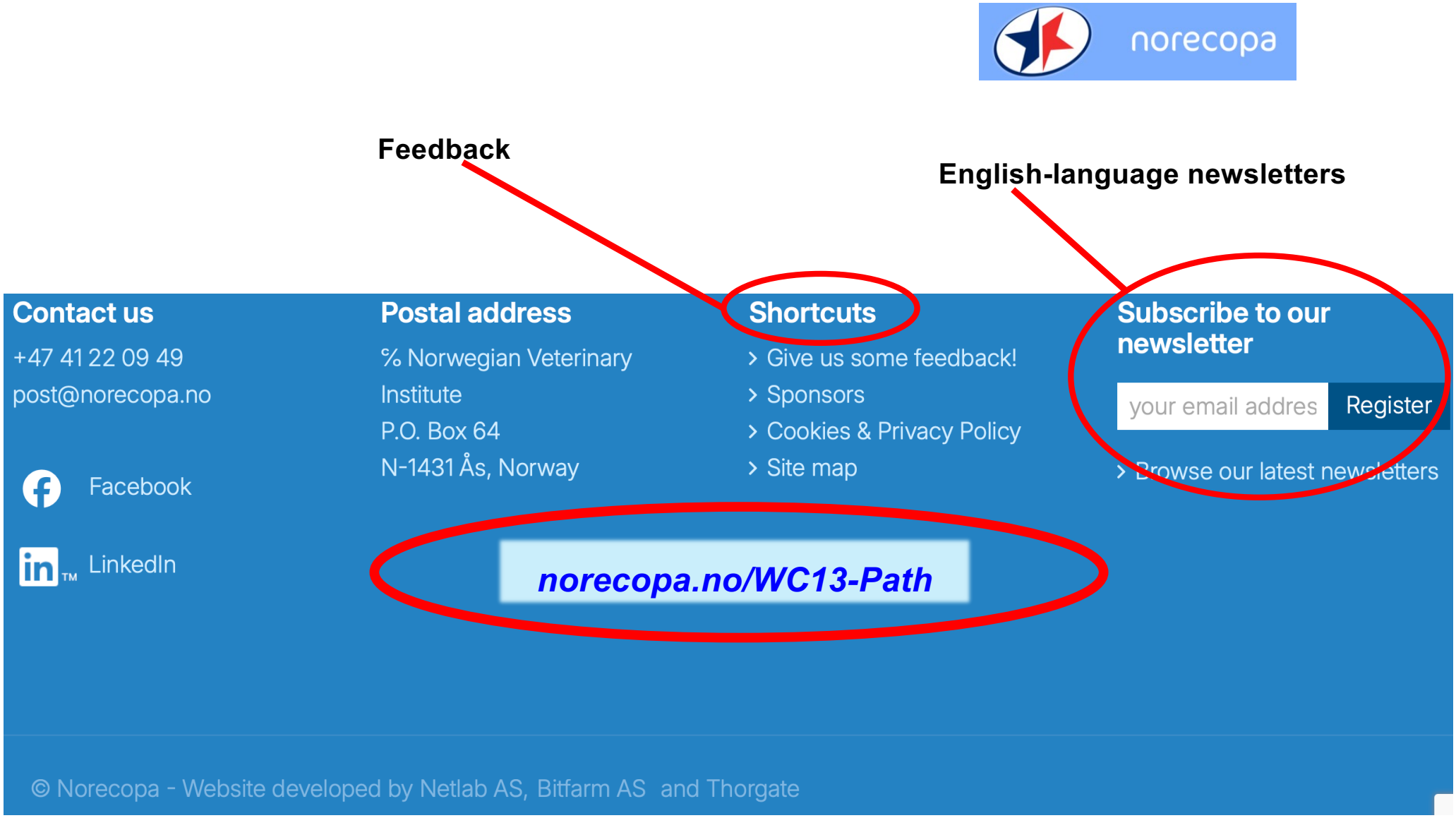

## Website of the Nordic Zebrafish Network

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.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