

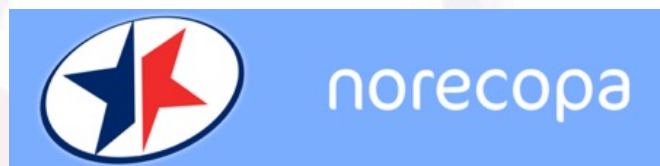
PREPARE guidelines: How to Plan Experiments from Day One

Adrian Smith

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<https://norecopa.no>



FONDAZIONE GUIDO BERNARDINI
BETTER EDUCATION FOR BETTER SCIENCE

Norecopa: PREPARE for better Science

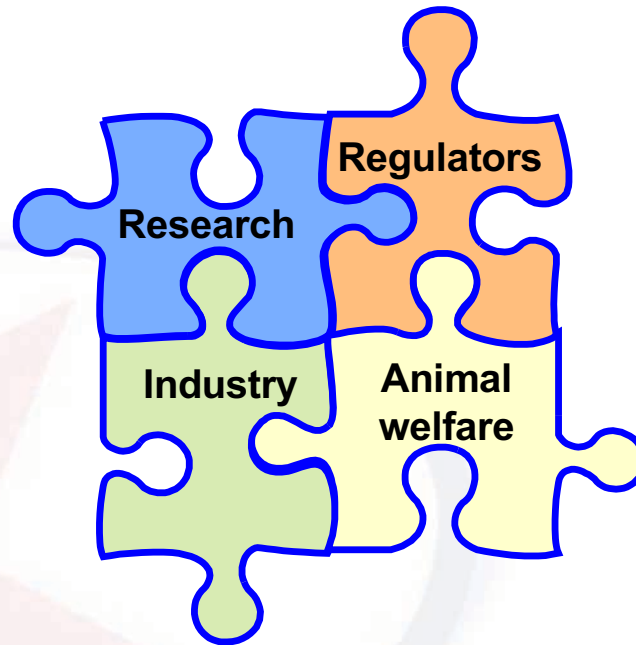


Norecopa is Norway's National **Consensus**-platform,

working to advance ***all the three R's***:

Replacement, Reduction and Refinement

Its Board represents:



Established in 2007

Disclosures about resources which will be mentioned

- *Webmaster for the Norecopa site - information about global guidelines*
- *Lead author of the 3R Guide database of guidelines*
- *Lead author of the PREPARE guidelines*
- *Manager of the Refinement Wiki*

“...better preclinical research”

- Implementation of all three Rs
- valid data (a true treatment effect)
- reproducible and translatable experiments
- best possible animal welfare
- health & safety (of animals and people)
- a culture of care in the research group
- communication of best practice to others



colourbox.com

Harms and Benefits

- *The harm* is experienced **NOW**, and is certain
- The benefit is *in the future*, for *other animals or humans*, and *is uncertain*
- *There are widespread concerns about the standard of animal experiments*



norecopa.no/concerns

We can work to tip the balance

The 3 Rs to minimise the harm:

- *Replace the unnecessary experiments*
- *Reduce the number of animals used*
- *Refine the conditions for the animals*

The 3 Ss - your commonsense and your heart

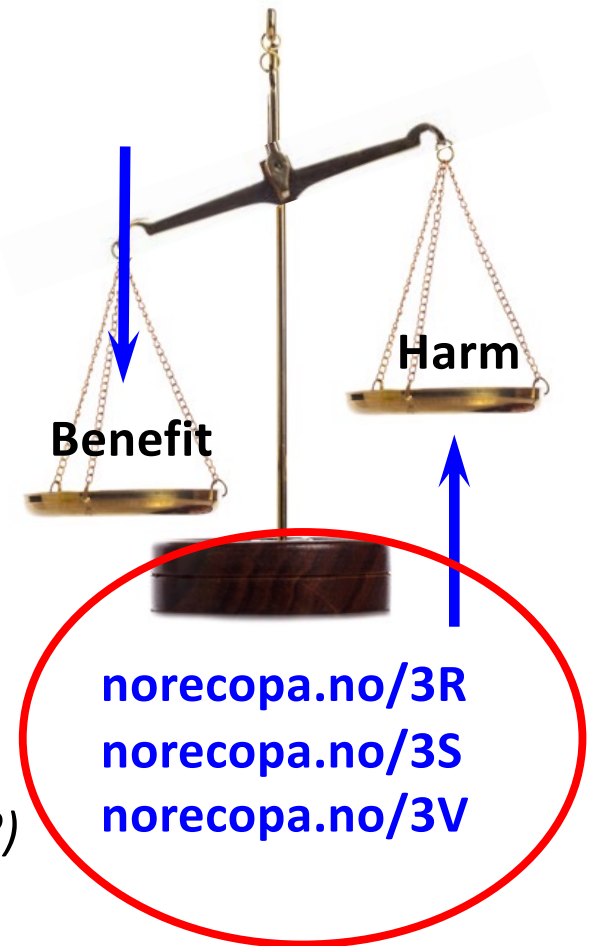
- *Good Science*
- *Good Sense*
- *Good Sensibilities*



The 3 Vs to increase the validity of the experiment:

- *Construct Validity (can the model answer the question?)*
- *Internal Validity (has the experiment been correctly designed?)*
- *External Validity (are the results translatable to the target group?)*

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How do others achieve reproducibility?



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



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...and precision in a variable environment?



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PILOTS



CABIN CREW

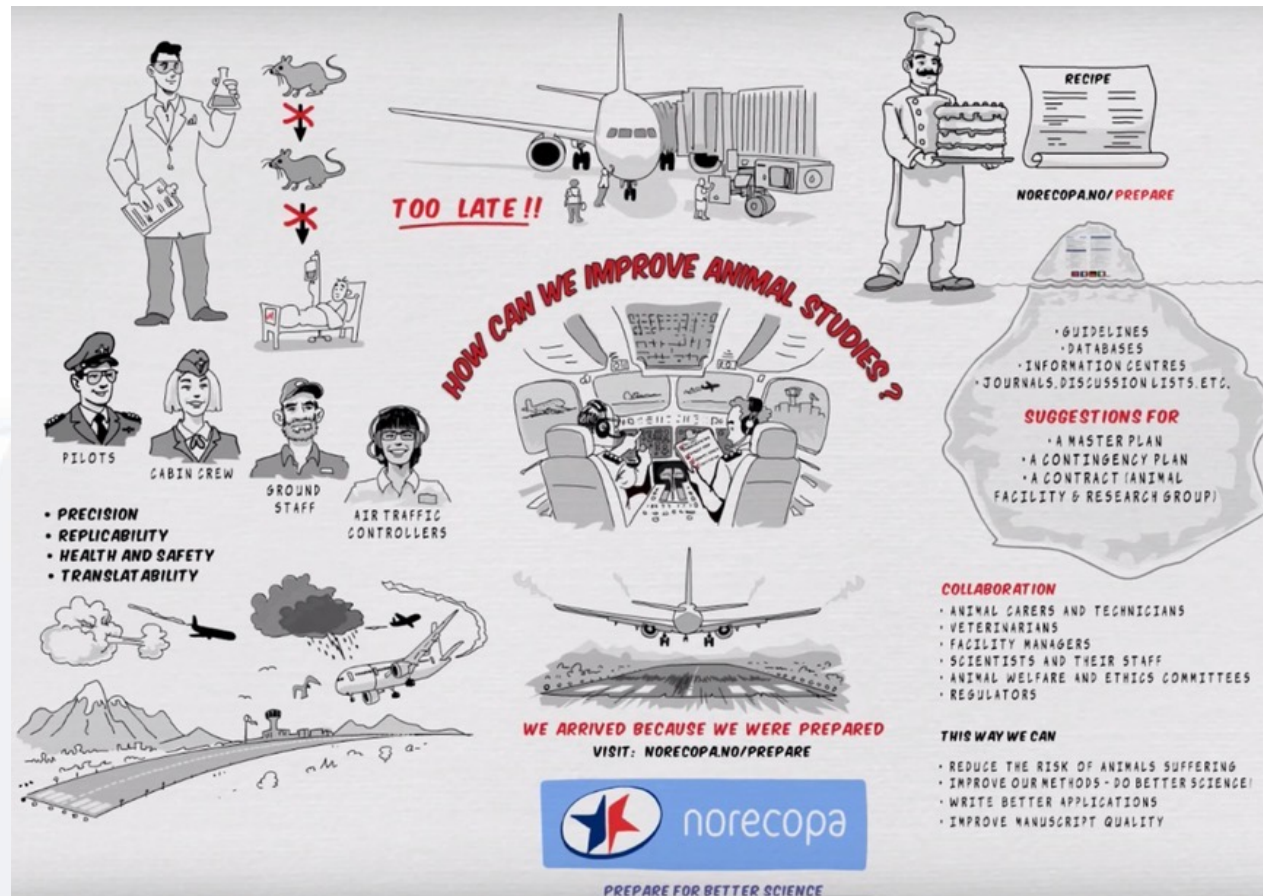


GROUND
STAFF



AIR TRAFFIC
CONTROLLERS

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



Norecopa: PREPARE for better Science



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



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

Norecopa: PREPARE for better Science

no.wikipedia.org/wiki/US_Airways_Flight_1549



norecopa



Hudson River, 2009

en.wikipedia.org

All 155 passengers and crew saved

10-15 checklists even on short routine flights



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
- Make sure that everyone is "**on the same page**"



Rapid evacuation by trained cabin crew saved many lives

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

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



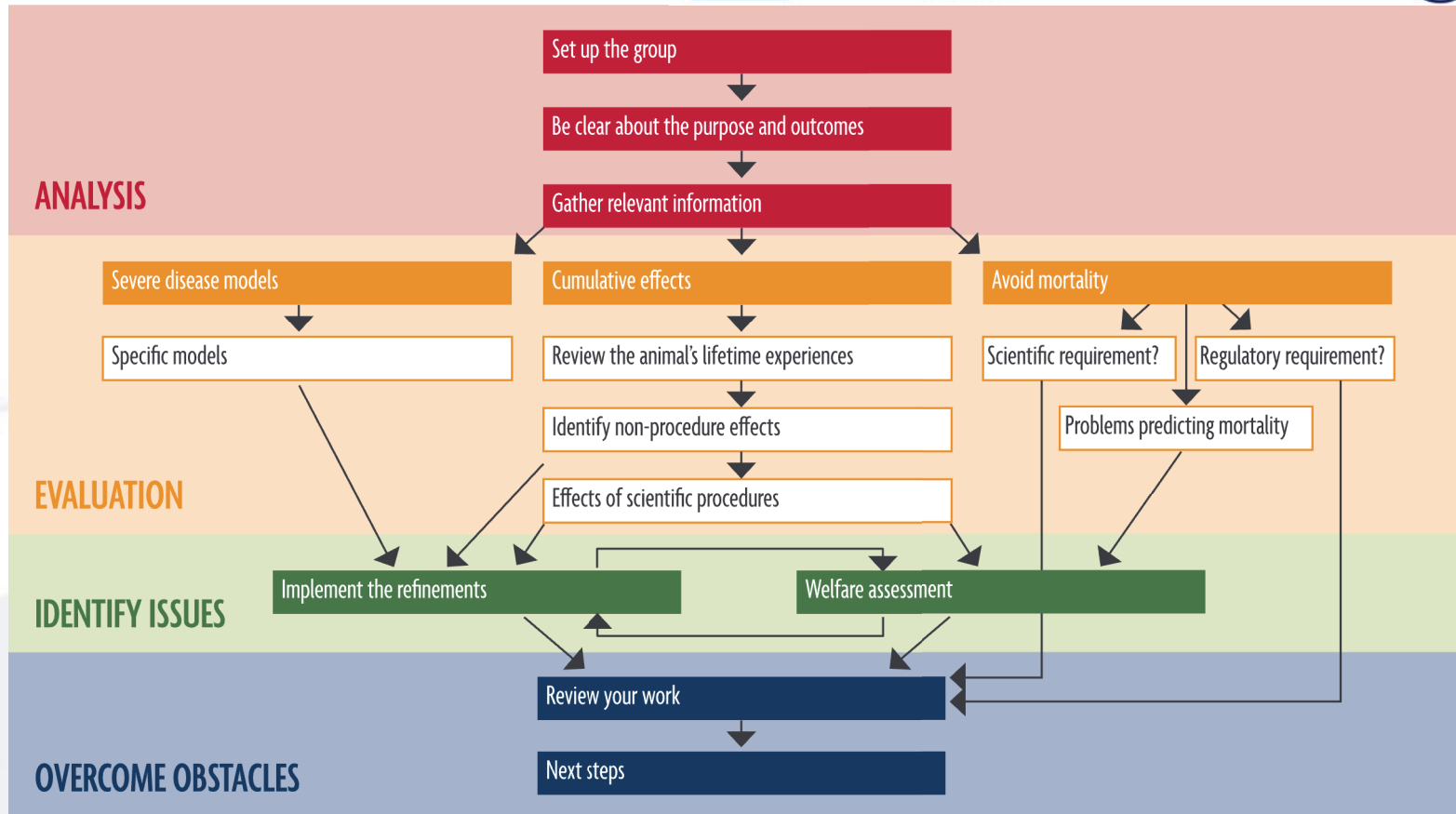
The pathway to better science



Norecopa: PREPARE for better Science

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

A roadmap to reduce severe suffering





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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SAGE

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



Over 27,000 views/downloads from the journal website so far

Also downloadable from norecoba.no/PREPARE

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

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14. Humane killing, release, reuse or rehoming
15. Necropsy

Systematic Reviews

Synthesis of Evidence from published papers

In vitro / in silico research



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 & Trend Brattli⁵
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, Woburn Race Way, Southwater, Haslemere, 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 8140 Dep., 0033 Oslo, Norway; ⁵Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

PREPARE consists of planning guidelines which are complementary to reporting guidelines. PREPARE covers the three broad areas which determine the quality of animal research: the 3Rs (Replacement, Reduction, Refinement) and the 3Ss (Sound Science, Good Sense, Good Availability).

1. Formulation of the study
 2. Design of the study
 3. Experimental design and statistical analysis

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 the 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 availability). <input type="checkbox"/> Consider pre-registration 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"/> Associate 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.

Animal welfare and Three Rs!

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. 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 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 & Brattli T. PREPARE: Guidelines for Planning Animal Research and Testing. *Laboratory Animals*, 2017, DOI: 10.1177/0023677217724923.
 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)



Three versions of the checklist:

The PREPARE Guidelines Checklist
Planning Research and Experimental Procedures on Animals: Recommendations for Excellence
 Adrian J. Smith¹, R. Eddie Clutton², Elliot Lilley¹, Kristine E. Aa. Hanssen¹ & Trond Bratvedt¹
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 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, 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.

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 its 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).
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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.

1. plain pdf file

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	
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Further information
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Three versions of the checklist:

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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.

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Three versions of the checklist:

3. online version

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PREPARE



The PREPARE Guidelines Checklist

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

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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

norecopa.no/PREPARE

- 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).
 - 3d 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

and will any advances in this research only index the title and abstract? 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

**PREPARE is closely linked to
norecopa.no : an updated overview of global 3R resources**



The screenshot shows the norecopa.no website interface. At the top, there is a navigation bar with the norecopa logo and a search bar. A yellow arrow points to the search bar. Below the navigation bar, there is a list of categories including Anaesthesia and analgesia, Animal facilities, Animal welfare organisations, Blood sampling, Culture of care, Email discussion lists, Environmental enrichment, Ethics, Experimental design and reporting, Harm-Benefit Assessment, Health and safety, Health monitoring, Humane endpoints, Humane killing, Journals, Literature searches and systematic reviews, Organisations, Reporting guidelines, Severity classification, and Suppliers.

On the right side, there is a 'Search filters' panel with 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

Below the navigation bar, there is a breadcrumb trail: norecopa.no / More resources / Experimental design and reporting. A green box highlights the text: approx. 9,000 webpages, 350,000 hits annually, and 7-8 detailed newsletters per year.

Design and reporting of animal experiments

This page supplements advice given in [Section 4 of the PREPARE guidelines](#). PREPARE covers all aspects of design (including animal and facility related issues).

Norecopa: PREPARE for better Science

Databases & Guidelines

Published lists of resources are difficult to search and quickly become outdated. Lists on a website are easier to search, but do not enable the use of filters or intelligent search engines.

Norecopa has therefore constructed four databases, which together with all the text on this website can be searched simultaneously using the search field at the top of every page.

- > [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 four 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 publications

Here is [an alphabetical global list of all the databases](#) cited on the Norecopa website.

norecopa.no/databases-guidelines

links to over 70 other databases

Norecopa: PREPARE for better Science

norecopa.no/3RGuide

Links to 415 guidelines



A good practice guide to the administration of substances and removal of blood, including routes and volumes

3R Guide database/c6721 (legacy id: 15079)

This paper provides the researcher in the safety evaluation laboratory with an up-to-date, easy-to-use set of data sheets to aid in the study design process whilst at the same time affording maximum welfare considerations to the experimental animals.

A guide to defining and implementing protocols for the welfare assessment of laboratory animals

3R Guide database/68ba4 (legacy id: 15065)

Eleventh report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement

A guide to the care and use of native Australian mammals in research and teaching

3R Guide database/502ff (legacy id: 15377)

The Guide supports implementation of the Australian Code for the care and use of animals for scientific purposes (8th edition, 2013) and ensures that the specific and unique needs of Australian native mammals are met when these animals are used for scientific purposes.

AAALAC Position Statements

3R Guide database/ef566 (legacy id: 15155)

In connection with its work of accreditation of animal care and use programmes, AAALAC International has issued position statements on a number of key elements in such a programme.



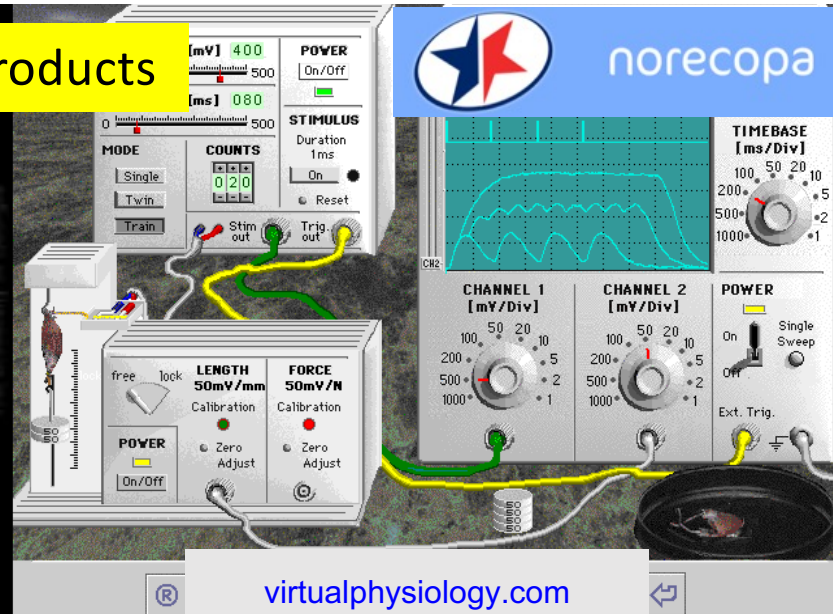
colourbox.com

Norecopa: PREPARE for better Science

NORINA database: approx. 3,000 products



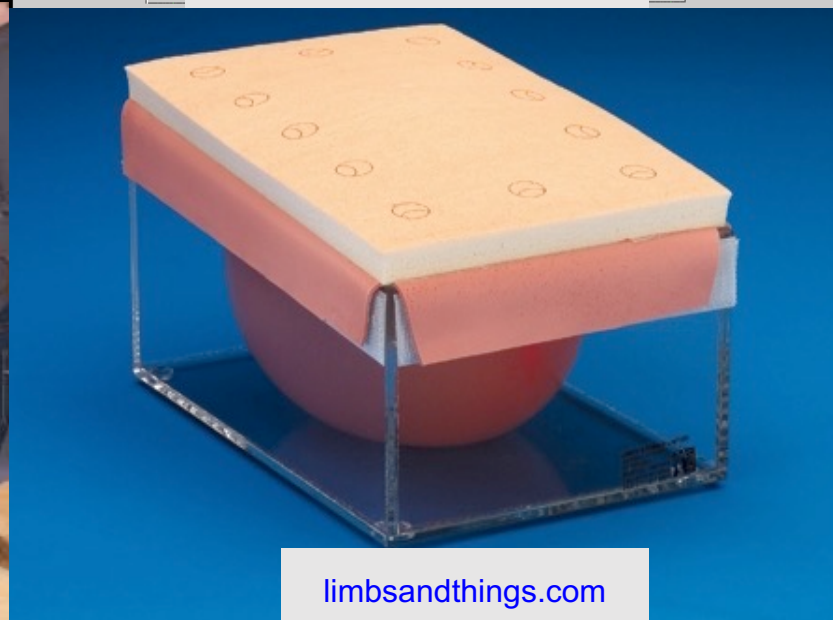
3dglasshorse.com



virtualphysiology.com



rescuecritters.com



limbsandthings.com

norecopa.no/education-training/films-and-slide-shows



Rat s.c. injection
Norecopa | 1,380 views



Testing anaesthetic depth in the chicken
Norecopa | 598 views



Blood sampling from the pig
Norecopa | 3,914 views



Subcutaneous injection in the rabbit
Norecopa | 1,479 views



Rat i.p. injection (method 2)
Norecopa | 1,280 views



Blood collection from the saphenous vein in the mouse
Norecopa | 6,777 views



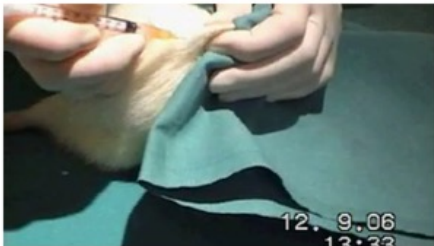
Intravenous injection in a rabbit
Norecopa | 2,025 views



Subcutaneous injection in the chicken
Norecopa | 1,806 views



Anatomía de la rata
Norecopa | 977 views



Subcutaneous injection in the rat - Technique 1
Norecopa | 2,249 views











Lifting a rabbit
Norecopa | 2,420 views












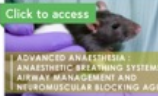
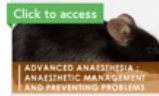


Immobilisation of the rabbit
Norecopa | 2,072 views

Norecopa: PREPARE for better Science

Training resources for animal research

 <p>National Legislation (EU1) Understand the national and international legal and regulatory framework within which projects involving animals are constructed and managed and of the legal responsibilities of the people involved.</p>	 <p>Ethics, Animal Welfare and the 3Rs (EU2) Identify the ethical and welfare issues raised by the use of animals in scientific procedures and understand the basic principles of the 3Rs.</p>
 <p>Basic and Appropriate Biology (EU3) Discover the basic principles of animal behaviour, care, biology and husbandry.</p>	 <p>Animal Care, Health and Management (EU4) Examine information on various aspects of animal health, care and management including: environmental controls, husbandry practices, diet, health status and disease.</p>
 <p>Recognition of Pain, Suffering and Distress (EU5) Identify the normal condition and behaviour of experimental animals and differentiate between a normal animal and one which is showing signs of pain, suffering or distress.</p>	 <p>Humane Methods of Killing (EU6.1) Learn the principles of humane killing including descriptions of the different methods available and information to help you compare the methods permitted to determine the most appropriate method.</p>
 <p>Minor Procedures without Anaesthesia (EU7) An introduction to the theory relating to minor procedures and information about appropriate methods of handling, restraint, appropriate techniques for injection, dosing and sampling relevant to the species.</p>	 <p>Anaesthesia for Minor Procedures (EU20) Guidance and information for individuals who, during their work with animals, will need to apply sedation or short-term anaesthesia for a brief period and mild pain level procedure.</p>

eModules

 <p>Click to access</p> <p>RECOGNITION & PREVENTION OF PAIN, SUFFERING & DISTRESS IN LABORATORY ANIMALS</p> <p>eModule – Recognition and Prevention of Pain, Suffering and Distress (EU5)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>HUMANE METHODS OF KILLING LABORATORY ANIMALS</p> <p>eModule – Humane Methods of Killing (EU6)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>DESIGN OF PROCEDURES AND PROJECTS (LEVEL 1)</p> <p>eModule – Design of procedures and projects (level 1) (EU10)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>DESIGN OF PROCEDURES AND PROJECTS (LEVEL 2)</p> <p>eModule – Design of procedures and projects (level 2) (EU11)</p> <p>ACCESS</p>
 <p>Click to access</p> <p>THE SEVERITY ASSESSMENT FRAMEWORK</p> <p>eModule – The Severity Assessment Framework (EU12)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>LABORATORY ANIMAL ANAESTHESIA FOR MINOR PROCEDURES</p> <p>eModule – Anaesthesia for Minor Procedures (EU20)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>ADVANCED ANAESTHESIA: PRE-ANAESTHETIC PREPARATIONS</p> <p>eModule – Pre-Anaesthetic Preparations (EU21-1)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>ADVANCED ANAESTHESIA: CHOOSING AN ANAESTHETIC</p> <p>eModule – Choosing an Anaesthetic (EU21-2)</p> <p>ACCESS</p>
 <p>Click to access</p> <p>ADVANCED ANAESTHESIA: ANAESTHETIC MONITORING AND INTRAOPERATIVE CARE</p> <p>eModule – Anaesthetic Monitoring and Intraoperative Care (EU21-3)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>ADVANCED ANAESTHESIA: ANAESTHETIC BREATHING SYSTEMS, AIRWAY MANAGEMENT AND NEUROMUSCULAR BLOCKING AGENTS</p> <p>eModule – Anaesthetic Breathing Systems, Airway Management and Neuromuscular Blocking Agents (EU21-4)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>ADVANCED ANAESTHESIA: ANAESTHETIC MANAGEMENT AND PREVENTING PROBLEMS</p> <p>eModule – Anaesthetic Management and Preventing Problems (EU21-5)</p> <p>ACCESS</p>	 <p>Click to access</p> <p>ADVANCED ANAESTHESIA: POST-ANAESTHETIC CARE</p> <p>eModule – Post Anaesthetic Care (EU21-6)</p> <p>ACCESS</p>
 <p>Click to access</p> <p>PROJECT EVALUATION</p> <p>eModule – Project Evaluation (EU25)</p>			

TextBase:

1,500 books related to LAS:

norecopa.no/textbase

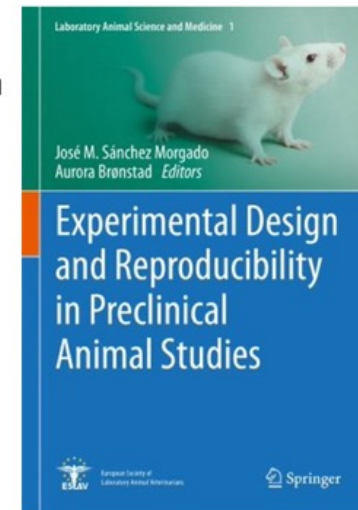
Experimental Design and Reproducibility in Preclinical Animal Studies

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

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

Return to homepage



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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.

[Privacy policy](#) [About Norecopa Wiki](#) [Disclaimers](#)



- 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



EU / National



Facility



Project



Procedure

ec.europa.eu/animals-in-science



EU / National

The screenshot shows the website for "Animals used for scientific purposes" under the "ENVIRONMENT" section of the European Commission. The page includes a navigation menu with options like Home, About us, Policies, Funding, Legal compliance, and News & outreach. The main content area is titled "Animals used for scientific purposes" and includes a sub-section "Retrieval and provision of information on the 'Three Rs' and alternatives". A sidebar on the right contains a dropdown menu for "The 'Three Rs' and alternative approaches" with sub-items like "Replacement, Reduction and Refinement – the 'Three Rs'", "Validation, acceptance and use", "EU activities to advance alternatives", "Member State activities to advance alternatives", "Finding and distributing information on alternatives", and "Key resources".

This is a dropdown menu titled "Legislation and implementation". It contains three items: "EU legislative framework", "Implementation of Directive 2010/63/EU", and "Q&A and guidance documents".

Animals used for scientific purposes



Opinions of European Commission Expert Committees related to the use of animals in experiments

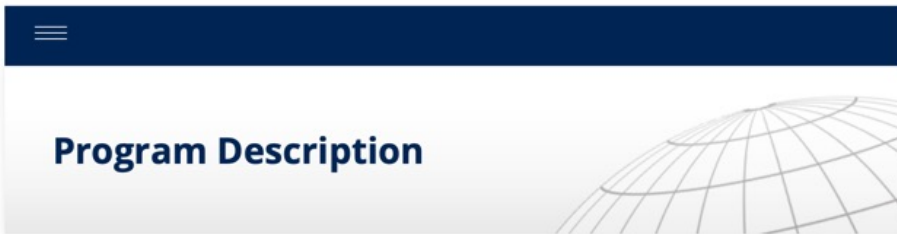


ec.europa.eu/environment/chemicals/lab_animals/pubs_guidance_en.htm

Norecopa: PREPARE for better Science



Facility



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

Norecopa: PREPARE for better Science

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

63 pages



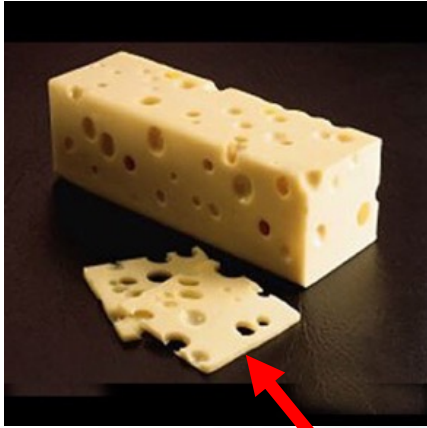
norecopa

A simple but effective Master Plan

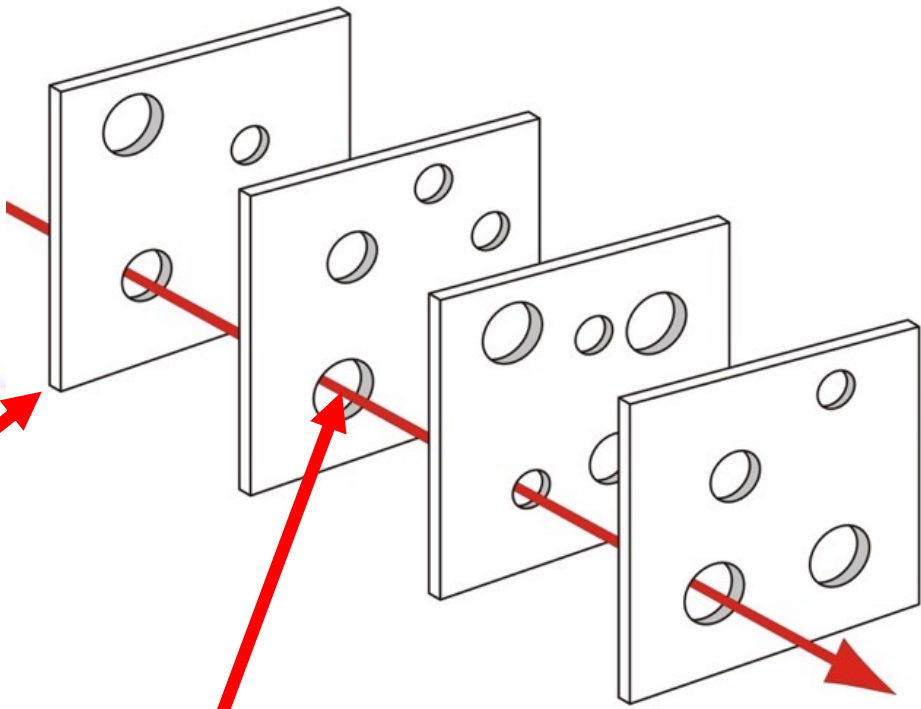


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Threat and Error Management



eaugallecheese.com/Swiss-Cheese



"Layer of defence"
or redundancy

Weakness / hazard

Loss

wikipedia.org/wiki/Swiss_cheese_model

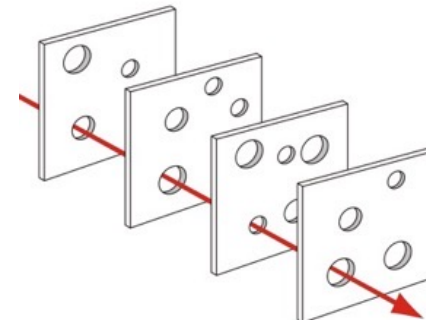
A Contingency Plan, based upon risk assessment

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

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

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

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



Temporary staff at weekends and holidays

Contingency and redundancy

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

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



Photo: NMBU



[wikipedia](#)

Norecopia: PREPARE for better Science



CIRS-LAS Portal

Critical incident reporting system in laboratory animal science

Refine - Reduce - Replace

Homepage

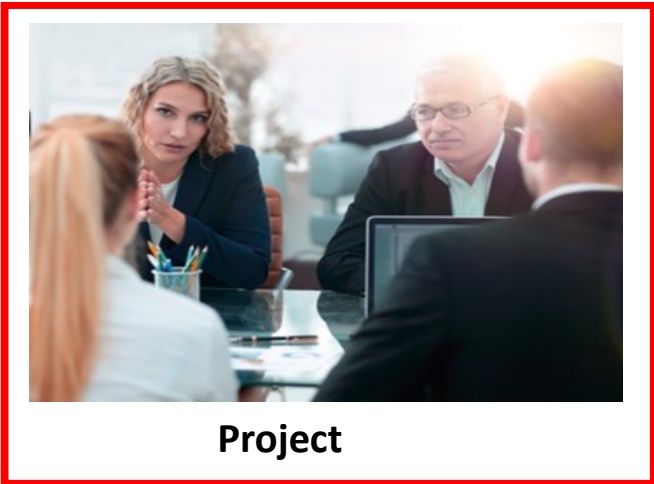
Project

Team

FAQ



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A contract between the animal facility and the research group

- Division of labour, responsibilities and cost
- Clarifying all stages of the experiment
- Ensuring that all necessary data are recorded

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



Procedure

Brain and chest surgery with minimal analgesia

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

experimental protocol, thoracotomy was performed under 50 mg/kg sodium thiopental anesthesia.



Culture of Care

The International Culture of Care Network
norecopa.no/coc

A demonstrable commitment, throughout the establishment, to improving:

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

It goes beyond simply complying with the law!

Norecopa: PREPARE for better Science



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

Culture of Care facilitates honest discussion



"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.



norecopa.no/global3r

Centres

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

Associations

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

Norecopa: PREPARE for better Science

arriveguidelines.org

The ARRIVE guidelines 2.0

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

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

ARRIVE Essential 10

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

Recommended Set

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

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The screenshot shows the ARRIVE guidelines website. The top navigation bar includes 'Home', 'About', 'ARRIVE guidelines', 'Supporters', 'Resources', 'Publications', and 'News'. A left-hand navigation menu lists 14 items, with 'Recommended Set' circled in red. The '11. Abstract' section is highlighted in the menu. The main content area features a 'RECOMMENDED SET' header, a title '11. Abstract', and a purple box with the number '11' and the text: 'Provide an accurate summary of the research objectives, animal species, strain and sex, key methods, principal findings, and study conclusions.' Below this are tabs for 'Explanation' and 'Examples'. The 'Explanation' tab is active, showing a paragraph about the utility of abstracts and a 'References' section with two citations.

ARRIVE

Home About ARRIVE guidelines Supporters Resources Publications News

ARRIVE guidelines

Essential 10

1. Study design

2. Sample size

3. Inclusion and exclusion criteria

4. Randomisation

5. Blinding

6. Outcome measures

7. Statistical methods

8. Experimental animals

9. Experimental procedures

10. Results

Recommended Set

11. Abstract

12. Background

13. Objectives

14. Ethical statement

RECOMMENDED SET

11. Abstract

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

Explanation Examples

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

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

References

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

There are three broad areas which need to be considered when planning animal studies:

1. The suitability of the species or strain as a model of the target organism
2. The ethical issues surrounding their use: '[choosing the right animal for the right reason](#)'. The large increase in use of genetically altered lines has created increasing [concern about the suitability of these animals as models of human conditions](#).
3. Characterisation of the animals. Items to be considered, in collaboration with the supplier, include:
 - > Species, strain, line and phenotype (with an explanation of any genetic modifications)
 - > Age, developmental stage, sex and weight
 - > Stage of oestrous cycle and any previous breeding history
 - > Any necessary pre-treatment (e.g. castration) for this
 - > Name and address of the supplier/breeder, method of capture and transport
 - > [Health status](#) (e.g. germ-free, gnotobiotic, SPF)
 - > Re-use of animals, which should be justified by legislation
 - > Any plans for release or re-homing, which must be justified

More resources

- > [Examples and references](#) from the NC3Rs
- > [Information on inbred strains of mice and rats](#)
- > [Strategies to minimise genetic drift and maximise experimental reproducibility in mouse research](#)
- > [Mouse Locator, UK](#)
- > [The Collaborative Cross panel of inbred mouse strains](#)
- > [Nude mice - more than what meets the eye](#)
- > [The Rat Guide](#)
- > [Rat Behavior and Biology](#)



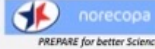
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"We ARRIVED, because we were PREPARED"

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

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Let's PREPARE together to ARRIVE in better shape: how to plan animal experiments

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What's the problem?

Preclinical *in vivo* research needs to be reproducible and translatable, while maximising the animals' welfare and replacing them with alternatives wherever possible. This can be summed up in the 3Rs of Russell & Burch: **Replace, Reduce & Refine**.

Scientists are usually well aware of **reporting** guidelines when publishing research. These are important, but a sub-standard study, like a burnt cake, cannot be improved by a better description. Guidelines for **planning**, although not mandatory, are of great help in designing better experiments.




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What can Norecopa offer?

Norecopa maintains a comprehensive database of resources for scientists, which include:



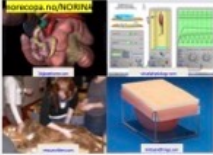


- 8,900 searchable webpages of quality 3R resources, with filters to facilitate searching
- the PREPARE guidelines for planning animal experiments, with a checklist in over 30 languages
- links to recordings of webinars covering all aspects of animal research
- an International Webinars & Meetings Calendar
- a collection of 400 guidelines for planning and conducting animal research
- an English-language newsletter with the latest developments within experimental design
- the NORINA database of alternatives to animal use in education and training
- a Refinement Wiki



Examples of Norecopa's resources:

PREPARE covers:

- ✓ Formulation of a study
- ✓ Dialogue between scientists and the animal facility
- ✓ Quality control of the components in the study



The Refinement Wiki
wiki.norecopa.no

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Thank you for listening!