Norecopa: PREPARE for better Science

Norecopa: PREPARE for better Science

Adrian Smith
adrian.smith@norecopa.no
@adrian_3r

norecopa.no/ACURET

norecopa

norecopa.no

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

and a source of *global* 3R resources

norecopa

https://norecopa.no

Established in 2007

Norecopa: PREPARE for better Science

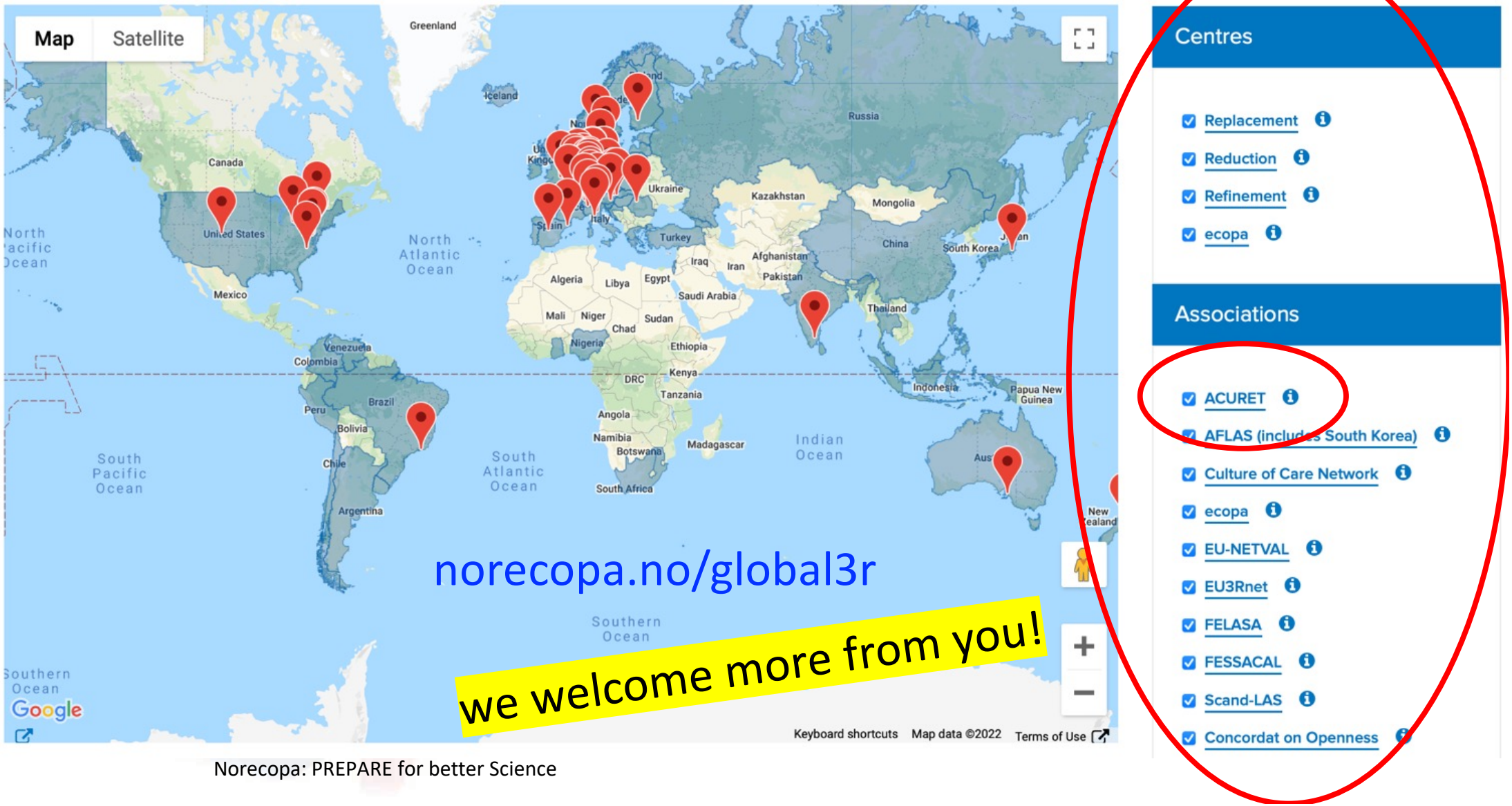
norecopa.no : an updated overview of global 3R resources

approx. 9,000 webpages
1,000 hits per day

7-8 detailed newsletters per year

Norecopa: PREPARE for better Science


norecopa
NORSK ENGLISH
Search:
About Norecopa Alternatives Databases & Guidelines Education Legislation Meetings More resources News PREPARE Species Wiki
Fish 2005 | Wildlife 2008 | Fish 2009 | Agricultural animals 2012 | Field research 2017 | Past meetings |
Meetings Calendar | An informal guide to arranging a scientific meeting | Presentations
norecopa.no / Meetings / Meetings Calendar
norecopa.no/meetings/meetings-calendar
Webinar and Meetings calendar
The influence of age on experimental outcomes and animal care, webinar (Paul Potter), 29 November 2022
SGV 2022 Meeting (Swiss Laboratory Animal Science Association), Lausanne, 29-30 November 2022
Refinement in rodent neurosurgeries, Zurich/online, 30 Novem
ACURET workshop and conference, Abeok
December 2022
+ webpages for recorded meetings
December 202
How can alternatives to animal testing bring benefit to chemical industry, webinar (Barbara Birk), 1 December 2022
Replacement methods for the diagnostics of botulinum neurotoxins: Challenges and recent progress, webinar (Brigitte Dorner), 1 December 2022
The culture of care within the Directive 2010/63/EU, webinar (Susanna Louhimies), 2 December 2022



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

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Published lists of resources are difficult to search and quickly become outdated.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:

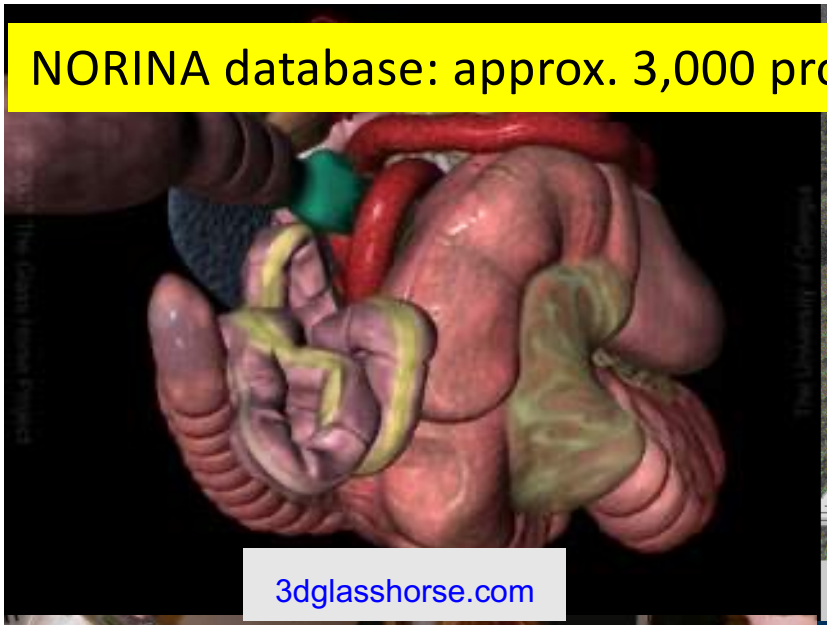
- NAL: a collection of literature references relating to the 3Rs from the US National Agricultural Library
- European Commission datasets:
  - 3Rs Knowledge Sources: over 800 resources collected by the Commission in 2016
  - 3Rs Education and Training Resources, over 560 items collected in 2018
  - Non-animal 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.

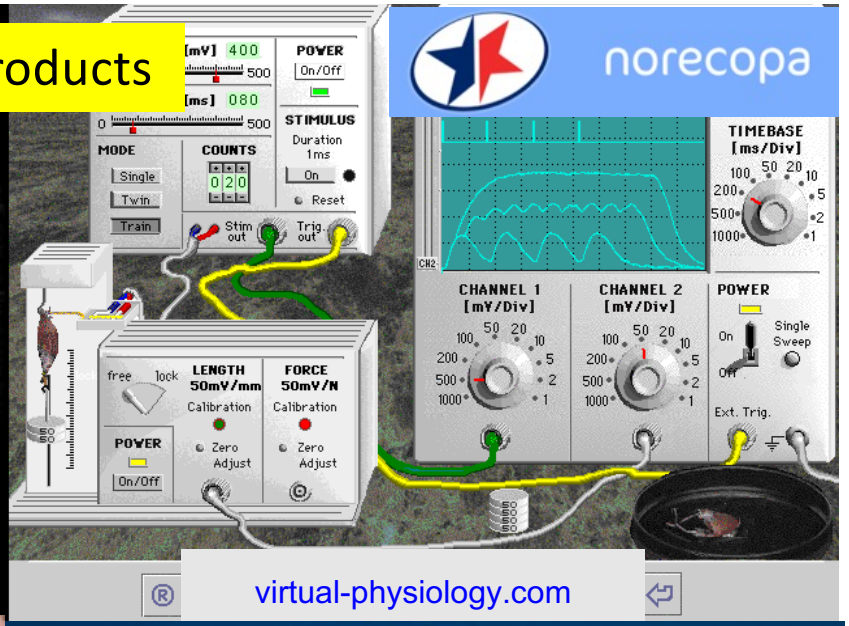
norecopa.no/databases-guidelines

links to over 70 other databases

NORINA database: approx. 3,000 products

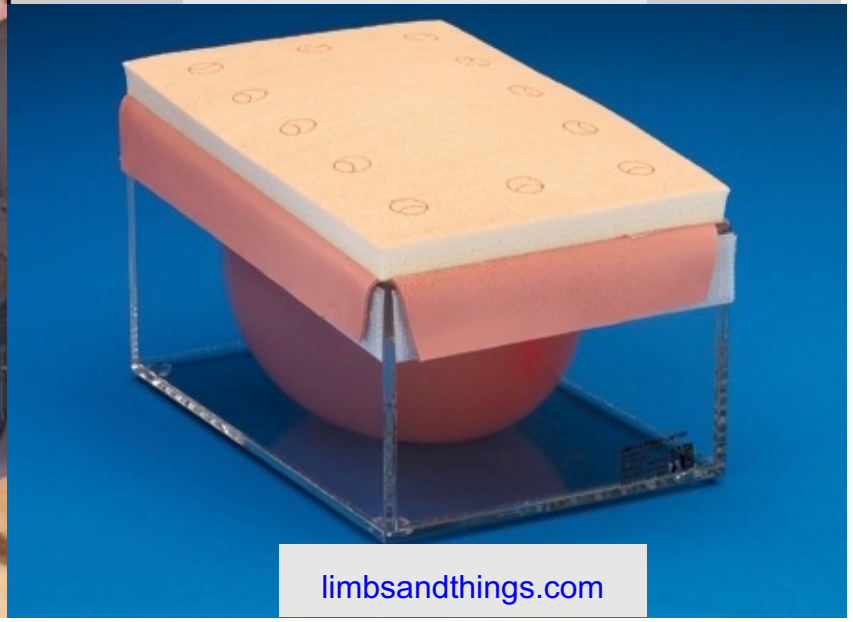


3dglasshorse.com



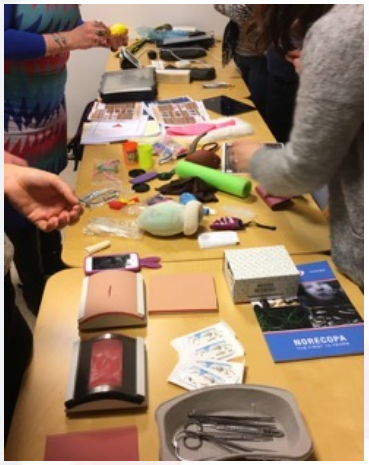
virtual-physiology.com

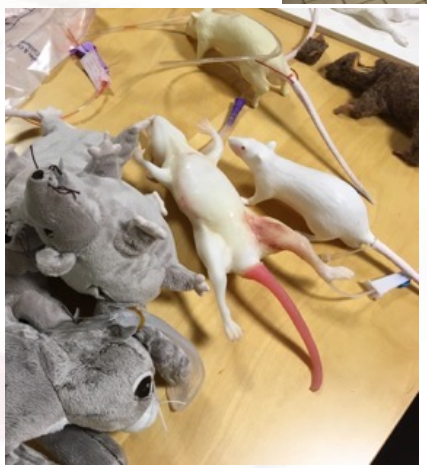
rescuecritters.com



limbsandthings.com

norecopa.no/education-training/homemade-educational-materials





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

norecopa

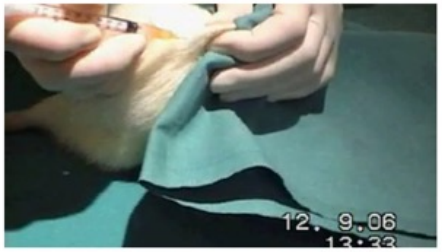
Rat s.c. injection
Norecopa | 1,380 views

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

Anatomia de la rata
Norecopa | 977 views

Testing anaesthetic depth in the chicken
Norecopa | 598 views

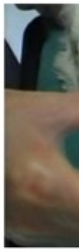
Blood collection from the saphenous vein in the mouse
Norecopa | 6,777 views



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

Blood san
Norecop

Blood san
Norecop



Blood san
Norecop

Blood sampling from the pig
Norecopa | 3,914 views

Intravenous injection in a rabbit
Norecopa | 2,025 views

Lifting a rabbit
Norecopa | 2,420 views

Subcutaneous injection in the rabbit
Norecopa | 1,479 views

Subcutaneous injection in the chicken
Norecopa | 1,806 views

Immobilisation of the rabbit
Norecopa | 2,072 views

Norecopa: PREPARE for better Science

TextBase:

1,500 books related to Laboratory Animal Science

norecopa.no/textbase

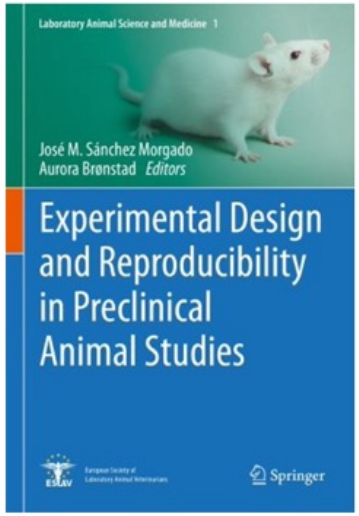
Experimental Design and Reproducibility in Preclinical Animal Studies

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

Record number: 8619d

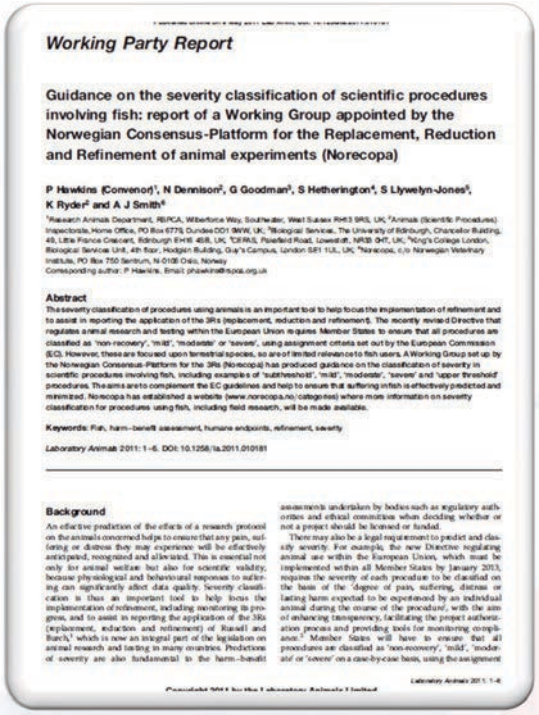
This book provides grounds on how to plan and conduct animal experiments that can be reproduced by others. It touches on factors that may impact the reproducibility of animal studies including: the animal genetic background, the animal microbial flora, environmental and physiological variables affecting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

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



Working Party Report

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

P Hawkins (Convenor)[1], N Dennison[2], G Goodman[3], S Hetherington[4], S Llywelyn-Jones[5], K Ryder[2] and A J Smith[6]

[1]Research Animals Department, RSPCA, Wilberforce Way, Southwater, West Sussex RH13 9RS, UK; [2]Animals (Scientific Procedures) Inspectorate, Home Office, PO Box 6779, Dundee DD1 9WW, UK; [3]Biological Services, The University of Edinburgh, Chancellor Building, 49, Little France Crescent, Edinburgh EH16 4SB, UK; [4]CEFAS, Pakefield Road, Lowestoft, NR33 0HT, UK; [5]King's College London, Biological Services Unit, 4th floor, Hodgkin Building, Guy's Campus, London SE1 1UL, UK; [6]Norecopa, c/o Norwegian Veterinary Institute, PO Box 750 Sentrum, N-0106 Oslo, Norway
Corresponding author: P Hawkins. Email: phawkins@rspca.org.uk

Abstract

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

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

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

Background

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

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

AVMA Guidelines for the Euthanasia of Animals: 2020 Edition*

Members of the Panel on Euthanasia

Steven Leary, DVM, DACLAM (Chair); Fidelis Pharmaceuticals, High Ridge, Missouri
Wendy Underwood, DVM (Vice Chair); Indianapolis, Indiana
Raymond Anthony, PhD (Ethicist); University of Alaska Anchorage, Anchorage, Alaska
Samuel Cartner, DVM, MPH, PhD, DACLAM (Lead, Laboratory Animals Working Group); University of Alabama at Birmingham, Birmingham, Alabama
Temple Grandin, PhD (Lead, Physical Methods Working Group); Colorado State University, Fort Collins, Colorado
Cheryl Greenacre, DVM, DABVP (Lead, Avian Working Group); University of Tennessee, Knoxville, Tennessee
Sharon Gwaltney-Brant, DVM, PhD, DABVT, DABT (Lead, Noninhaled Agents Working Group); Veterinary Information Network, Mahomet, Illinois
Mary Ann McCrackin, DVM, PhD, DACVS, DACLAM (Lead, Companion Animals Working Group); University of Georgia, Athens, Georgia
Robert Meyer, DVM, DACVAA (Lead, Inhaled Agents Working Group); Mississippi State University, Mississippi State, Mississippi
David Miller, DVM, PhD, DACZM, DACAW (Lead, Reptiles, Zoo and Wildlife Working Group); Loveland, Colorado
Jan Shearer, DVM, MS, DACAW (Lead, Animals Farmed for Food and Fiber Working Group); Iowa State University, Ames, Iowa
Tracy Turner, DVM, MS, DACVS, DACVSMR (Lead, Equine Working Group); Turner Equine Sports Medicine and Surgery, Stillwater, Minnesota
Roy Yanong, VMD (Lead, Aquatics Working Group); University of Florida, Ruskin, Florida

AVMA Staff Consultants

Cia L. Johnson, DVM, MS, MSc; Director, Animal Welfare Division
Emily Patterson-Kane, PhD; Animal Welfare Scientist, Animal Welfare Division

The following individuals contributed substantively through their participation in the Panel's Working Groups, and their assistance is sincerely appreciated.
Inhaled Agents—Scott Helms, DVM, DABVP; Lee Niel, PhD; Daniel Weary, PhD
Noninhaled Agents—Virginia Fajt, DVM, PhD, DACVCP
Physical Methods—Rose Gillesby, DVM; Jeff Hill, PhD; Jennifer Woods, BSc
Aquatics—Craig Harms, DVM, PhD, DACZM; Nick Saint-Erne, DVM; Michael Stoskopf, DVM, PhD, DACZM
Avian—Laurel Degernes, DVM, MPH, DABVP; Laurie Hess, DVM, DABVP; Kemba Marshall, DVM, DABVP; James Morrisey, DVM, DABVP; Joanne Paul-Murphy, DVM, DACZM, DACAW
Companion Animals—Kathleen Cooney, MS, DVM; Stacey Frick, DVM; John Mays; Rebecca Rhoades, DVM
Equids—Fairfield Bain, DVM, MBA, DACVIM, DACVP, DACVECC; Thomas R. Lenz, DVM, MS, DACT; Nathaniel Messer IV, DVM, DABVP; Stuart Shoemaker, DVM, DACVS
Food and Fiber Animals—Eric Benson, PhD; C. Scanlon Daniels, DVM, MBA; John Deen, DVM, PhD, DABVP, DACAW; John Gilliam, DVM, MS, DACVIM, DABVP; Dee Griffin, DVM, MS; Glen Johnson, DVM; James Kober, DVM; Meghann Riordon, VMD, DACAW; Paul Plummer, DVM, DACVIM-LA; Richard Reynnells, PhD; James Reynolds, DVM, MPVM, DACAW; Bruce Webster, PhD
Laboratory Animals—James Arrowsmith, MS, DVM, DACLAM; Larry Carbone, DVM, PhD, DACLAM; Paul Flecknell, VetMB, MRCVS, PhD, DECVA, DECLAM, DACLAM, FRCVS; David P. Friedman, PhD; Debra Hickman, DVM, DACLAM, DACAW; Kathleen Pritchett-Corning, DVM, DACLAM, MRCVS
Reptiles, Zoo and Wild Animals—Scott Citino, DVM, DACZM; Mark Drew, DVM, MS, DACZM; Julie Goldstein, DVM; Barry Hartup, DVM, PhD; Gregory Lewbart, MS, VMD, DACZM; Douglas Mader, MS, DVM, DABVP, FRSM; Patrick Morris, DVM, DACZM

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

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

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

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

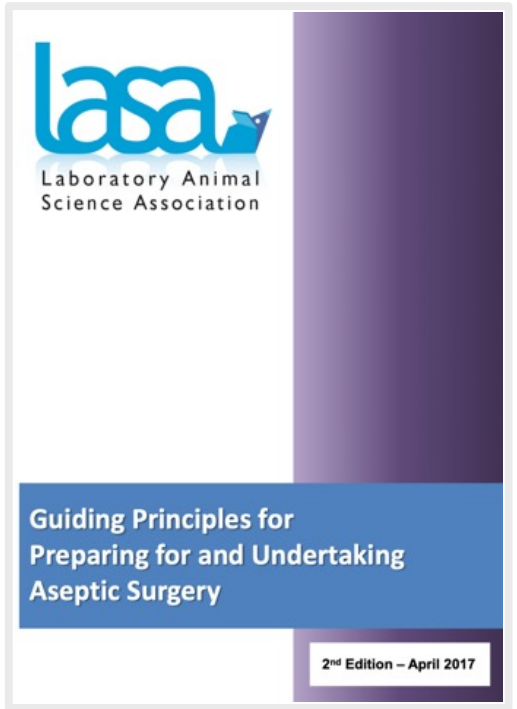
Summary — Systematic reviews are generally regarded by professionals in the field of evidence-based medicine as the highest level of medical evidence, and they are already standard practice for clinical studies. However, they are not yet widely used nor undertaken in the field of animal experimentation,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

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

Address for correspondence: *Carlijn Hooijmans, Radboud University Nijmegen Medical Centre, Central Animal Laboratory and 3R Research Centre, Geert Grooteplein Noord 29, route 231, 6525 EZ Nijmegen, The Netherlands.*
E-mail: C.Hooijmans@cdl.umcn.nl

Introduction

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



Norecopa: PREPARE for better Science

The Path to better Science

Norecopa: PREPARE for better Science

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

What are the challenges on the path to better Science?

- 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

We cannot improve our research by

better reporting alone...

Start in the kitchen!

reddit.com

NATURE | NEWS FEATURE

1,500 scientists lift the lid on reproducibility

Survey sheds light on the 'crisis' rocking research.

Monya Baker

25 May 2016 | Corrected: 28 July 2016

norecopa

Frequently highlighted causes of the "reproducibility crisis"

1. Publication bias (reporting only positive results)
2. Lack of randomisation and blinding
3. Low statistical power
4. P-value hacking (manipulating data to obtain significance)
5. HARK-ing (Hypothesizing After the Results are Known)

norecopa.no/concerns

HARK-ING

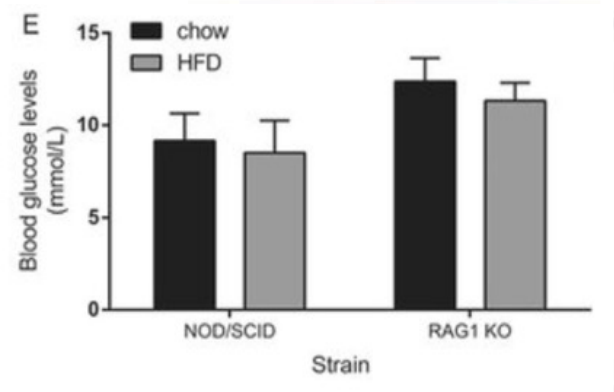
Hypothesizing **A**fter the **R**esults are **K**nown

Dirk-Jan Hoek, CC-BY.

norecopa.no/concerns

Scientists and animal carers must be on the same path...

The scientist



The mouse

Breeding
New social groups
Transportation
Acclimation to the research facility
Allocation to experimental group
Adaptation to new diet
Handling and immobilisation

Blood sampling

often also:
injections, gavaging, surgery
pain and distress
developing illness and death

Stress caused by capture and handling

INDEPENDENT

News › Science

Scores of scientific studies based on mice thrown into doubt because they wer

Mice picl
naturally

't act

Ian Johnstor

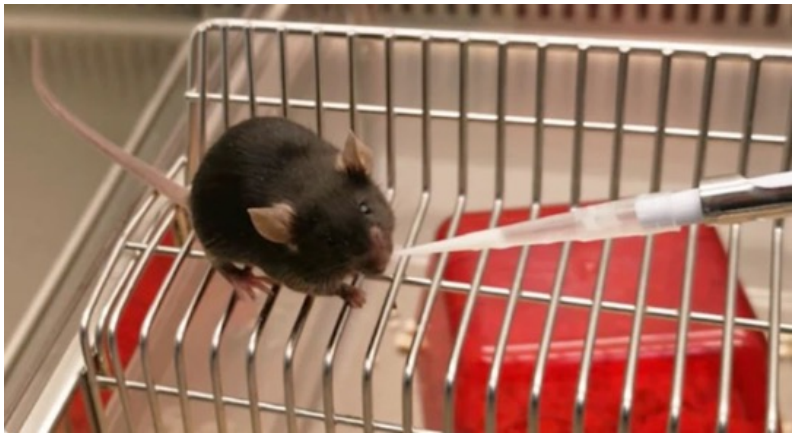
nc3rs.org.uk/3rs-resources/mouse-handling

Artefacts caused by poor administration techniques

Photo: NMBU

- *Are you sure that your injection ends up in the same place each time?*
- *Are they realistic? (intramuscular injections in small animals)*

photo: NMBU



nature.com/articles/s41684-021-00723-0.epdf

youtube.com/watch?v=bdtVZtrr69c

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

'A simple' case: a researcher wants a blood sample

medipoint.co ml/for_use_ nice.html

theodor m/roden boratory/ d_collectio l

vimeo.com/486368886

photo:NMBU

The best blood sampling techniques are those where you can:

- ✓ see the blood vessel
- ✓ regulate the amount of blood you remove
- ✓ stop the bleeding easily (including internal bleeding)
- ✓ avoid damage to the surrounding tissue
- ✓ collect samples rapidly, to avoid artefacts due to mechanical stress, temperature changes, differing lengths of sampling time

A simple but effective Master Plan

Norecopa: PREPARE for better Science

A contract between the animal facility and the research group

Division of labour, responsibilities and cost

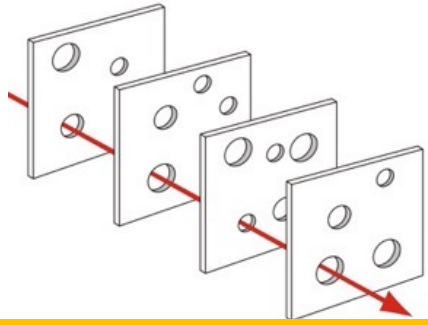
Clarifying all stages of the experiment

Ensuring that all necessary data are recorded

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

A Contingency Plan, based upon risk assessment

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



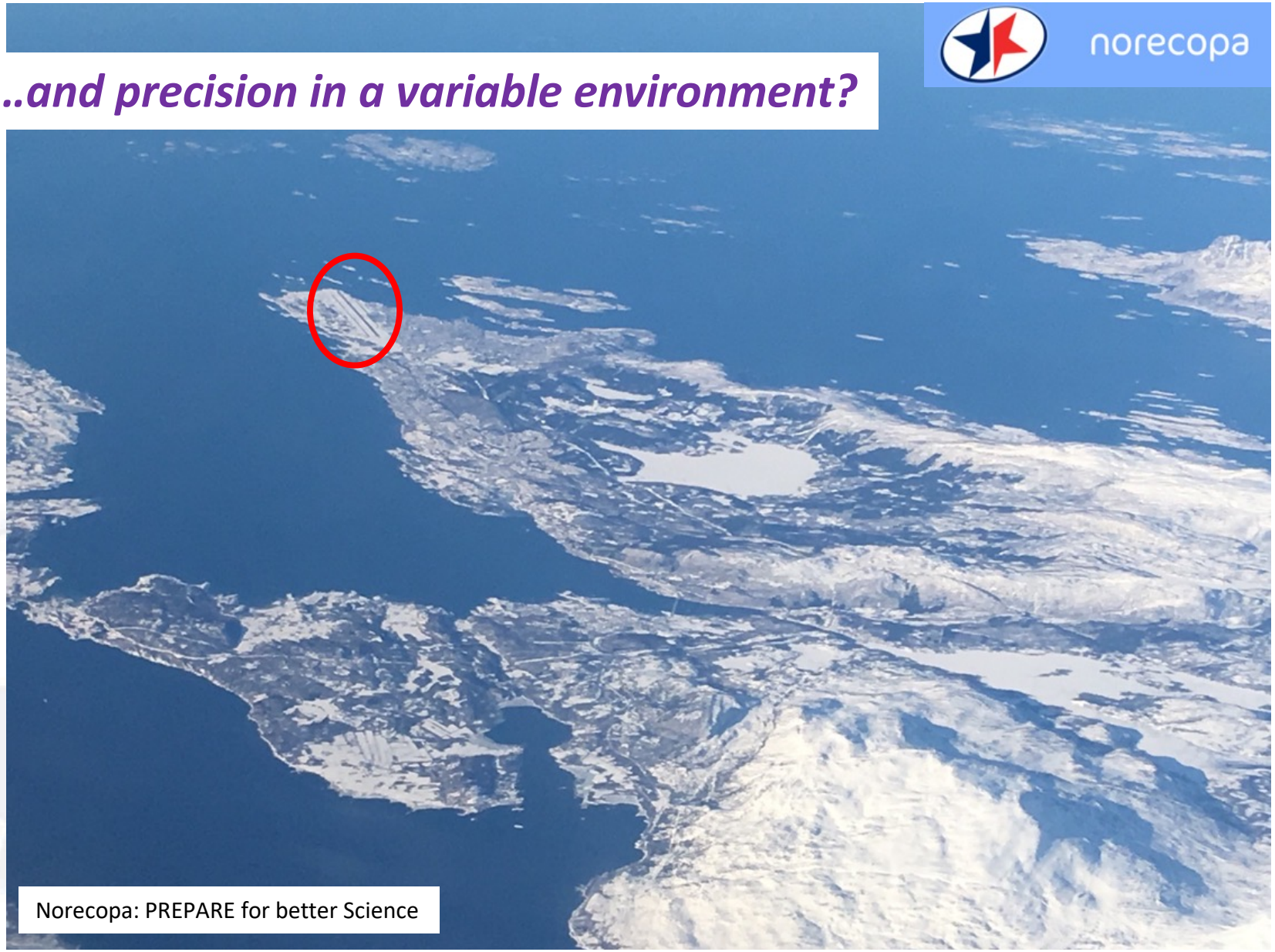
Temporary staff at weekends and holidays

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

How do others achieve reproducibility?

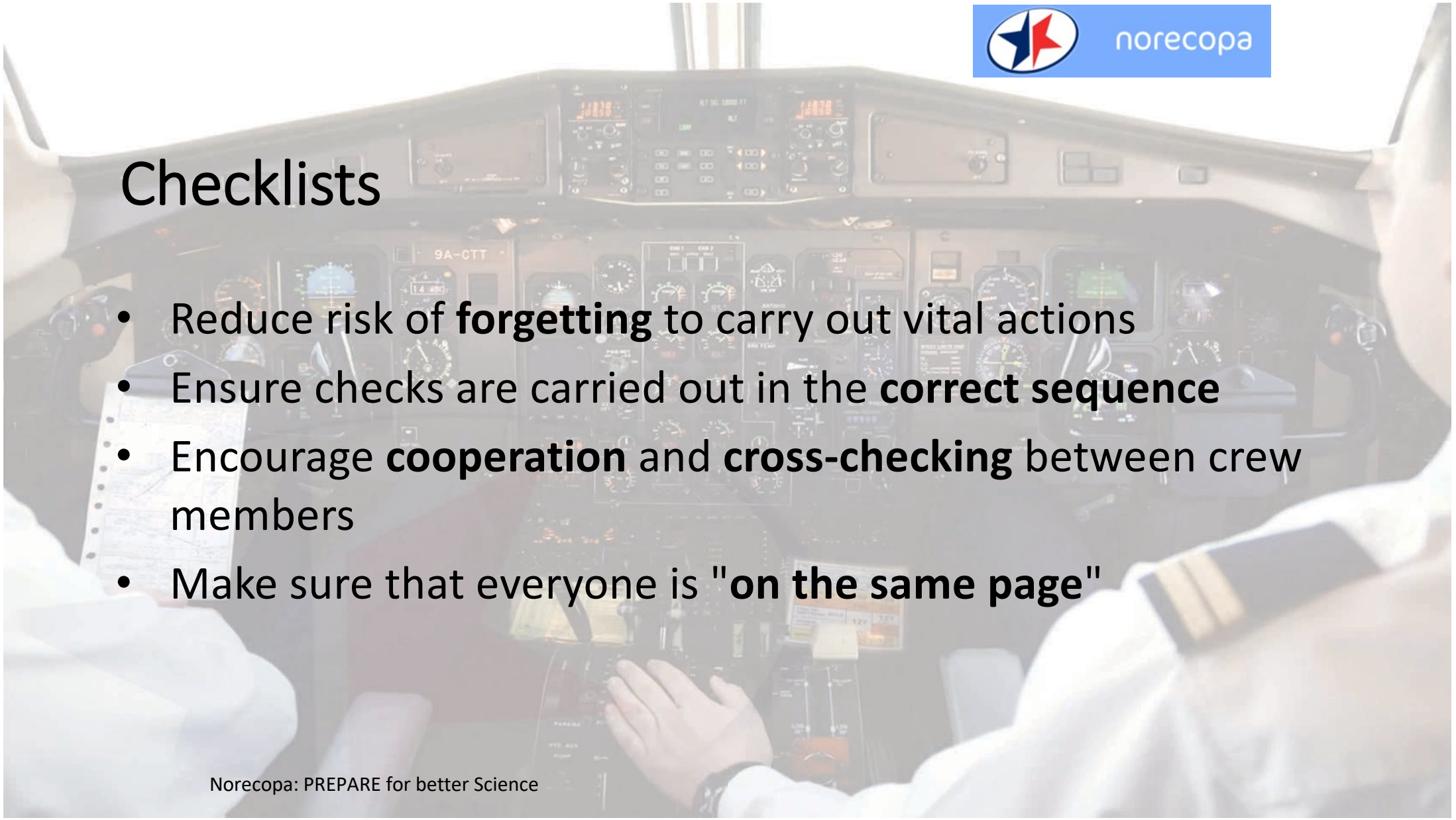
https://www.meonuk.com/runway-markings-explained

…and precision in a variable environment?



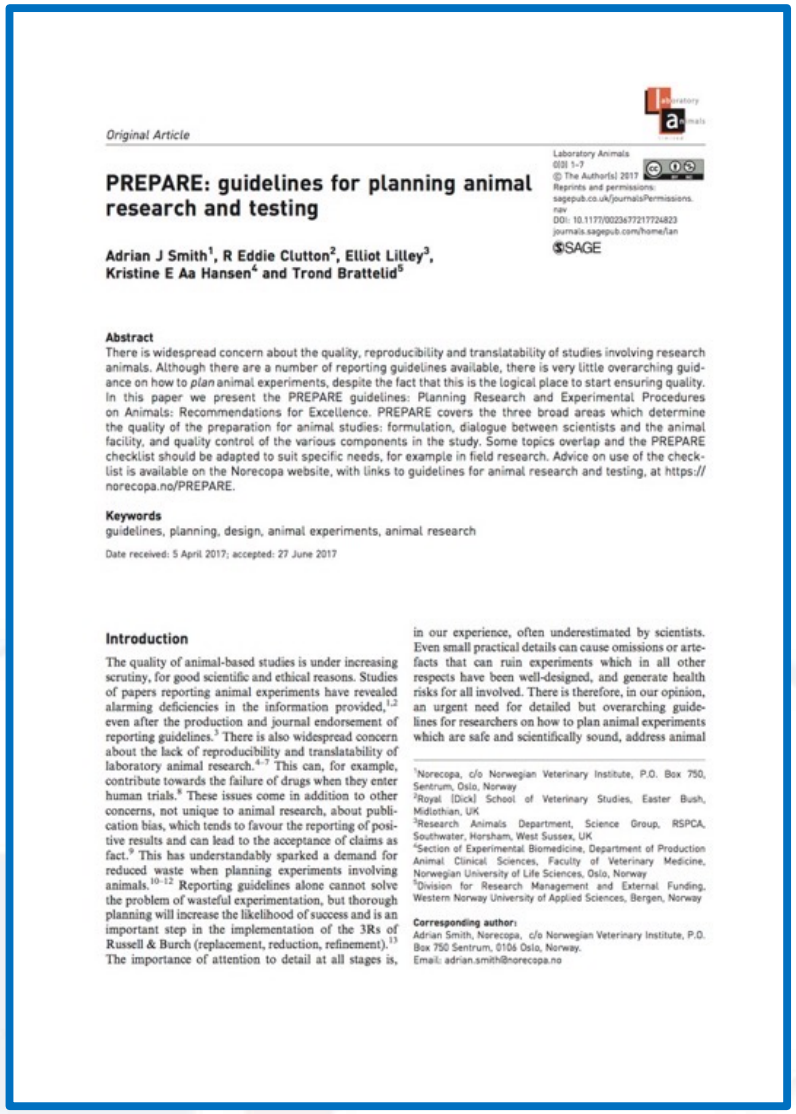
Norecopa: PREPARE for better Science

10-15 checklists even on short routine flights



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**"



Original Article

PREPARE: guidelines for planning animal research and testing

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

Laboratory Animals
0(0) 1–7

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

Abstract

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

Keywords

guidelines, planning, design, animal experiments, animal research

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

Introduction

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

[1]Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750, Sentrum, Oslo, Norway
[2]Royal [Dick] School of Veterinary Studies, Easter Bush, Midlothian, UK
[3]Research Animals Department, Science Group, RSPCA, Southwater, Horsham, West Sussex, UK
[4]Section of Experimental Biomedicine, Department of Production Animal Clinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences, Oslo, Norway
[5]Division for Research Management and External Funding, Western Norway University of Applied Sciences, Bergen, Norway

Corresponding author:
Adrian Smith, Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway.
Email: adrian.smith@norecopa.no

Norecopa: PREPARE for better Science

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 25,000 downloads from the journal website so far

Also downloadable from norecopa.no/PREPARE

PREPARE:

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

PREPARE covers 15 topics:

Formulation of the study

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

Dialogue between scientists and the animal facility

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

Methods

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

Items in pink are not typically highlighted in reporting guidelines

norecopa.no/PREPARE/prepare-checklist

PREPARE

norecopa

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 Bratteli[d]

[a]Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; [b]Royal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; [c]Research Animals Department, Science Group, RSPCA, Wilberforce Way, Southwater, Horsham, West Sussex, RH13 9RS, U.K.; [d]Section 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; [e]Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

PREPARE[1] consists of planning guidelines which are complementary to reporting guidelines [illegible]. PREPARE covers the three broad areas which determine the quality of [illegible]:

1. Formulation of the study
2. Dialogue between [illegible]

[illegible] is available on the Norecopa website. The [illegible] will evolve as more species- and situation-specific guidelines are produced, and [illegible] Laboratory Animal Science progresses.

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

References

1. Smith AJ, Clutton RE, Lilley E, Hansen KEA & Brattelid T. PREPARE: Guidelines for Planning Animal Research and Testing. *Laboratory Animals*. 2017; DOI: 10.1177/0023677217724823.
2. Kilkenny C, Browne WJ, Cuthill IC *et al.* Improving Bioscience Research Reporting: The ARRIVE Guidelines for Reporting Animal Research. *PloS Biology*. 2010; DOI: 10.1371/journal.pbio.1000412.

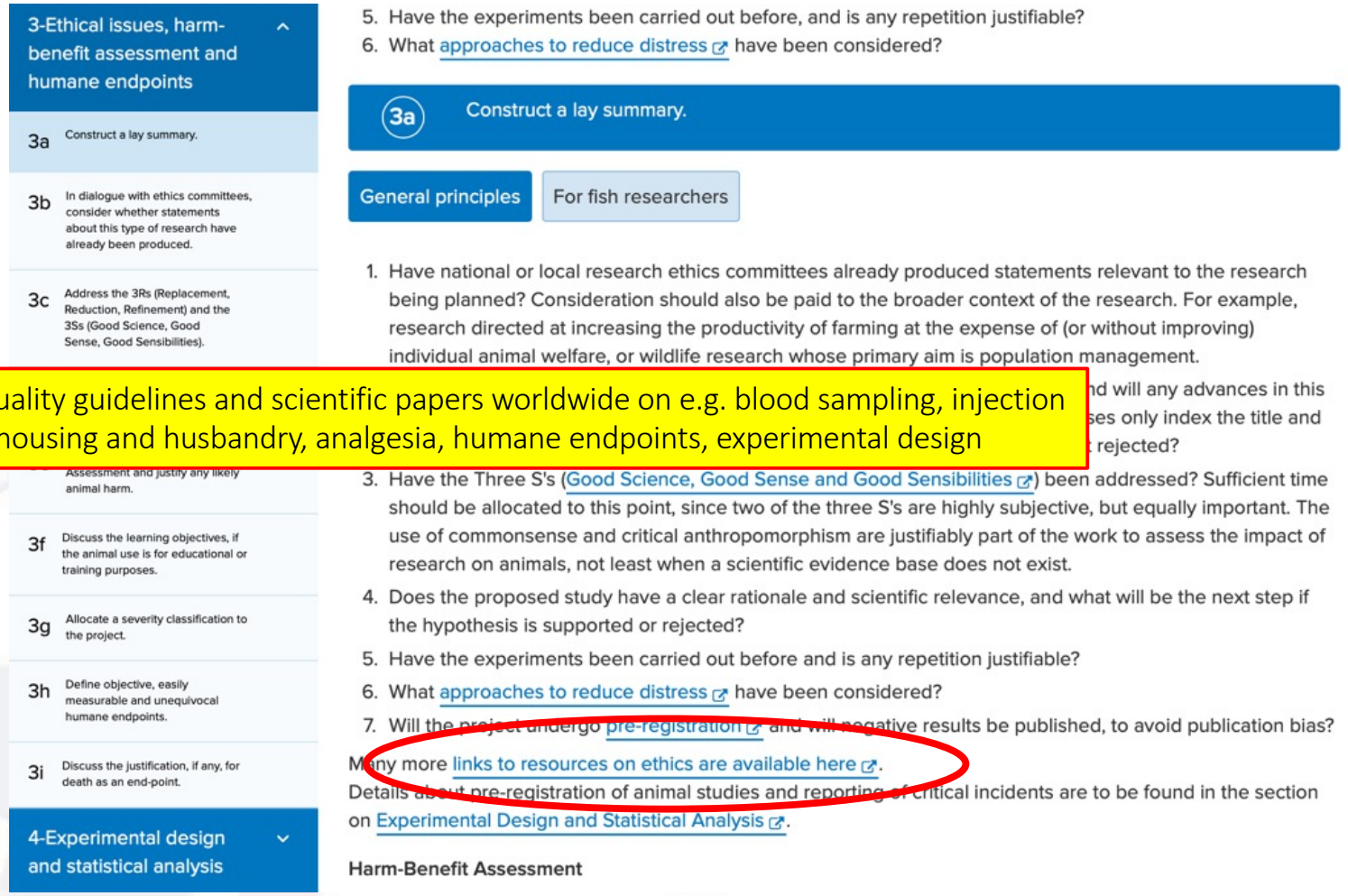
Further information
https://norecopa.no/PREPARE / post@norecopa.no / @norecopa

Norecopa: PREPARE for better Science

In addition to the checklist, much more information is available on:

norecopa.no/PREPARE

norecopa.no/PREPARE



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

Norecopa: PREPARE for better Science

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

While we are waiting for the scientific evidence…

Carol M. Newton (1925-2014)

National Library of Medicine

The three S's

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

https://norecopa.no/3S

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!

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.


Map
Satellite
Greenland
Iceland
Finland
Sweden
Norway
Russia
United Kingdom
Poland
Germany
Ukraine
Kazakhstan
Mongolia
France
Spain
Italy
Turkey
China
South Korea
Japan
Canada
United States
North Atlantic Ocean
Iraq
Iran
Afghanistan
Pakistan
Algeria
Libya
Egypt
Saudi Arabia
India
Thailand
Mexico
Mali
Niger
Sudan
Chad
Nigeria
Ethiopia
Venezuela
Colombia
Kenya
DRC
Tanzania
Indonesia
Papua New Guinea
Brazil
Peru
Angola
Bolivia
Namibia
Botswana
Madagascar
Indian Ocean
South Pacific Ocean
South Atlantic Ocean
Chile
Australia
South Africa
Argentina
New Zealand
norecopa.no/coc
Culture of Care Network
Google
Keyboard shortcuts
Map data ©2022
Terms of Use

Norecopa: PREPARE for better Science

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

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

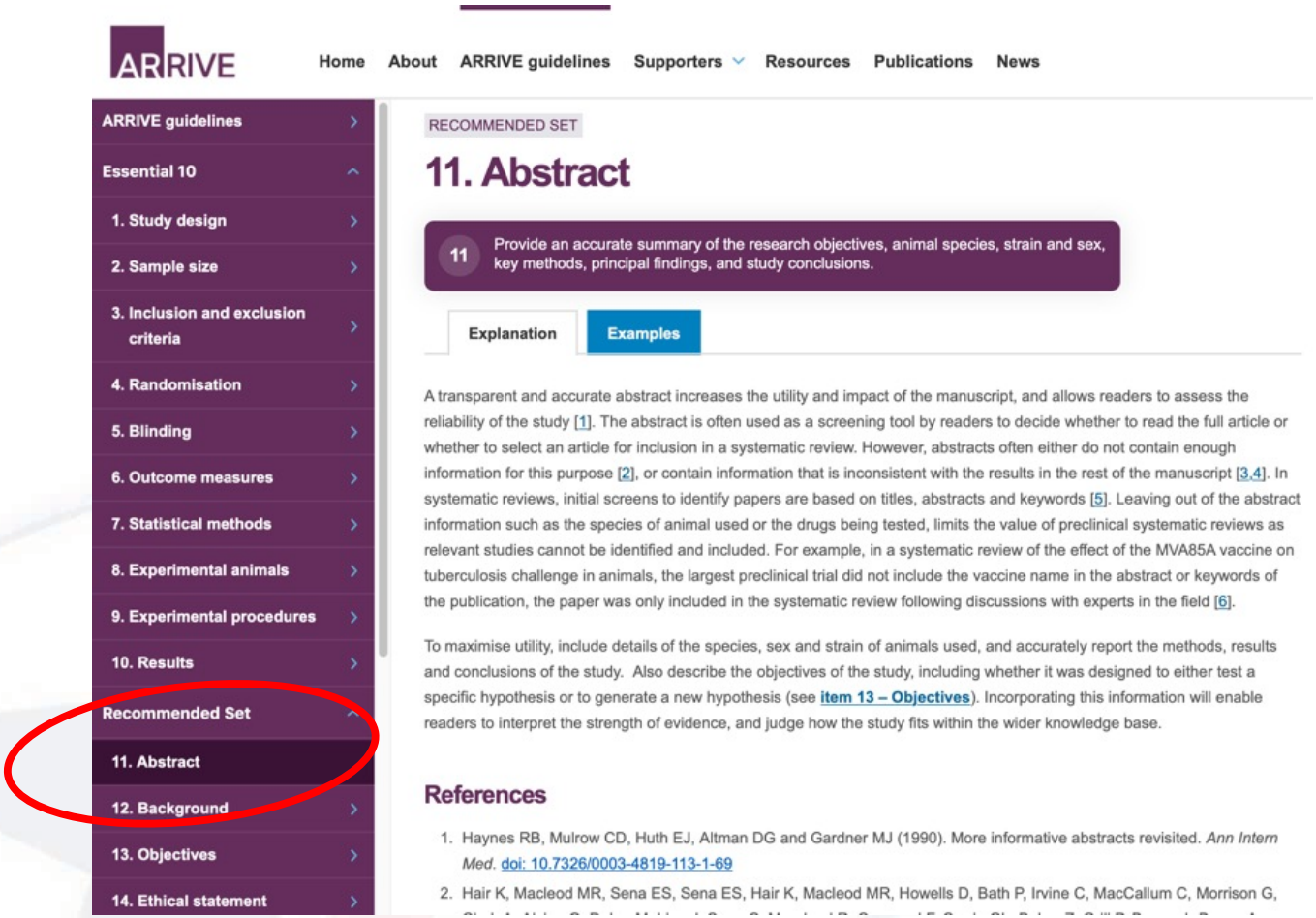
These ten items are the basic minimum that must be included in any manuscript describing animal research. Without this information readers and reviewers cannot assess the reliability of the findings.

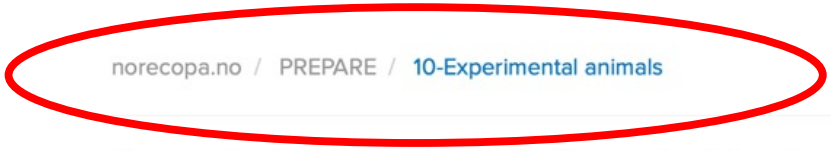
Recommended Set

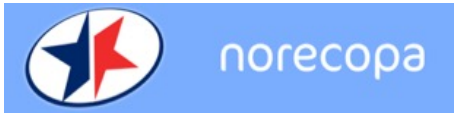
These items complement the Essential 10 set and add important context to the study described. Reporting the items in both sets represents best practice.

Norecopa: PREPARE for better Science

arriveguidelines.org







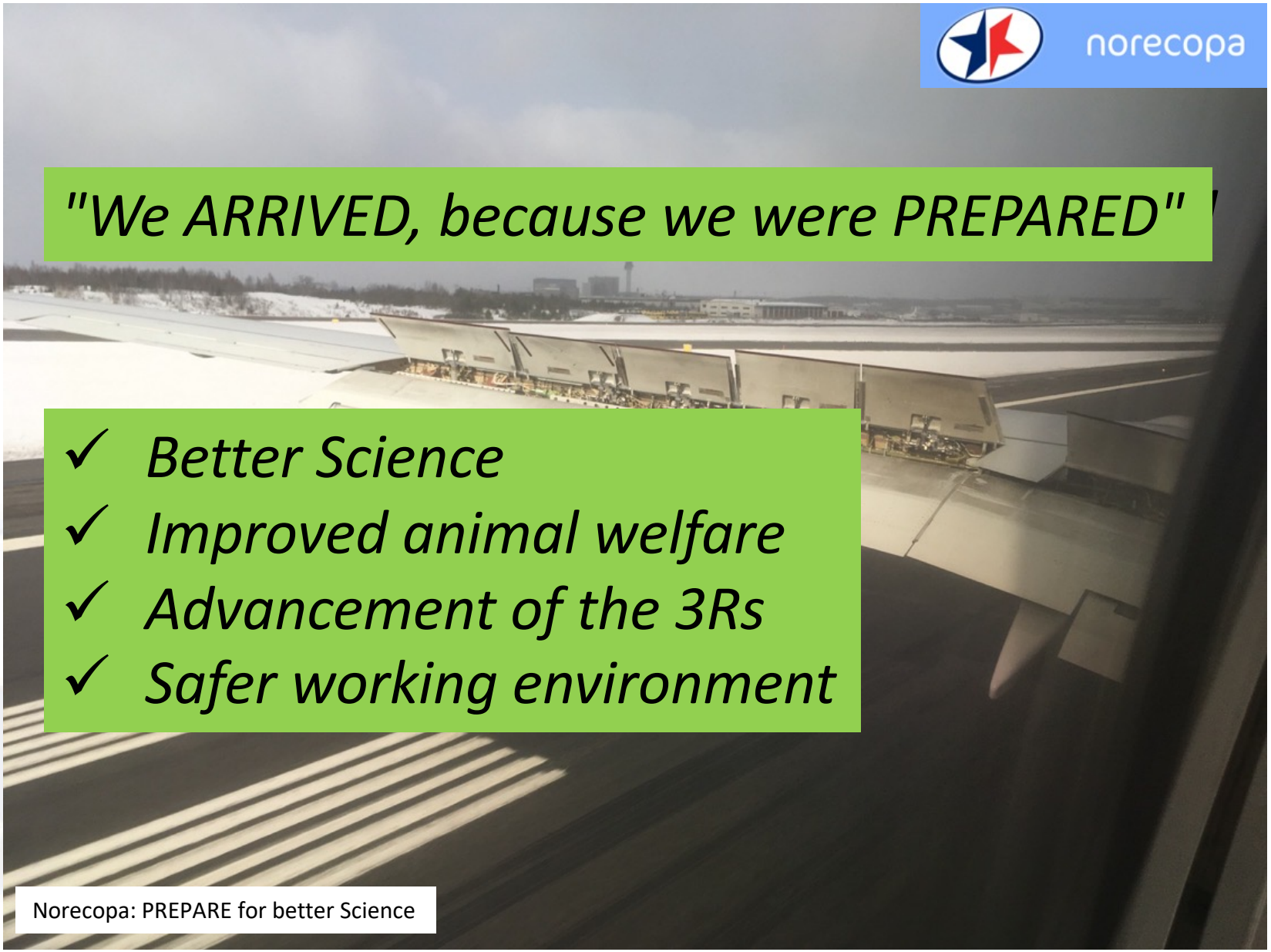
There are three broad areas which need to be considered when planning animal studies:

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, SP
   - Re-use of animals, which should be justified legislation
   - Any plans for release or re-homing, which m

More resources

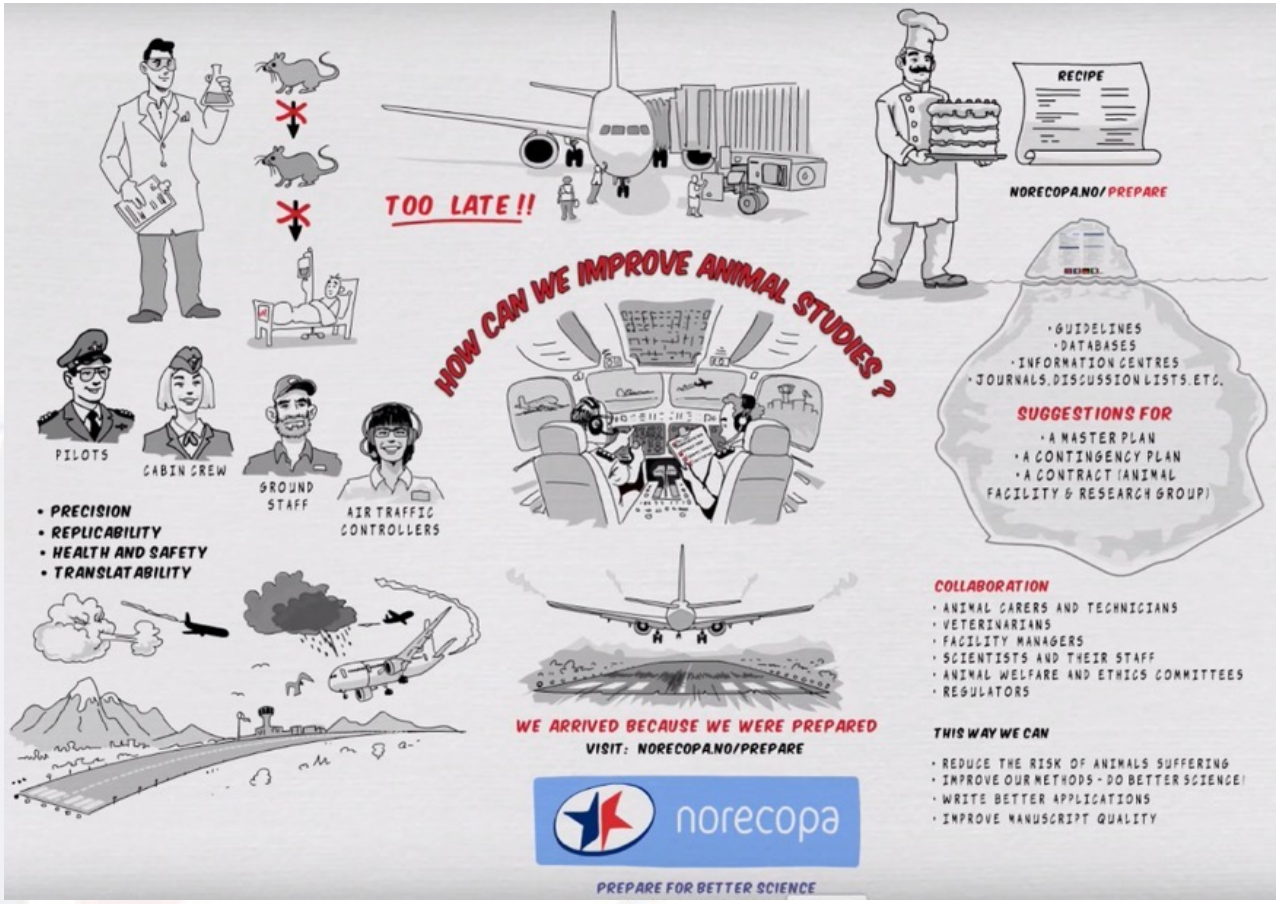
- Examples and references from the NC3Rs
- Information on inbred strains of mice and rats
- Strategies to minimise genetic drift and maximise experimental reproducibility in mouse research
- Mouse Locator, UK
- The Collaborative Cross panel of inbred mouse strains
- Nude mice - more than what meets the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

Norecopa: PREPARE for better Science


norecopa
"We ARRIVED, because we were PREPARED"
✓ Better Science
✓ Improved animal welfare
✓ Advancement of the 3Rs
✓ Safer working environment
Norecopa: PREPARE for better Science

vimeo.com/358069203 or norecopa.no/PREPARE/film

3-minute cartoon film



Norecopa: PREPARE for better Science

norecopa.no/Europhysiology

norecopa
PREPARE for better Science

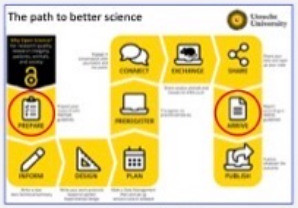
Let's PREPARE together to ARRIVE in better shape: how to plan animal experiments

Adrian Smith, Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 64, 1431 Ås, Norway
adrian.smith@norecopa.no

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.



norecopa.no/PREPARE

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*

norecopa.no/PREPARE

The Refinement Wiki
wiki.norecopa.no

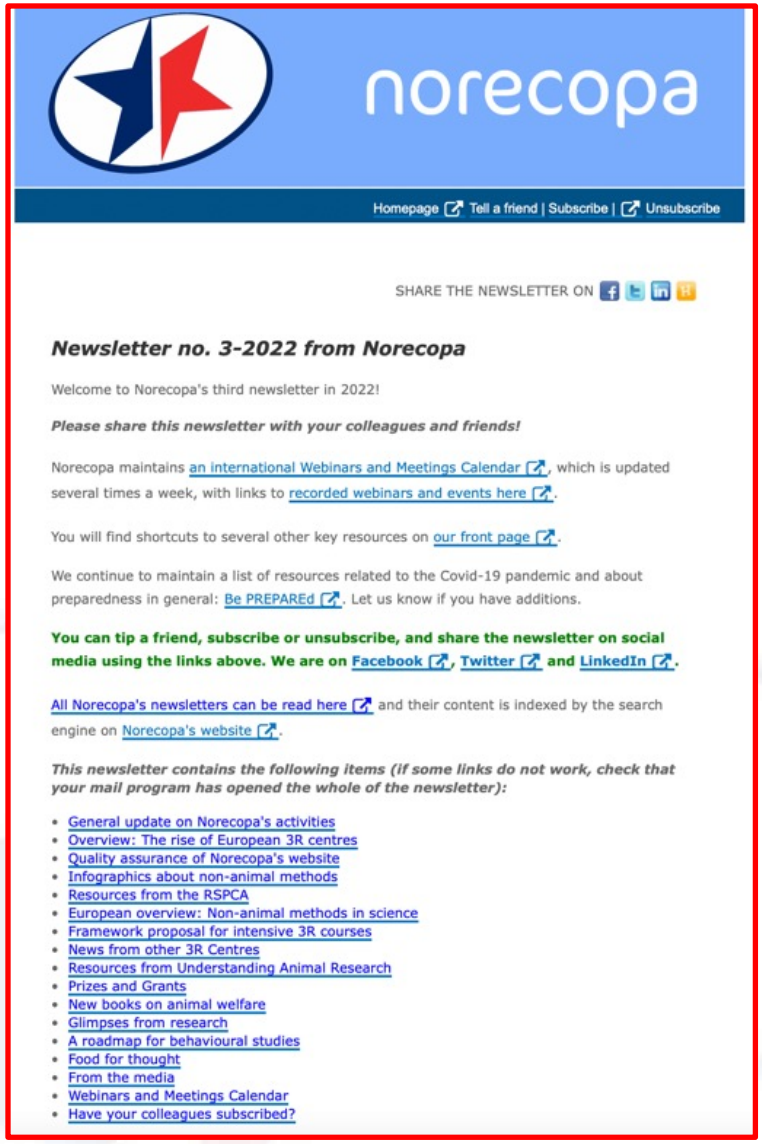
Norecopa gratefully acknowledges financial support from:
The Norwegian Parliament, the Ministry of Agriculture & Food and the Ministry of Trade, Industry & Fisheries; the Nordic Society against Painful Experiments (NSMSD), Novo Nordisk, the Norwegian Animal Protection Alliance (Dyrevernalliansen), the Norwegian Society for Protection of Animals (Dyrebeskyttelsen Norge), the Research Council of Norway, Laboratory Animals Ltd., the Royal Society for the Prevention of Cruelty to Animals (RSPCA), Sanofi, the Scottish Accreditation Board, the Stiansen Foundation, the Universities Federation of Animal Welfare (UFAW) and the US Department of Agriculture (USDA).

Norecopa: PREPARE for better Science

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



norecopa

Homepage | Tell a friend | Subscribe | Unsubscribe

SHARE THE NEWSLETTER ON

Newsletter no. 3-2022 from Norecopa

Welcome to Norecopa's third newsletter in 2022!

Please share this newsletter with your colleagues and friends!

Norecopa maintains an international Webinars and Meetings Calendar, which is updated several times a week, with links to recorded webinars and events here.

You will find shortcuts to several other key resources on our front page.

We continue to maintain a list of resources related to the Covid-19 pandemic and about preparedness in general: Be PREPAREd. Let us know if you have additions.

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

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

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

- General update on Norecopa's activities
- Overview: The rise of European 3R centres
- Quality assurance of Norecopa's website
- Infographics about non-animal methods
- Resources from the RSPCA
- European overview: Non-animal methods in science
- Framework proposal for intensive 3R courses
- News from other 3R Centres
- Resources from Understanding Animal Research
- Prizes and Grants
- New books on animal welfare
- Glimpses from research
- A roadmap for behavioural studies
- Food for thought
- From the media
- Webinars and Meetings Calendar
- Have your colleagues subscribed?

English-language newsletters

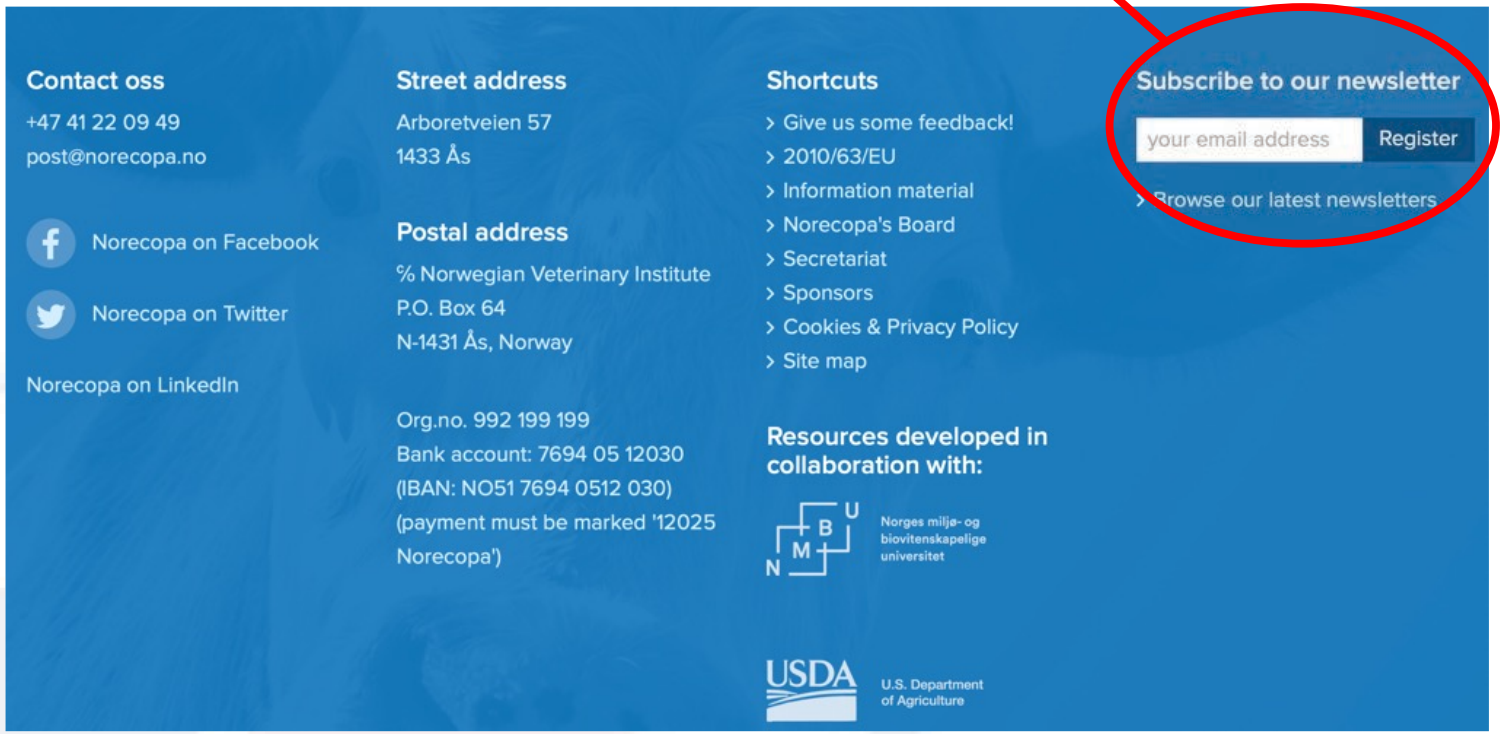
norecopa.no/news/newsletters

7-8 times a year

1,200 international subscribers

At the bottom of Norecopa's webpages

English-language newsletters



Norecopa: PREPARE for better Science

Norecopa: PREPARE for better Science