

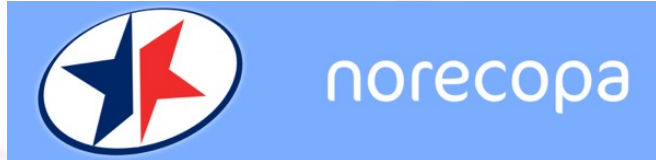
The pathway to better aquaculture research

Adrian Smith, Norecopa

[***norecopa.no/Aqua3R***](https://norecopa.no/Aqua3R)

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***Congratulations!
and thanks for this meeting!***



Norecopa: PREPARE for better Science

Thanks to many colleagues, including:

Aurora Brønstad, University of Bergen

Chris Noble, Nofima Tromsø

Gidona Goodman, University of Edinburgh

Susanna Lybæk, Norwegian Animal Protection Alliance

Tore Kristiansen, Institute of Marine Research, Bergen

Contributors to Norecoba's Refinement Wiki

The PREPARE guidelines, fish section:

Penny Hawkins and Chloe Stevens

Disclosure: lead author



Norway's National Consensus Platform for the
Three Rs: Replacement, Reduction and Refinement
and a source of *global* 3R resources

we welcome more from you!



norecoba

<https://norecoba.no>

Established in 2007

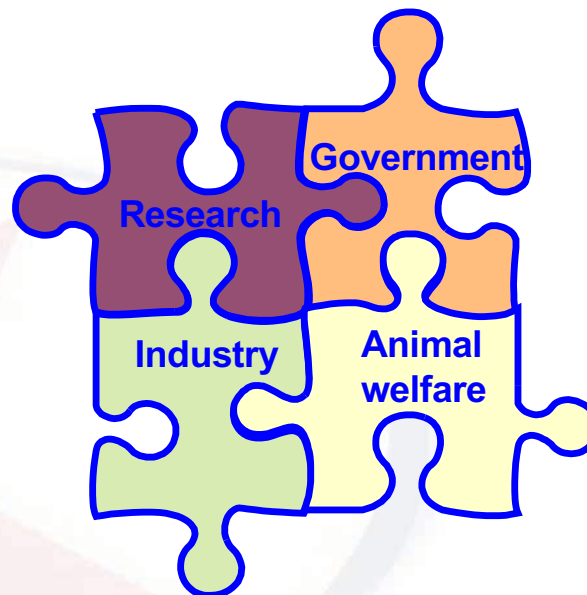
Norecoba: PREPARE for better Science

European Consensus-Platform for Alternatives

ecopa.eu



- Established in 2000
- Recognises **National Consensus Platforms** (NCPs) with **4 stakeholders** equally represented:



Norecopa was established in 2007

Norecopa: PREPARE for better Science



Centres


- [Replacement](#) i
- [Reduction](#) i
- [Refinement](#) i
- [ecopa](#) i

Associations

- [ACURET](#) i
- [AFLAS \(includes South Korea\)](#) i
- [Culture of Care Network](#) i
- [ecopa](#) i
- [EU-NETVAL](#) i
- [EU3Rnet](#) i
- [FELASA](#) i
- [FESSACAL](#) i
- [Scand-LAS](#) i
- [Concordat on Openness](#) f

Norecopa: PREPARE for better Science

“Better aquaculture research”?!

- ✓ valid data (a true treatment effect)
 - ✓ reproducible and translatable experiments
 - ✓ best possible animal welfare
 - ✓ health & safety (of animals and people)
 - ✓ a culture of care
 - ✓ communication of best practice to others
- 



Sinus bradycardia
ventricular escape complexes



Labitt *et al.*, 26 February 2021

4 strains of mice, both sexes, 3 experienced handlers

Labitt RN, Oxford EM, Davis AK, Butler SD & Daugherty EK (2021): A Validated Smartphone-Based Electrocardiogram Reveals Severe Bradyarrhythmias during Immobilizing Restraint in Mice of Both Sexes and Four Strains. *J. Am. Assoc. Lab. Anim. Sci.*
doi: 10.30802/AALAS-JAALAS-20-000069



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forskning.no

A path to better research



Norecopa: PREPARE for better Science

norecopa.no/PREPARE and ivd-utrecht.nl/en/news/better-animal-research-through-open-science-1



Prepare



Original Article

PREPARE: guidelines for planning animal research and testing

Adrian J Smith¹, R Eddie Clutton², Elliot Lilley³, Kristine E Aa Hansen⁴ and Trond Brattelid⁵

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 Norecoba website, with links to guidelines for animal research and testing, at <https://norecoba.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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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 24,000 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

Items in pink are
not typically
highlighted in
reporting guidelines



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 Brattelid⁵
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, Horsham, 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. PREPARE covers the three broad areas which determine the quality of the preparation for animal studies:

1. Formulation of the study
2. Dialogue between scientists and the animal facility
3. Quality control of the components in the study

The topics will not always be addressed in the order in which they are presented here, as a checklist can be adapted to meet special needs, such as field studies. PREPARE includes guidelines for in-house experiments dependent upon their quality. The full version of the checklist is available on the norecopa website, with links to global resources, at <https://norecopa.no/PREPARE>. The PREPARE guidelines are a dynamic set which will evolve as more species- and situation-specific guidelines are produced, and as best practice within Laboratory Animal Science progresses.

Three Rs!

Topic	Recommendation
(A) Formulation of the study	
1. Literature searches	<input type="checkbox"/> Form a clear hypothesis, with primary and secondary outcomes. <input type="checkbox"/> Consider the use of systematic reviews. <input type="checkbox"/> Decide upon databases and information specialists to be consulted, and construct search terms. <input type="checkbox"/> Assess the relevance of the species to be used, its biology and suitability to answer the experimental questions with the least suffering and to welfare needs. <input type="checkbox"/> Assess the reproducibility and translatability of the project.
2. Legal issues	<input type="checkbox"/> Consider how the research is affected by relevant legislation for animal research and other areas, e.g. animal transport, occupational health and safety. <input type="checkbox"/> Locate relevant guidance documents (e.g. EU guidance on project evaluation).
3. Ethical issues, harm-benefit assessment and humane endpoints	<input type="checkbox"/> Construct a lay summary. <input type="checkbox"/> In dialogue with ethics committees, consider whether statements about this type of research have already been produced. <input type="checkbox"/> Address the 3Rs (replacement, reduction, refinement) and the 3Ss (good science, good sense, good sensibilities). <input type="checkbox"/> Consider pre-regulation and the publication of negative results. <input type="checkbox"/> Perform a harm-benefit assessment and justify any likely animal harm. <input type="checkbox"/> Discuss the learning objectives, if the animal use is for educational or training purposes. <input type="checkbox"/> Allocate a severity classification to the project. <input type="checkbox"/> Define objective, easily measurable and unequivocal humane endpoints. <input type="checkbox"/> Discuss the justification, if any, for death as an end-point.
4. Experimental design and statistical analysis	<input type="checkbox"/> Consider pilot studies, statistical power and significance levels. <input type="checkbox"/> Define the experimental unit and decide upon animal numbers. <input type="checkbox"/> Choose methods of randomisation, prevent observer bias, and decide upon inclusion and exclusion criteria.

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 study.
8. Health risks, waste disposal and decontamination	<input type="checkbox"/> Perform a risk assessment, in collaboration with the animal facility, for all persons and animals affected directly or indirectly by the study. <input type="checkbox"/> Assess, and if necessary produce, specific guidance for all stages of the project. <input type="checkbox"/> Discuss means for containment, decontamination, and disposal of all items in the study.
(C) Quality control of the components in the study	
9. Test substances and procedures	<input type="checkbox"/> Provide as much information as possible about test substances. <input type="checkbox"/> Consider the feasibility and validity of test procedures and the skills needed to perform them.
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 acclimatisation, 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
 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](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 3Ss (Good Science, Good Sense, Good Sensibilities).
 - 3f Assessment and justify any likely animal harm.
 - 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

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, research directed at increasing the productivity of farming at the expense of (or without improving) individual animal welfare, or wildlife research whose primary aim is population management.

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

2. Will any advances in this research be published, and if so, will the publication only index the title and abstract, or will the full paper be made available? Will the project be rejected?
3. Have the Three S's ([Good Science, Good Sense and Good Sensibilities](#)) been addressed? Sufficient time should be allocated to this point, since two of the three S's are highly subjective, but equally important. The 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

1c

Decide upon databases and information specialists to be consulted, and construct search terms.

General principles

For fish researchers

The editors and chapter authors of [textbooks about fish](#) are obvious candidates to be information specialists when designing fish experiments. Other sources include:

- > The [Zebrafish Information Network \(ZFIN\) database on model organisms](#) and their publications
- > EBSCO [Fish, Fisheries and Aquatic Biodiversity Worldwide](#) (FFAB) database
- > [FishBase](#) - a global information system on fin fishes
- > [SeaLifeBase](#)
- > [Fish Pathogens Database](#)
- > [Aquatic Sciences and Fisheries Abstracts \(ASFA\)](#)
- > [AGRIS](#)
- > [ECOTOX](#)
- > [The Alternatives section](#) in the part of the Norecopa website on fish
- > [Fishwise Professional](#) database
- > An [overview of global marine databases and resource centres](#)

Administration and sampling

Links to resources on administration and sampling

General or collective guidance:

- > [Guidance on training animals from the NC3Rs](#)
- > [A good practice guide to the administration of substances and removal of blood, including routes and volumes](#)
- > [Films and slide shows of handling, injection and blood sampling techniques](#)
- > [Guidelines for handling research animals](#)
- > [A collection of guidelines on procedures](#)
- > [Understanding and selecting surgical suture and needle](#)
- > [The re-use of needles](#)
- > [Single use needles: putting refinement into practice](#)
- > [Single use of needles: how AWERBs can support refinements in practice](#)
- > [Animal Technician Hub from the NC3Rs](#)
- > [Refining procedures for the administration of substances](#)
- > [Blood, sweat and tears: a review of non-invasive DNA sampling](#)

Species-specific guidance:

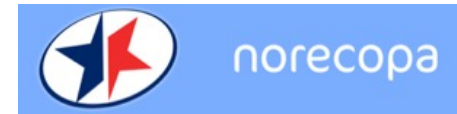
- > [Clicker training of mice and rats](#)
- > [Preclinical validation of the micropipette-guided drug administration \(MDA\) method in the maternal immune activation model of neurodevelopmental disorders \(mice\)](#)
- > [Oral application of clozapine-N-oxide using the micropipette-guided drug administration \(MDA\) method in mouse DREADD systems \(Schalbetter et al., 2021\) \(mice\)](#)
- > [A spoonful of sugar helps the medicine go down: a novel technique to improve oral gavage in mice](#)
- > [Voluntary ingestion of antiparasitic drugs emulsified in honey represents an alternative to gavage in mice](#)
- > [A table of scientific papers summarising the research published to date on tunnel handling and cupping methods for handling mice](#)
- > [Handling method alters the hedonic value of reward in laboratory mice](#)
- > [The welfare impact of gavaging laboratory rats](#)
- > [Videos of administration to rodents by gavage \(Instech Laboratories\)](#)
- > [An improved method of continuous infusion in mice](#)
- > [A Noninvasive Ocular \(Tear\) Sampling Method for Genetic Ascertainment of Transgenic Mice and Research Ethics Innovation \(Balafas et al., 2019\)](#)
- > [Training Rats Using Water Rewards Without Water Restriction \(Reinagel, 2018\)](#)

Blood sampling techniques

- > Knowledge of the total circulating blood volume of the animal
- > Consideration of [species-specific guidelines for blood sampling](#) and choice of the most refined method
- > Assessment of the likely consequences of blood removal (including the stress of handling)
- > Consideration of steps that can be taken to minimise residual bleeding (within or outside the animal) after the sample has been taken.

Links to resources on blood sampling

- > [General guidance on blood sampling](#)
- > [Links to more resources on bleeding animals](#)
- > [Videos of automated blood sampling techniques \(Instech Laboratories\)](#)
- > [Orbital sinus blood sampling in rats: effects upon selected behavioural variables \(van Herck et al., 2000\)](#)
- > [Guidance on microsampling from the NC3Rs](#)
- > [Microsampling: considerations for its use in pharmacological drug discovery and development](#)



Three versions of the checklist:

1. plain pdf file

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Planning Research and Experimental Procedures on Animals: Recommendations for Excellence
 Adrian J. Smith¹, R. Eddie Clutton², Elliot Lilley¹, Kristine E. Aa. Hanssen¹ & Trond Bratlie¹

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, Horsham, 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 8148 Dg., 0033 Oslo, Norway; ⁵Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

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(A) Formulation of the study	
1. Literature searches	<input type="checkbox"/> Form a clear hypothesis, with primary and secondary outcomes. <input type="checkbox"/> Consider the use of systematic reviews. <input type="checkbox"/> Decide upon databases and information specialists to be consulted, and construct search terms. <input type="checkbox"/> 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. <input type="checkbox"/> Assess the reproducibility and translatability of the project.
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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
 1. Smith AJ, Clutton RE, Lilley E, Hansen KEA & Bratlie T. PREPARE Guidelines for Planning Animal Research and Testing. *Laboratory Animals*, 2017, DOI: 10.1177/002367721724823.
 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.

norecopa.no/PREPARE/prepare-checklist

Three versions of the checklist:

2. fillable pdf file

norecopa.no/PREPARE-Word

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PREPARE



The PREPARE Guidelines Checklist

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

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

^aNorecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; ^bRoyal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; ^cResearch Animals Department, Science Group, RSPCA, Wilberforce Way, Southwater, Horsham, West Sussex, RH13 9RS, U.K.;

^dSection 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; ^eDivision for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

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The PREPARE guidelines are a dynamic set which will evolve as more species- and situation-specific guidelines are produced, and as best practice within Laboratory Animal Science progresses.

Formulation of the study

1. Literature searches

✓ Form a clear hypothesis, with primary and secondary outcomes.

Text stored in the file

Consider the use of systematic reviews.

Decide upon databases and information specialists to be consulted, and construct search terms.

norecopa.no/PREPARE/prepare-checklist

Three versions of the checklist:

3. online version

norecopa.no/PREPARE/Mychecklist

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PREPARE



The PREPARE Guidelines Checklist

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

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

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1. Formulation of the study
2. Dialogue between scientists and the animal facility
3. Quality control of the components in the study

The topics will not always be addressed in the order in which they are presented here, and some topics overlap. The PREPARE checklist can be adapted to meet special needs, such as field studies. PREPARE includes guidance on the management of animal facilities, since in-house experiments are dependent upon their quality. The full version of the guidelines is available on the Norecopa website, with links to global resources, at <https://norecopa.no/PREPARE>. The PREPARE guidelines are a dynamic set which will evolve as more species- and situation-specific guidelines are produced, and as best practice within Laboratory Animal Science progresses.

Create new PREPARE checklist

Open existing checklist

Your auth code for this checklist is **deeb7d** Please save this code so you are able to open your checklist at a later time. You can also bookmark this page.


Topic	Recommendation
(A) Formulation of the study	
1. Literature searches	<input type="checkbox"/> Form a clear hypothesis with primary and secondary outcomes. <input type="checkbox"/> Consider the use of systematic reviews. <input checked="" type="checkbox"/> Decide upon databases and information specialists to be consulted, and construct search terms. <input type="checkbox"/> 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.
2. Legal issues	<input type="checkbox"/> Consider how the research is affected by relevant legislation for animal research and other areas, e.g. animal transport, occupational health and safety.

text only stored on author's computer

norecopa.no/prepare/mychecklist?id=deeb7d

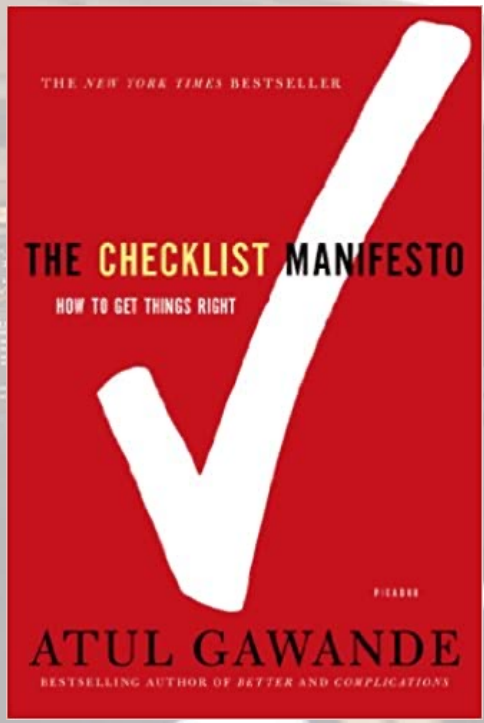
Nore

Surgical Safety Checklist



World Health Organization | Patient Safety
A World Alliance for Safer Health Care

Before induction of anaesthesia <small>(with at least nurse and anaesthetist)</small>	Before skin incision <small>(with nurse, anaesthetist and surgeon)</small>	Before patient leaves operating room <small>(with nurse, anaesthetist and surgeon)</small>
Has the patient confirmed his/her identity, site, procedure, and consent? <input type="checkbox"/> Yes	<input type="checkbox"/> Confirm all team members have introduced themselves by name and role. <input type="checkbox"/> Confirm the patient's name, procedure, and where the incision will be made.	Nurse Verbally Confirms: <input type="checkbox"/> The name of the procedure <input type="checkbox"/> Completion of instrument, sponge and needle counts <input type="checkbox"/> Specimen labelling (read specimen labels aloud, including patient name) <input type="checkbox"/> Whether there are any equipment problems to be addressed
Is the site marked? <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	Has antibiotic prophylaxis been given within the last 60 minutes? <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	To Surgeon, Anaesthetist and Nurse: <input type="checkbox"/> What are the key concerns for recovery and management of this patient?
Is the anaesthesia machine and medication check complete? <input type="checkbox"/> Yes	Anticipated Critical Events To Surgeon: <input type="checkbox"/> What are the critical or non-routine steps? <input type="checkbox"/> How long will the case take? <input type="checkbox"/> What is the anticipated blood loss? To Anaesthetist: <input type="checkbox"/> Are there any patient-specific concerns? To Nursing Team: <input type="checkbox"/> Has sterility (including indicator results) been confirmed? <input type="checkbox"/> Are there equipment issues or any concerns?	
Is the pulse oximeter on the patient and functioning? <input type="checkbox"/> Yes	Is essential imaging displayed? <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable	
Does the patient have a: Known allergy? <input type="checkbox"/> No <input type="checkbox"/> Yes Difficult airway or aspiration risk? <input type="checkbox"/> No <input type="checkbox"/> Yes, and equipment/assistance available Risk of >500ml blood loss (7ml/kg in children)? <input type="checkbox"/> No <input type="checkbox"/> Yes, and two IVs/central access and fluids planned		



This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

© WHO, 2009

who.int/patientsafety/topics/safe-surgery/checklist/en

amazon.com/gp/product/0312430000

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10-15 checklists even on short routine flights



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They are also used in emergency situations...



en.wikipedia.org

Norecopa: PREPARE for better Science

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



Norecopa: PREPARE for better Science

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

The screenshot displays the norecopa.no website interface. At the top, there is a blue header with the norecopa logo (a stylized star) and the text 'norecopa'. Below the header, a navigation menu includes links for 'About Norecopa', 'Alternatives', 'Databases & Guidelines', 'Education & training', 'Legislation', 'Meetings', and 'More resources'. A secondary navigation bar lists various topics such as 'Anaesthesia and analgesia', 'Animal facilities', 'Animal welfare organisations', 'Blood sampling', 'Email discussion lists', 'Environmental enrichment', 'Ethics', 'Experimental design and reporting', 'Health and safety', 'Health monitoring', 'Humane endpoints', 'Humane killing', 'Journals', 'Literature searches and systematic reviews', 'Organisations', 'Reporting guidelines', and 'Severity'. A search bar is visible on the right side of the page.

The 'Search filters' sidebar on the right is highlighted with a red border and contains the following sections:

- Search filters**
- Order by: Relevance
- Typo tolerance: Default
- Database**
- 3R Guide database (403)
- Classic AVs database (118)
- European Commission Inventory of 3Rs Education & Training Resources (567)
- European Commission Inventory of 3Rs Knowledge Sources (807)
- European Commission Inventory of NAMs for Respiratory tract diseases (280)
- NAL records (1688)
- NORINA database (3141)
- TextBase database (1501)
- Website (761)
- Browse the databases**
- eBooks (286)
- Free (199)
- Held at NMBU Oslo (contact Kristine Hansen, 67 23 21 89) (431)
- Key products (68)
- On loan (6)
- Reviewed (85)
- Search in the databases**
- All Text
- Title
- Author
- Publisher
- Supplier
- Record Number

The main content area features the title 'Design and reporting of animal experiments' and a breadcrumb trail: 'norecopa.no / More resources / Experimental design and reporting'. Below the title, there is a text block: 'This page supplements advice given in [See](#) covers all aspects of design (including animal)'. A green callout box contains the following statistics:

- approx. 8,900 webpages
- 350,000 hits annually
- 7-8 detailed newsletters per year

At the bottom of the page, the text reads: 'Norecopa: PREPARE for better Science'. A 'Privacy - Terms' link is located in the bottom right corner.

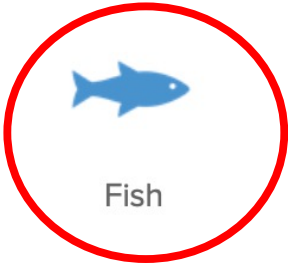
+ webpages for past meetings and recorded meetings

norecopa.no/meetings/meetings-calendar

Webinar and Meetings calendar

- > [AquaR2002: National Workshop on 3Rs in Aquaculture Research](#), Ås, 9 June 2022
- > [Practical Applications of Adverse Outcome Pathways](#), webinar, 9 June 2022
- > [Sex as a biological variable in biomedical research](#), Bern, 9-10 June 2022
- > [Swine in Biomedical Research](#), Madison, 10-14 June 2022
- > [Symposium: We have to talk about rodent surgery](#), Marseille, 12 June 2022
- > [15th FELASA congress: Communication in Animal Research](#), Marseille, 13-16 June 2022
- > [LIVe2022 \(Lung In Vitro event\)](#), Nice, 13-14 June 2022
- > [UK Home Office Licensee Training Course - Wildlife](#), online, 17-30 June 2022
- > [Do Octopuses have Feelings? The Question of Animal Sentience](#), London, 18 June 2022
- > [How to conduct a preclinical animal systematic review & meta-analysis](#), online workshop, 20-22 June 2022
- > [2022 Animal Research Tomorrow \(ART\) Award Ceremony and Conference](#), 21 June 2022
- > [ESLAV/ECLAM Summer School on Anesthesia, Analgesia and Euthanasia](#), online (part A: 21-23 June 2022) & Bologna (part B: 8-9 September 2022)
- > [ONE - Health, Environment & Society - Conference 2022](#), Brussels and virtual event, 21-24 June 2022
- > [Ethics of Animal Behaviour and Welfare Research](#), virtual ASAB workshop, 21-22 June 2022
- > [Practical guide to developing a 3R strategy](#), webinar (Nikki Osborne), 22 June 2022
- > [Stress-reduced handling of rats and mice](#), virtual workshop, 22 June 2022
- > [Innovative Approaches in Cosmetic Testing, in Compliance with European Regulations](#), Genova, 22-23 June 2022

- > [Alternatives](#)
- > [Anaesthesia and analgesia](#)
- > [Behaviour](#)
- > [Education and training](#)
- > [Environmental enrichment](#)
- > [Guidelines](#)
- > [Handling](#)
- > [Health monitoring and disease prevention](#)
- > [Humane killing](#)
- > [Legislation](#)
- > [Marking and identification](#)
- > [Meetings](#)
- > [Organisations](#)
- > [Pain and suffering](#)
- > [Projects involving Norecoba](#)
- > [Sampling](#)
- > [Surgery](#)
- > [Training fish](#)
- > [Welfare](#)
- > [Zebrafish](#)



<https://norecopa.no/meetings>

International consensus meetings

Harmonisation of the Care and Use of:

- Fish (2005)

- Wildlife (2008)

- Fish (2009)

- Agricultural animals (2012)

- Wildlife (2017)

**All the presentations and consensus statements
on the web: a lasting resource**



From **3R-Guide** (400 guidelines for animal research and testing)
norecopa.no/3r-guide



Hint: Type * to see everything on the website and then use the filters in the right margin

fish*

Filters: [clear all filters](#)

Database: 3R Guide database X

19 results

An overview of existing guidelines for handling, bleeding, administration and identification techniques in fish
3R Guide database/8a3f1 (legacy id: 15202)
A collection of references and websites compiled by Dr. Penny Hawkins in connection with the international consensus meeting Harmonisation of the Care and Use of *Fish* in Research held at Gardermoen, Norway, 22-24 September 2009.

Search filters

Order by:
Relevance

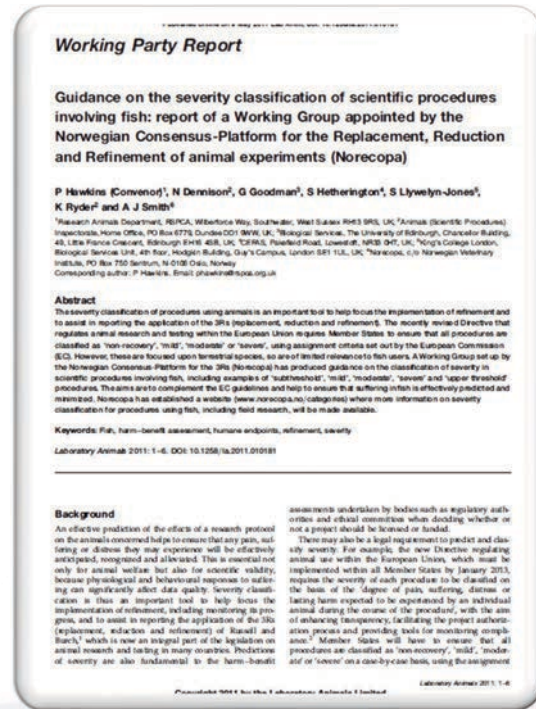
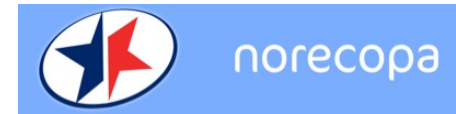
Typo tolerance:
Default

Database

- 3R Guide database (19)
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- European Commission Inventory of 3Rs Education & Training Resources
- European Commission Inventory of 3Rs Knowledge Sources
- European Commission Inventory of NAMs for Respiratory tract diseases
- NAL records
- NORINA database
- Refinement Wiki

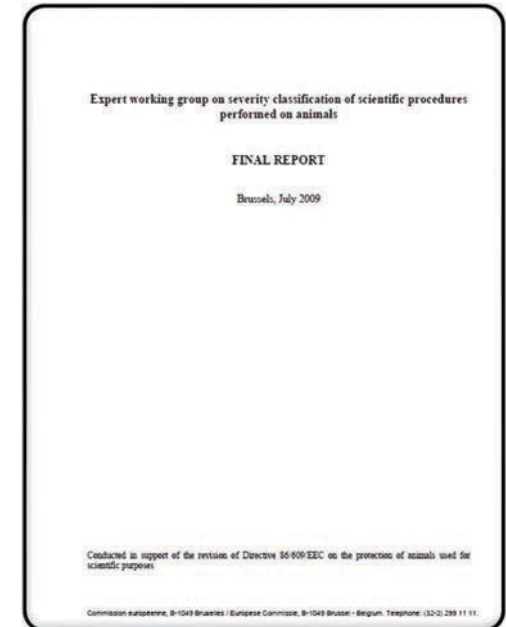
Norecopa: PREPARE for better Science

From **3R-Guide** (400 guidelines for animal research and testing)
norecopa.no/3r-guide



Guidance on the severity classification of procedures involving fish

Report from a Working Group convened by Norecopa



http://ec.europa.eu/environment/chemicals/lab_animals/pdf/report_ewg.pdf

P Hawkins, N Dennison, G Goodman, S Hetherington,
S Llywelyn-Jones, K Ryder and AJ Smith

Laboratory Animals, 45: 219-224, 2011

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norecopa.no/categories

TextBase:

1,500 books related to LAS:

norecopa.no/textbase

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The Welfare of Fish

By Tore S. Kristiansen, Anders Fernö, Michail A. Pavlidis & Hans van de Vis

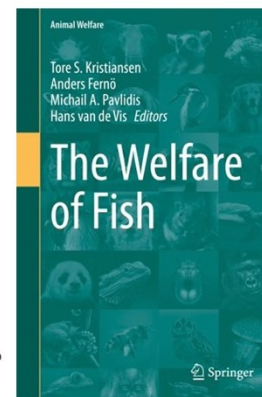
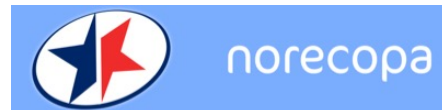
Record number: ef2a0

This book investigates how fish experience their lives, their amazing senses and abilities, and how human actions impact their quality of life. The authors examine the concept of fish welfare and the scientific knowledge behind the inclusion of fish within the moral circle, and how this knowledge can change the way we treat fish in the future. In many countries fish are already protected by animal welfare legislation in the same way as mammals, but in practice there is still a major gap between how we ethically view these groups and how we actually treat them. The poor treatment of fish represents a massive animal welfare problem in aquaculture and fisheries, both in terms of the number of animals affected and the severity of the welfare issues.

Thanks to its interdisciplinary scope, this book should appeal to professionals, academics and students in the fields of animal welfare, cognition and physiology, as well as fisheries and aquaculture management.

List of chapters:

- > A Brief Look into the Origins of Fish Welfare Science
- > Ethics and the Welfare of Fish
- > The Diverse World of Fishes
- > Fish behaviour: Determinants and Implications for Welfare
- > The Effects of Early Life Experience on Behavioural Development in Captive Fish Species
- > Fish Brains: Anatomy, Functionality, and Evolutionary Relationships
- > Inside the Fish Brain: Cognition, Learning and Consciousness; Awareness in Fish
- > The Predictive Brain: Perception Turned Upside Down
- > Can Fish Experience Pain?
- > How Fish Cope with Stress?
- > Individual Variations and Coping Style
- > Assessing Fish Welfare in Aquaculture
- > Welfare of Farmed Fish in Different Production Systems and Operations
- > Ornamental Fish and Aquaria
- > Fish as Laboratory Animals
- > Catch Welfare in Commercial Fisheries
- > Fish Welfare in Capture-Based Aquaculture (CBA)
- > Fish Welfare in Recreational Fishing
- > Impacts of Human-Induced Pollution on Wild Fish Welfare
- > What Have We Learned?



1a

Form a clear hypothesis, with primary and secondary outcomes.

General principles

For fish researchers

There are approx. 100 textbooks about the care and use of fish in research [in the TextBase database](#), which may be helpful when deciding upon the hypotheses in a fish experiment. The more general books include:

- > [The Laboratory Fish](#) (ed. Ostrand, 2000)
- > [The Laboratory Zebrafish](#) (Harper & Lawrence, 2010)
- > [Guidance on the housing and care of Zebrafish \(*Danio rerio*\)](#) (Reed & Jennings, 2010)
- > [CCAC Guidelines: Zebrafish and other small, warm-water laboratory fish](#) (2020)
- > [CCAC Guidelines on the Care and Use of Fish in Research, Teaching and Testing](#) (2005)
- > [The Welfare of Fish](#) (eds. Kristiansen *et al.*, 2020)
- > [The Physiology of Fishes](#) (eds. Currie & Evans, 2020)

Books on more specific subjects are mentioned under the appropriate sections in PREPARE.

Resource hubs

The screenshot shows the RSPCA Science Home website. At the top is the RSPCA logo. Below it is a navigation menu with the following items: Science Home, Companion animals, Farm animals, Animals in science (highlighted), Wildlife, and Animal Sentience. A search icon is located on the right side of the menu. Below the navigation menu are several links: Implementing the 3Rs, Ethical review, Focus on severe suffering, Our international work, and Reports and resources (underlined). A 'Print' icon is also visible. The main content area features a grid of eight resource hubs, each with a representative image and a title:

- Ethical review**: Image of three people in a meeting.
- Culture of care**: Image of a white mouse being held in a hand.
- Severe suffering**: Image of a white mouse.
- Welfare and severity assessment**: Image of a person in a lab coat and mask handling a mouse.
- Housing and care**: Image of a mouse in a cage.
- Refining procedures**: Image of a zebrafish.
- Genetically altered animals and biotechnology**: Image of two mice, one white and one black.
- Non-human primates**: Image of a monkey.

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

norecopa.no/PREPARE

8-Health risks, waste disposal and decontamination

Planning an animal study must include a risk assessment, because of both the potential dangers to health from working directly or indirectly with animals or animal material.

A common factor for many of the health hazards (e.g. micro-organisms and radiation) is that they are difficult to detect. This places a great responsibility upon those who are involved in the hazardous activity, or who have enough knowledge to predict it, and those who are charged with the tasks of containment after accidents and subsequent decontamination. Openness is vital.

8a

Perform a risk assessment, in collaboration with the animal facility, for all persons and animals affected directly or indirectly by the study.

General principles

For fish researchers



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

It goes beyond simply complying with the law!

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

Refinement Wiki



- Main page
- Recent changes
- Random page
- Help about MediaWiki
- Tools
- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link
- Page information
- Cite this page

wiki.norecopa.no



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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

This page was created and edited by KH191219 (talk).

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

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Refinement Wiki

- 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
- 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
- General discussion on use of analgesics
- Genotyping mice
- Habituation training
- 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
- Ketamine and alpha-2 agonist combinations
- Long term anaesthesia in rodents
- Lumpfish
- Main Page
- Marble Burying Test
- Metabolic cages
- Minipumps
- Montanide adjuvant
- Mouse Grimace Scale
- Mouse handling
- Nest building material
- Oestrus suppression in ferrets
- Pneumocystis murina
- Recapping needles
- Rotarod Test
- Screening cell lines
- Sedation of cattle
- Splenectomy
- Sterilisation of instruments
- TTEAM and TTouch
- Tail vein injection
- Tramadol
- Transport stress
- Tumour cell implant into mammary fat pad
- Ulcerative Dermatitis in Mice
- Water quality
- Xenopus laevis
- Zebrafish swabbing

***While we are waiting for the scientific evidence for best practice
in fish research...***

Carol M. Newton (1925-2014)



National Library of Medicine

The three S's

- *Good Science*
- *Good Sense*
- *Good Sensibilities*

<https://norecopa.no/3S>

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Thanks to Norecopa's main sponsors:

- Standing Committee on Business Affairs, Norwegian Parliament
- Norwegian Ministries of Agriculture and Fisheries
- Research Council of Norway
- Laboratory Animals Ltd.
- Architect Finn Rahn's Legacy
- Nordic Society Against Painful Experiments (NSMSD)
- Norwegian Society for Animal Protection (Dyrebeskyttelsen Norge)
- Norwegian Animal Protection Alliance (Dyrevernalliansen)
- Novo Nordisk
- Sanofi
- Scottish Accreditation Board (SAB)
- Stiansen Foundation
- Universities Federation for Animal Welfare (UFAW)
- US Department of Agriculture (USDA)

Graphics: colourbox.com



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Dyrebeskyttelsen Norge







Dyrevernalliansen

Norecopa: PREPARE for better Science



norecopa

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Newsletter no. 3-2020 from Norecopa

Welcome to Norecopa's third newsletter in 2020. *Please share this with your colleagues and friends!* In these difficult times, let us all devote time [to culturing care](#).

You can tip a friend, subscribe or unsubscribe, and share the newsletter on social media using the links above. We are on [Facebook](#) and [Twitter](#).

[All Norecopa's newsletters can be read here](#) and their content is indexed by the search engine on [Norecopa's website](#).

Norecopa also maintains a [newsfeed](#), with English and Scandinavian language items about Laboratory Animal Science in Europe, and [an international Webinar and Meetings Calendar](#), which is updated several times a week.

This newsletter contains the following items (if some links do not work, check that your mail program has opened the whole of the newsletter):

- [Overview of 3R Education and Training Courses](#)
- [Covid-19 and Contingency Plans](#)
- [Resources for home learning](#)
- [Update on the Refinement Wiki](#)
- [Update on PREPARE](#)
- [News from other 3R Centres](#)
- [News of other 3R initiatives](#)
- [Update on the World Congress in Maastricht](#)
- [Glimpses from research](#)
- [Food for thought](#)
- [From the media](#)
- [Webinar and Meetings Calendar](#)
- [Have your colleagues re-subscribed?](#)

English-language newsletters




norecopa.no/news/newsletters

7-8 times a year

1,100 international subscribers

norecopa.no/Aqua3R

English-language newsletters

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 Norecopa on Facebook	Postal address % Norwegian Veterinary Institute P.O. Box 750 Sentrum N-0106 Oslo, Norway	Resources developed in collaboration with:  Norges miljø- og biovitenskapelige universitet  U.S. Department of Agriculture	