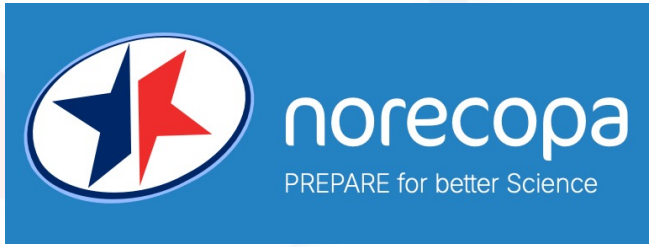
Norecopa: a global overview of resources to implement the 3Rs (Replacement, Reduction & Refinement) in animal research & testing

Adrian Smith
adrian.smith@norecopa.no

norecopa.no/Saarland



Disclosures

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

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

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

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

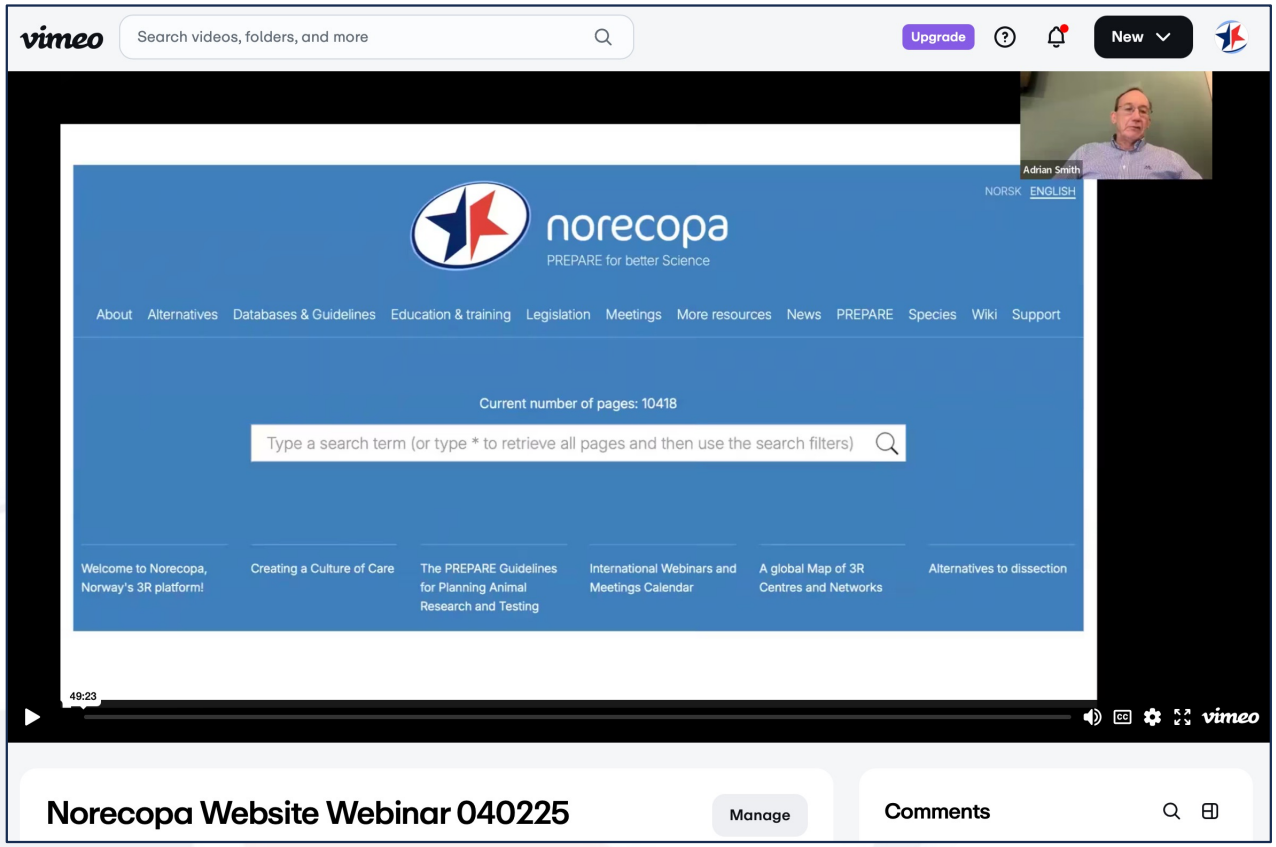
Norecopa is a member of AAALAC International, based upon our positive experiences in accrediting animal facilities

*We are promoting **your** resources!*
Let us know what's missing!

Guided tour webinar (50 min.)

norecopa
PREPARE for better Science

norecopa.no/Tour



vimeo.com/1053518017

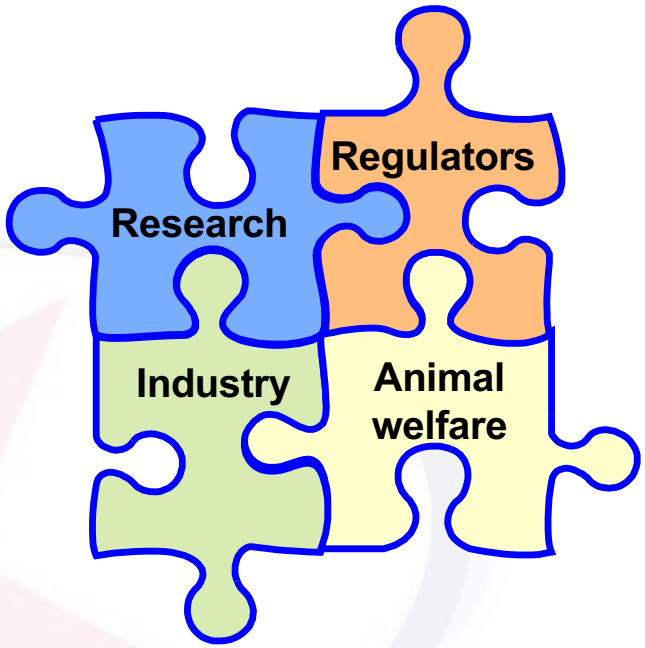
part of vimeo.com/Norecopa

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

norecopa.no

40-slide powerpoint presentation about the 3Rs

ccac.ca

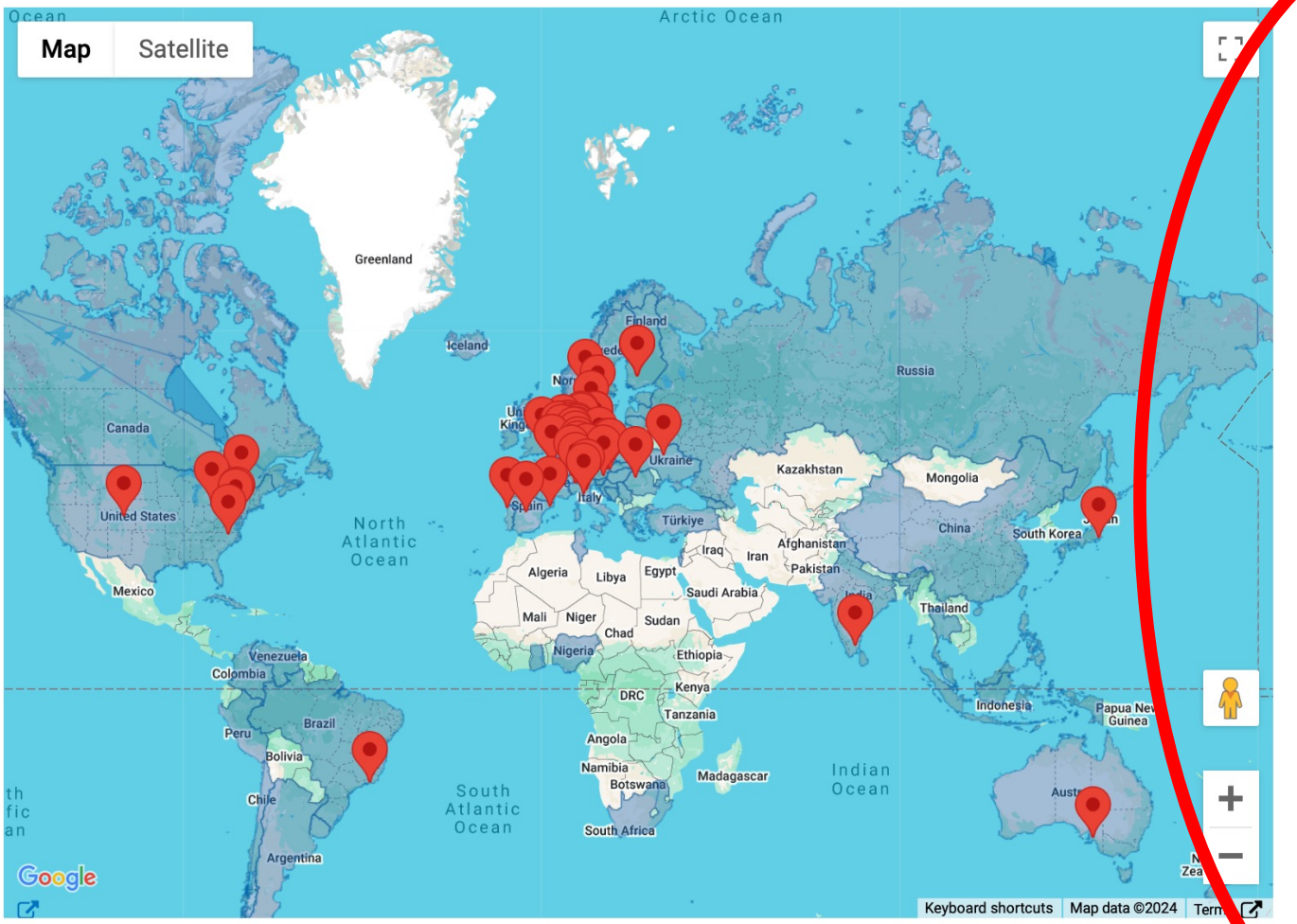
All three Rs of Russell and Burch:

Replacement, Reduction & Refinement

English, French, German, Spanish and Czech versions

Free download from norecopa.no/3Rs

Search Centres



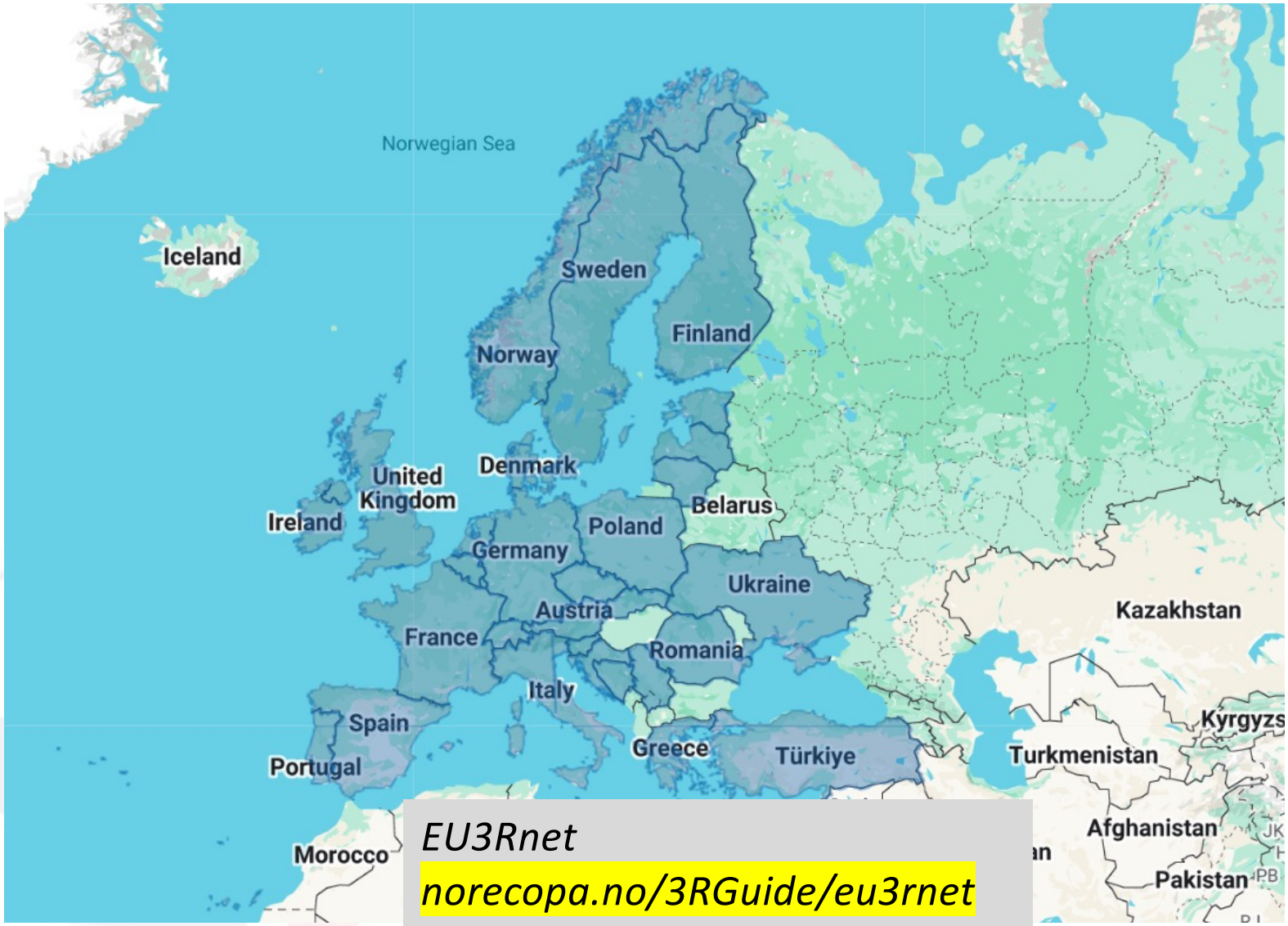
norecopa.no/global3r

Centres

- Replacement
- Reduction
- Refinement
- ecopa

Associations

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



norecopa.no/global3r

April 2026

- German Biotech Days, Leipzig, 21-22 April 2026
- Expanding Access to Non-Animal-Derived Antibodies in Research and Industry. What's Available - and What's Still Needed, Copenhagen, 22 April 2026 (Registration)
- Habituation and Refined Procedures for the Laboratory Rabbit to Re (Evelyn Skoumbourdis), 22 April 2026
- AAALAC Findings and Trends in the European region, webinar, 2
- Pain and Distress in Rodents - what everyone must know!, webinar (Paul Flecknell), 22 April 2026
- Invertebrate and *in vitro* models, NC3Rs Technology Partn3Ring webinar series, 22 April 2026
- Habituation and Refined Procedures for the Laboratory Rabbit to Reduce Stress and Enhance Welfare for both Animals and Staff, webinar (Evelyn K. Skoumbourdis), 22 April 2026
- BCLAS Symposium: Empowering the 3Rs: Innovation for Better Science and Care, Brussels, 22-23 April 2026
- The Human Cost of Animal Research: When Compassion Becomes Moral Injury, Justify webinar, 23 April 2026
- Managing Aquatic Colonies: A Different Kettle of Fish, Charles River webinar, 23 April 2026
- The Human Cost of Animal Research: When Compassion Becomes Moral Injury, Justify webinar, 23 April 2026
- 3Rs in One Health Preclinical Research, LAVA-APHA meeting, South East England, 23-24 April 2026
- Publishing animal use statistics, UAR webinar (Hannah Hobson), 24 April 2026
- An Introduction to Openness on Animal Research, UAR Oceania Asia Network webinar (Bella Lear), 24 April 2026
- Moving Beyond Animal Testing: An Introduction to New Approach Methodologies in Research, panel discussion (na Ewart & Troy Siedle), 24 April 2026
- Higher education, humane innovations, and the transition to alternatives
- Forsøgsdyrenes Dag, Copenhagen, 26 April 2026
- Cryopreservation and Biobanking (zebrafish)
- Building Bridges, Bursting ustrian 3R Days, Vienna, 28-30 April 2026
- Towards approaches in UK chemical regulation, workshop, Solihull, 29 April 2026
- Huts for Laboratory Mice, webinar (Maya Bodnar), 29 April 2026
- AAA and Trends in the European region, webinar, 22 April 2026 (replay of 15 April webinar)
- AI Errors May Be Impossible to Eliminate - What That Means for Its Use in the FDA, webinar (Ginette Collazo), 29 April 2026
- Human *in vitro* endochondrial ossification model for bone and marrow niche formation: a scalable alternative to in vivo ossicle implantation, webinar (Hanna Svitina), 30 April 2026
- Ex vivo non-clinical system using fresh circulating human whole blood for evaluating immunotoxicity, webinar (Philippe Stas), 30 April 2026
- Updating Anaesthesia and Analgesia for Laboratory Rats and Mice, online workshop, 30 April - 1 May 2026

norecopa.no/meetings/meetings-calendar

+ webpages for recorded meetings, sorted by PREPARE topics

norecopa.no/news

Please refresh your browser if the newsfeed does not appear immediately.
This newsfeed provides English- and Scandinavian-language news about animal research, testing and alternatives, from European media.

Newsfeed

21 April 2026

FDA Achieves Goals In Reducing Animal Testing In Drug Development

strategy established specific time frames for phasing out animal testing where equivalent or better alternatives exist. Monday, the agency

20 April 2026

Navigating through toxicological data: review of toxicological databases and sources in the interdisciplinary context including—chemicals, cosmetics, pharmaceuticals and forensics

of the utility of the REACH database is its role in promoting alternative methods to animal testing. The database enables 'read-across,' a

20 April 2026

Animal testing New images show terrifying toxicity tests on animals 04/20/2026 Press release

New, shocking undercover footage documents the cruel daily reality in animal testing laboratories. The German Animal Welfare Federation,

English-language newsletters

norecopa.no/news/newsletters

1,500 international subscribers

7-8 times a year

- Urgent: Register now for our Summer School in Bergen!
- News of Norecopa
- Highlights from Norecopa's Annual Meeting
- Aurora Brønstad wins Norecopa's 3R Prize
- UFAW Handbook - new edition published
- Website of the Nordic Zebrafish Network
- Refinement of oral administration
- European Network of National Networks of Animal Welfare Bodies
- Mouse tail simulator for i.v. injection
- News of other 3R Centres and activities
- Glimpses from research
- Food for thought
- For Norwegian readers
- From the media
- Webinars and Meetings Calendar
- Have your colleagues subscribed?

Aurora Brønstad wins Norecopa's 3R Prize

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

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

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

Website of the Nordic Zebrafish Network

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

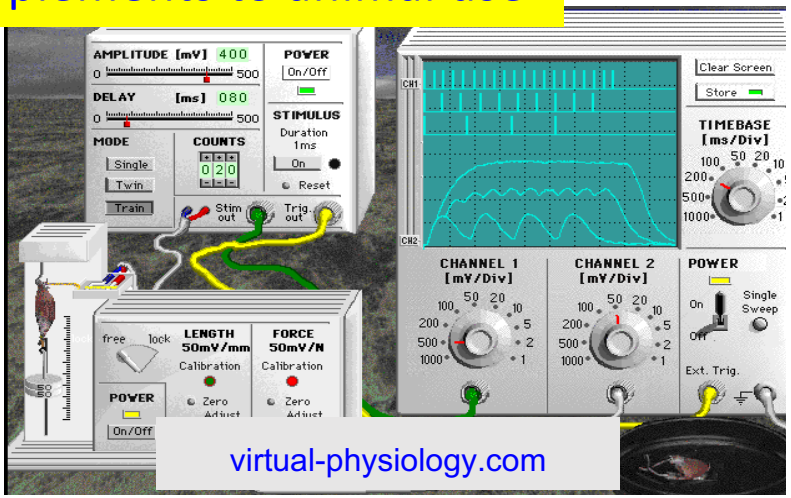
The Network has started to build its website, which is hosted by the Karolinska Institutet in Stockholm.

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

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

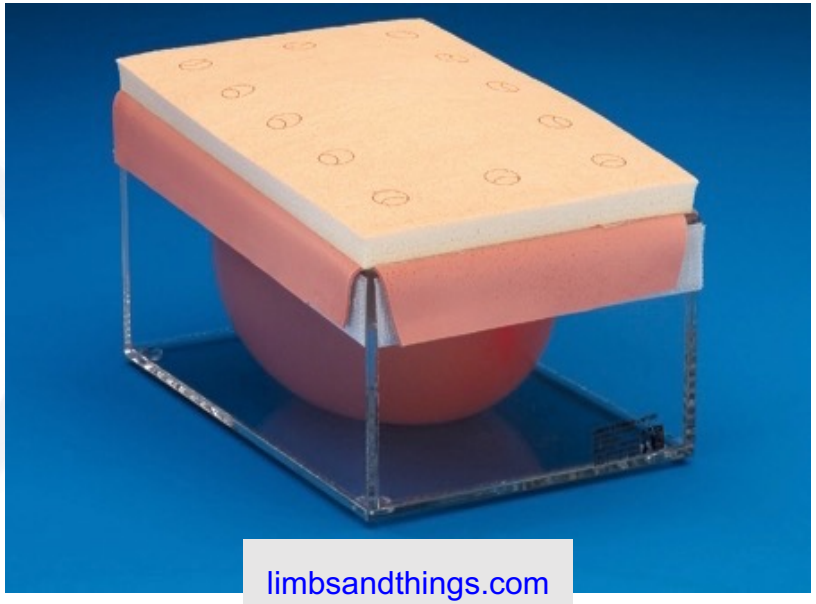
norecopa.no/NORINA 3,400 alternatives/supplements to animal use

frogvirtualdissection.com



virtual-physiology.com

rescuecritters.com



limbsandthings.com

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

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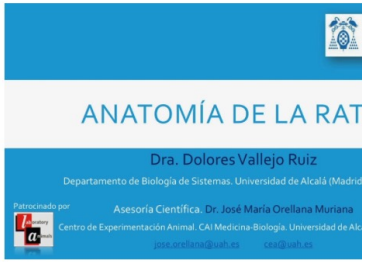
Rat s.c. injection
Norecopa | 1,380 views

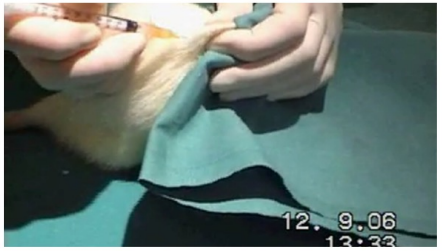
Rat i.p. injection (method 2)
Norecopa | 1,280 views



Anatomia de la rata
Norecopa | 977 views

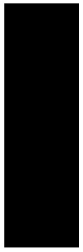
Testing anaesthetic depth in the chicken
Norecopa | 598 views

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

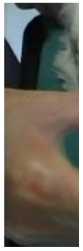


Subcutaneous injection in the rat - Technique 1
Norecopa | 2,249 views

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

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

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 aims are to complement the EC guidelines and help to ensure that suffering in fish is effectively predicted and minimized. Norecopa has established a website (www.norecopa.no/categories) where more information on severity classification for procedures using fish, including field research, will be made available.

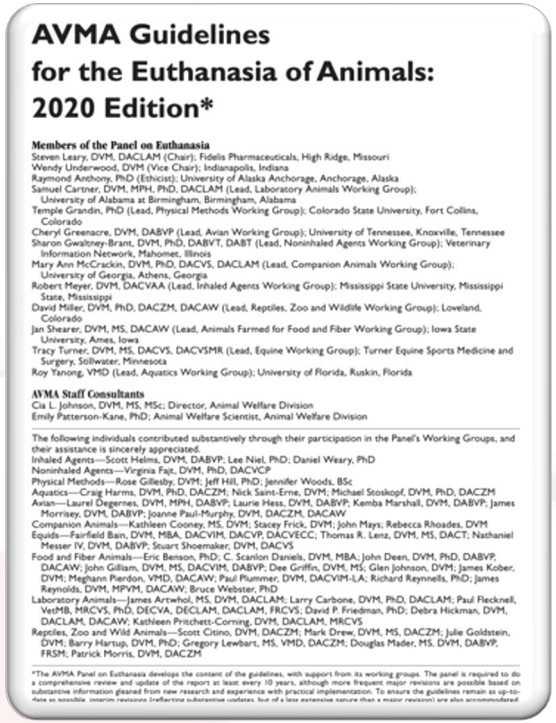
Keywords: Fish, harm–benefit assessment, humane endpoints, refinement, severity

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

Background

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

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



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 Pierdon, VMD, DACAW; Paul Plummer, DVM, DACVIM-LA; Richard Reynnells, PhD; James Reynolds, DVM, MPVM, DACAW; Bruce Webster, PhD
Laboratory Animals—James Artwohl, 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 (reflecting substantive updates, but of a less extensive nature than a major revision) are also recommended

ATLA 38, 167–182, 2010

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

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

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

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

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

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

Tim Allen, USDA

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TextBase:

2,000 books related to Lab Animal Science, welfare and alternatives:

norecopa.no/textbase

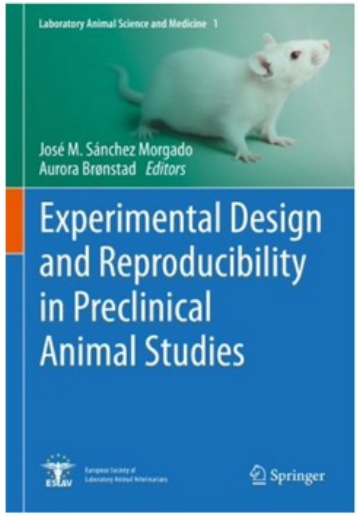
Experimental Design and Reproducibility in Preclinical Animal Studies

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

Databases & Guidelines

norecopa.no/databases-guidelines

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

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

The Norecopa website also includes five other collections:

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

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

links to over 70 other databases

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

Culture of Care

The International Culture of Care Network

norecopa.no/coc

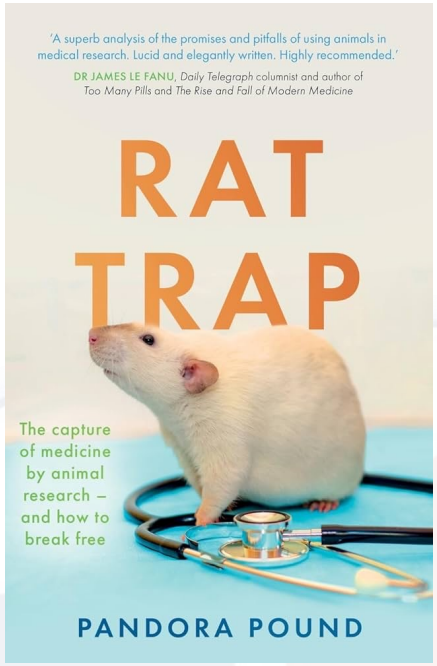
A demonstrable commitment, throughout the establishment, to improving:

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

It goes beyond simply complying with the law!

+ Quick Start Guide

“Respectful dialogue”?



Scientists who have built their career on an animal model

- refined
- humanised (genetically altered)
- validated
- where previous data is available

“Animal testing” and “animal research” are often used indiscriminatively, even though the potential for animal replacement is very different

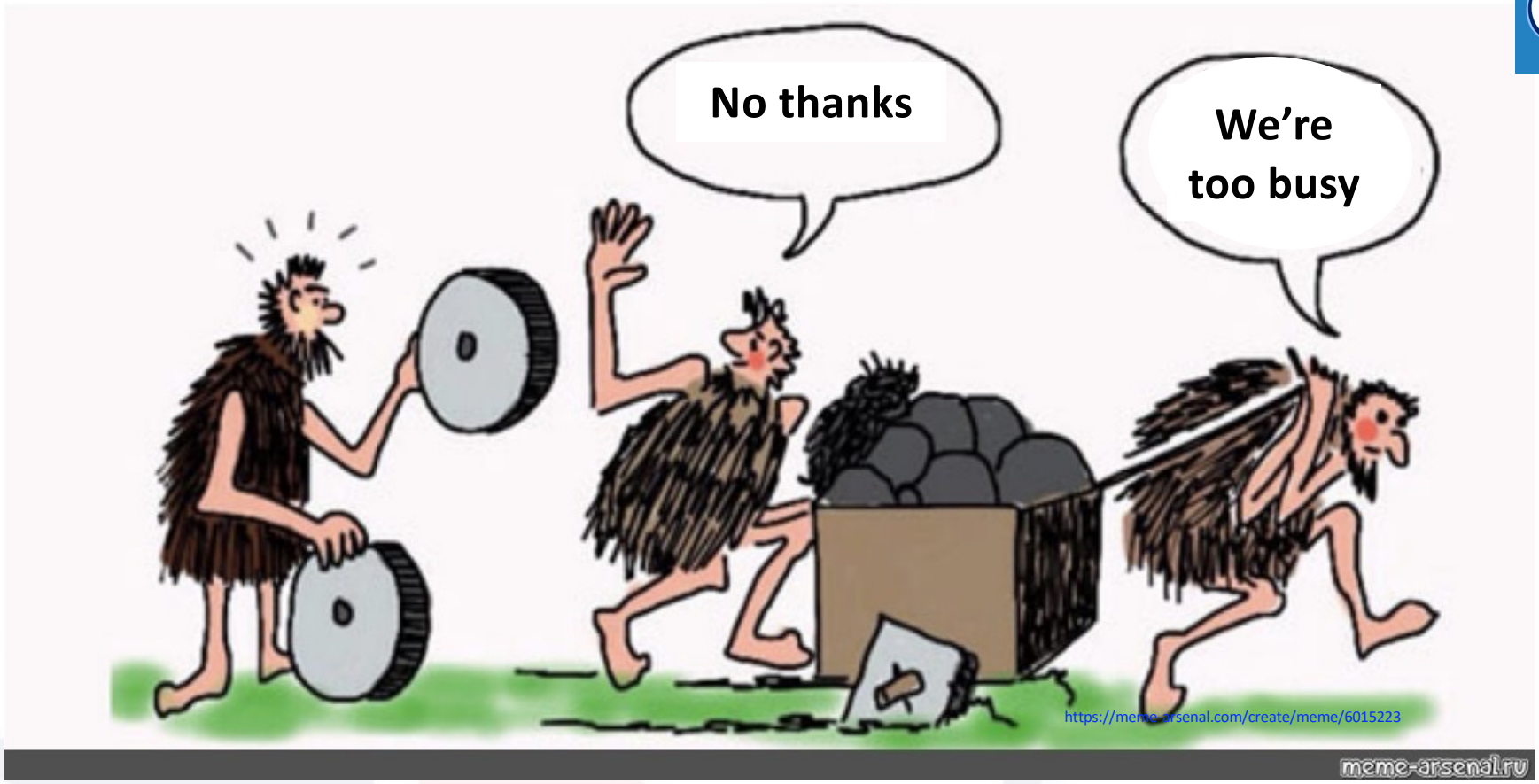
How can we advance implementation of the Three Rs?

Norecopa: PREPARE for better Science

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

Norecopa: PREPARE for better Science

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


No thanks
We're too busy
https://meme-arsenal.com/create/meme/6015223
meme-arsenal.ru

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

FELASA Congress, 2 June 2025

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

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

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

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

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

Germany — *no mention of analgesia*

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

Turkey — *no mention of analgesia*

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

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

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

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no mention of analgesia

Culture of Care facilitates honest discussion along the path

"because we've always done it that way»

"as often as necessary"

"there are no alternatives"

Culture of Care facilitates honest discussion along the path

"because we've always done it
that way»

"as often as necessary"

"there are no alternatives"

Closely related to a culture of care is

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

Look for the acceptable, rather than choosing the accepted.

The pathway to open (better) science

Norecopa: PREPARE for better Science

https://riojournal.com/article/105198

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

reddit.com

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

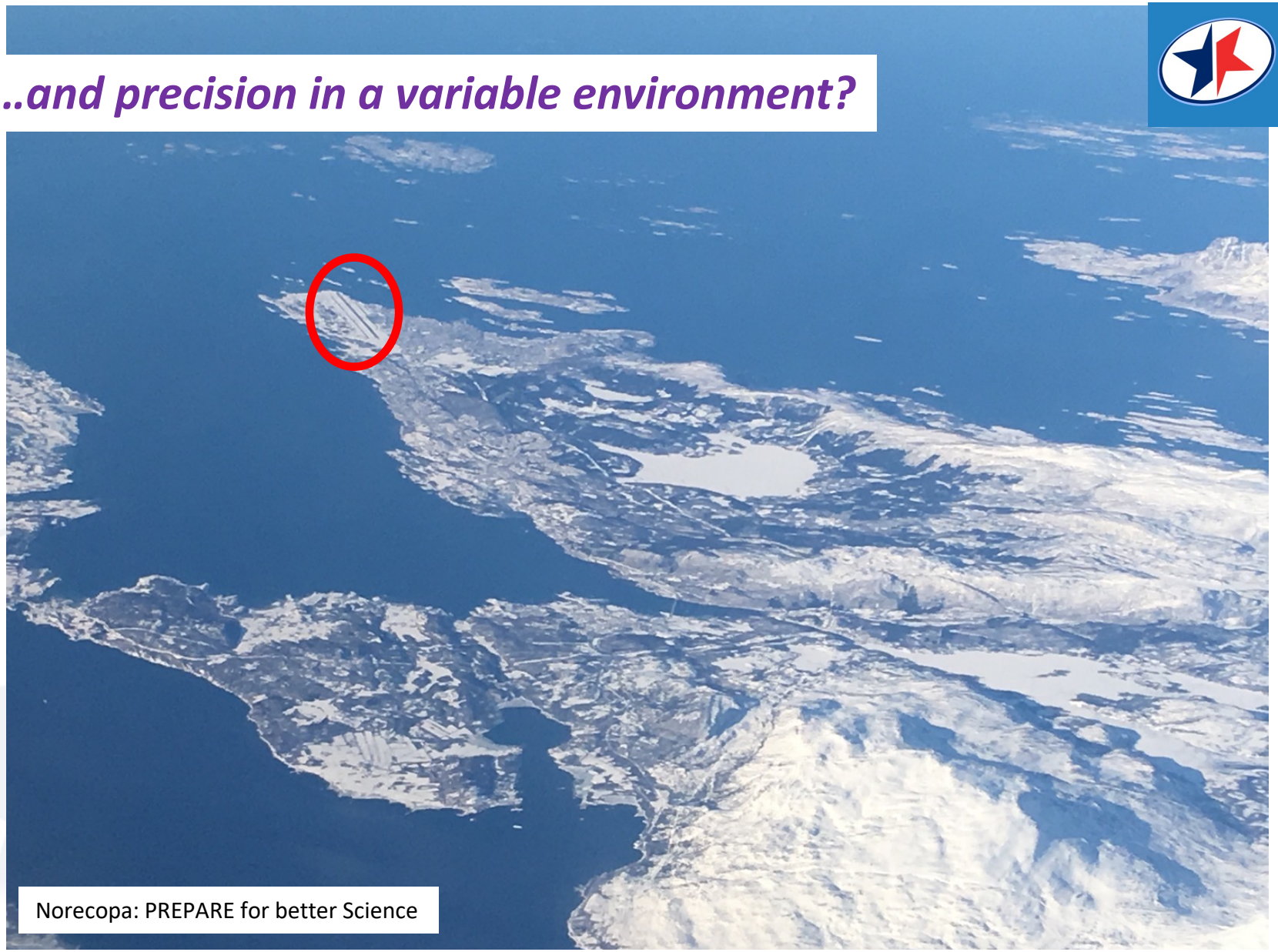
reddit.com

ChatGPT

How do others achieve reproducibility?

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

…and precision in a variable environment?



10-15 checklists even on short routine flights

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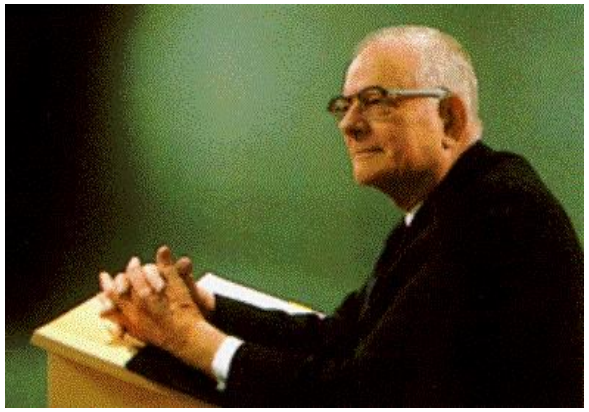
Checklists

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

Standard Operating Procedures are the clue



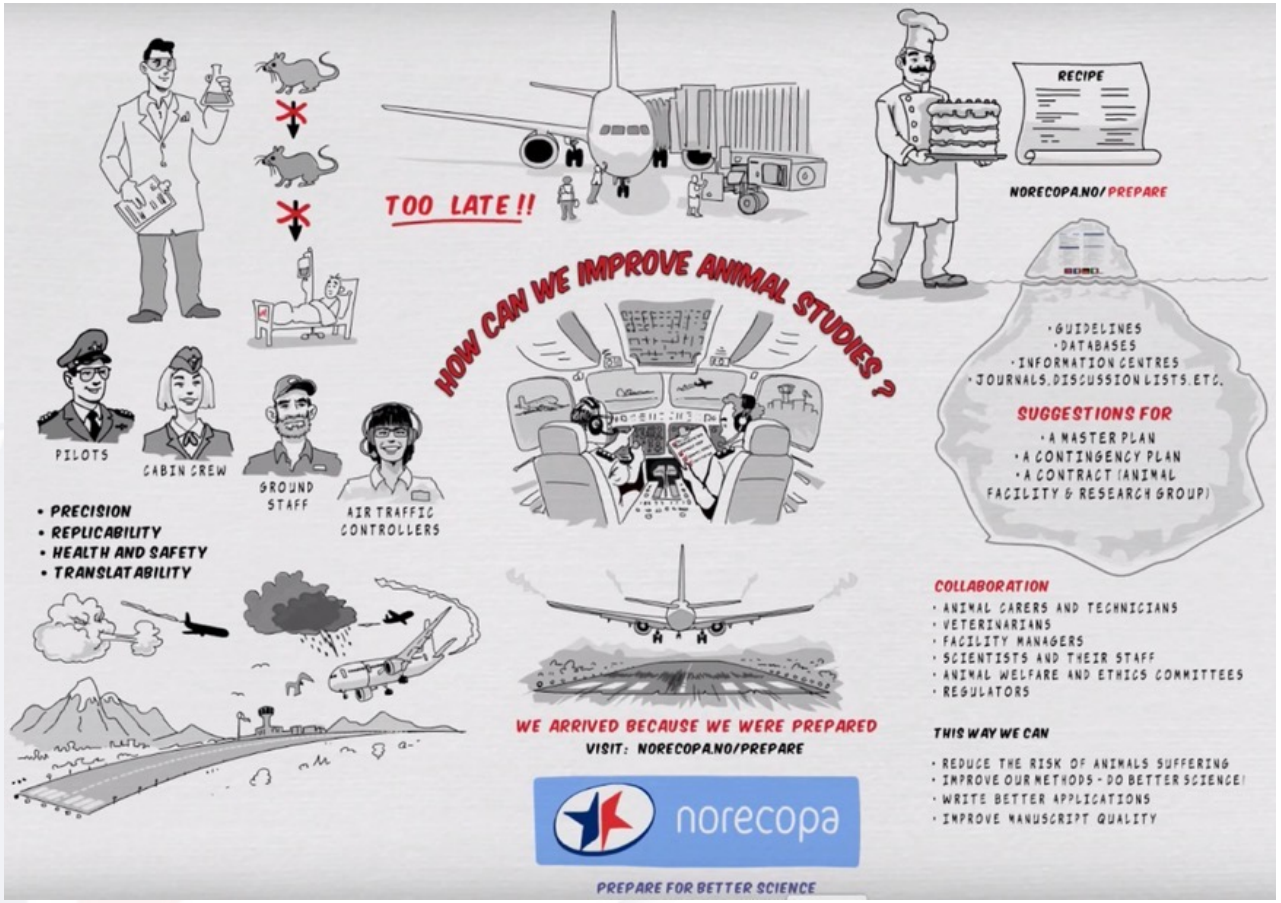
"The use of standards (i.e. SOP's) frees resources within problem areas that have already been solved and have become a routine, so that these resources can instead be used for creative work in areas where problems still exist"

W. Edwards Deming

https://en.wikipedia.org/wiki/W._Edwards_Deming#/media/File:W._Edwards_Deming.jpg

norecopa.no/PREPARE/film

3-minute whiteboard film



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PILOTS
CABIN CREW
GROUND STAFF
AIR TRAFFIC CONTROLLERS

Hudson River, 2009

en.wikipedia.org

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

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

15.25.33	-01.38	Kaptein	Cockpit	V one, rotate
15.25.38	-01.33	Kaptein	Cockpit	positive rate
15.25.39	-01.32	Styrmann	Cockpit	Gear up please
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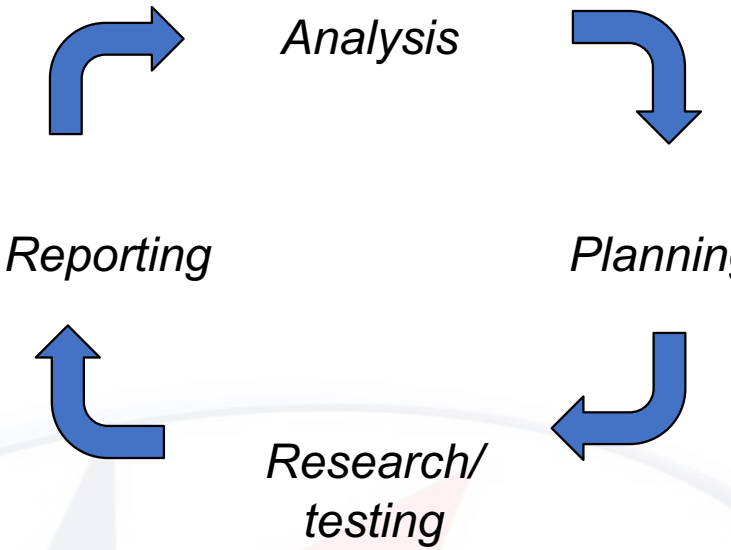
15.27.32	+00.21	Kaptein	Radio	Mayday mayday mayday. Uh this is Cactus fifteen thirty [sic] nine, hit birds. We've lost thrust on both engines. We're turning back towards LaGuardia.

All 155 passengers and crew saved

no.wikipedia.org/wiki/US_Airways_Flight_1549

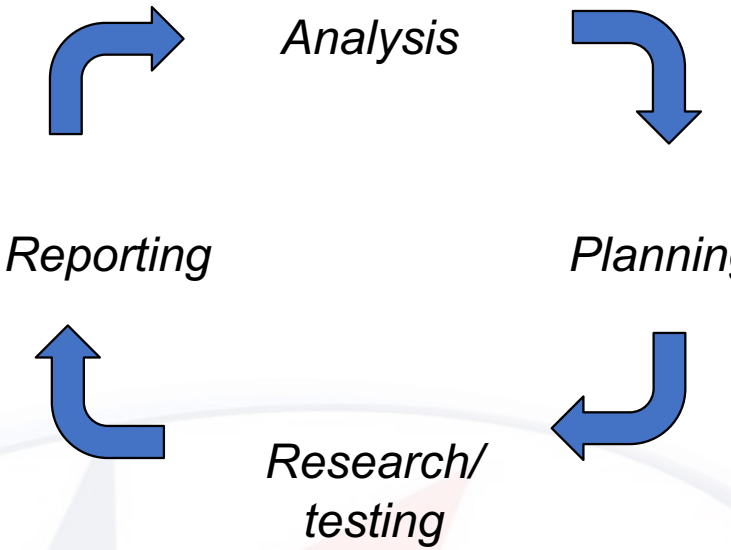
Rapid evacuation by trained cabin crew saved many lives

Continuous quality control



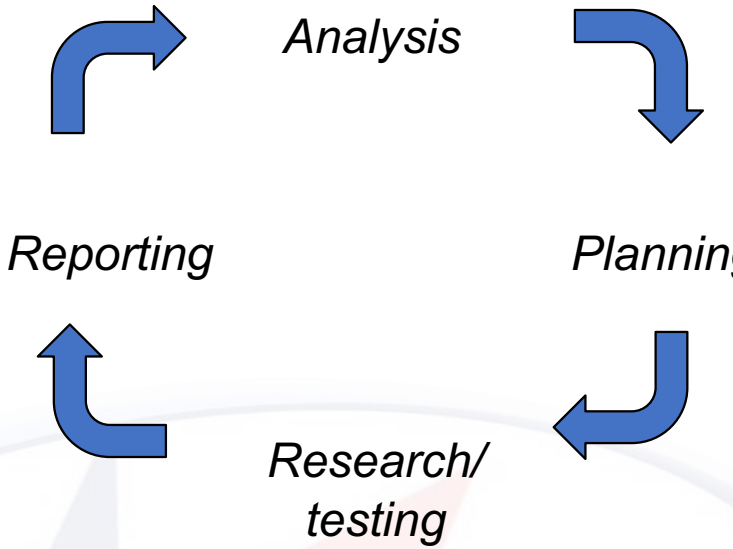
*Identify and ensure the quality of (at least) the **critical points** in the experiment: critical for animal welfare and scientific value*

Continuous quality control



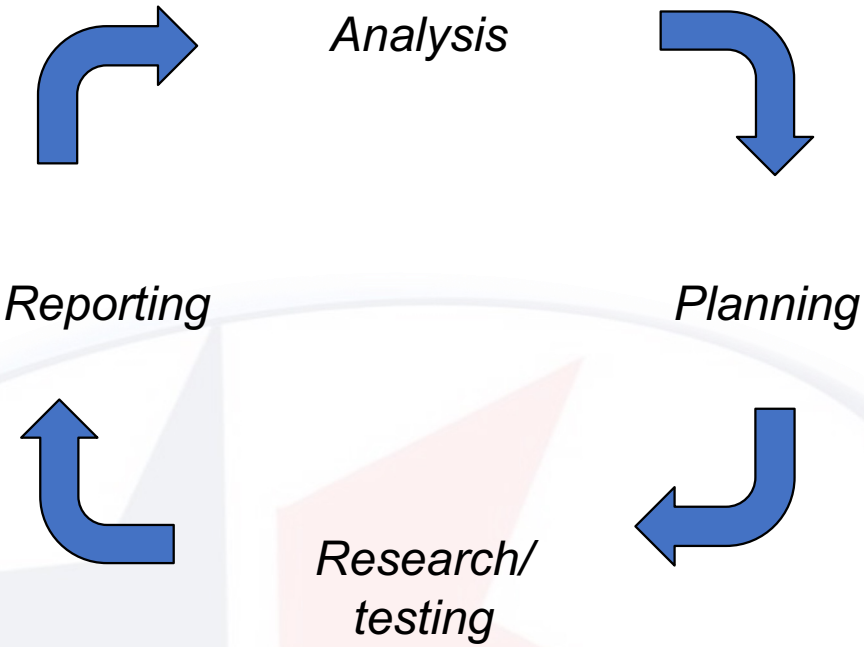
*Identify and ensure the quality of (at least) the **critical points** in the experiment: critical for animal welfare and scientific value*

Continuous quality control



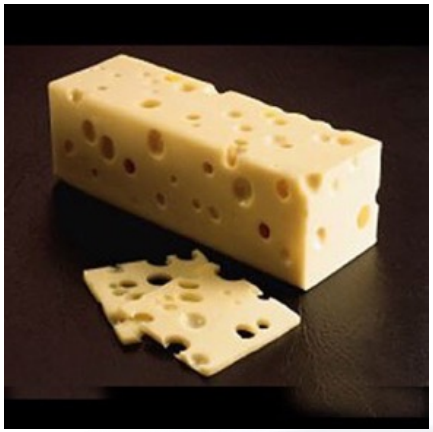
Make sure that all concerns are discussed openly between management and technical staff in an atmosphere of respectful dialogue

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



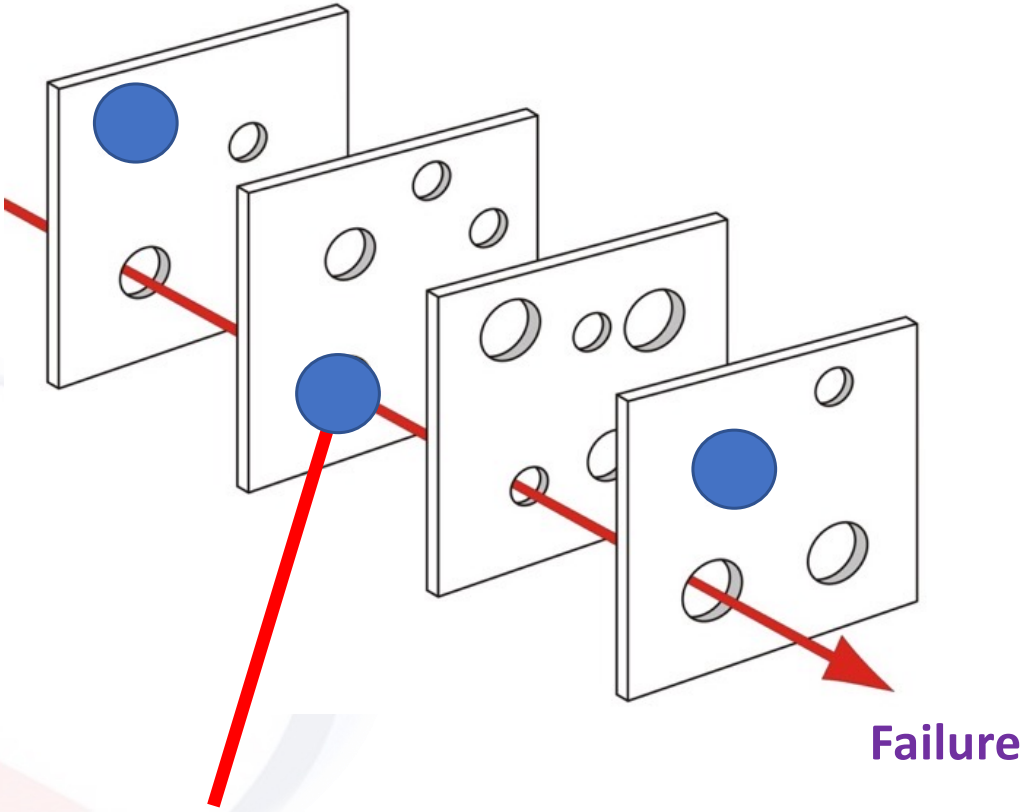
freepik.com

Threat and Error Management



eaugallecheese.com/Swiss-Cheese

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

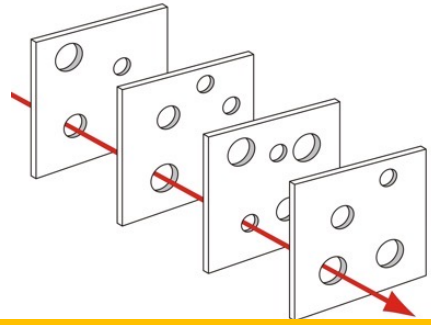


wikipedia.org/wiki/Swiss_cheese_model

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

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



Temporary staff at weekends and holidays

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

colourbox.com

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Contingency and redundancy

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

Photo: NMBU

Dagbladet.no

Publisert fredag 23.04.2010 kl. 18:26

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

Slår alarm om arbeidsforholdene på Radiumhospitalet. Sykehuset innrømmer rutinesvikt.


ASLE HANSEN
ash@dagbladet.no


DIANA BADI
dba@dagbladet.no

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

Health hazards: there are many people to think about

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

An analogy from NASA:

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

Identify the **critical points** in your experiment

cbsnews.com
colourbox.com no-wikipedia.org

aaalac INTERNATIONAL

Program Description

A. Animal Care and Use Program

B. Animal environment, Housing and Management

C. Veterinary Care

D. Physical plant

63 pages!

www.aaalac.org/program-description

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

aaalac INTERNATIONAL

Program Description

A. Animal Care and Use Program

B. Animal environment, Housing and Management

C. Veterinary Care

D. Physical plant

63 pages!

www.aaalac.org/program-description

A simple but effective Master Plan

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

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

https://boeing.com

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PREPARE for better Science

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

https://boeing.com

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

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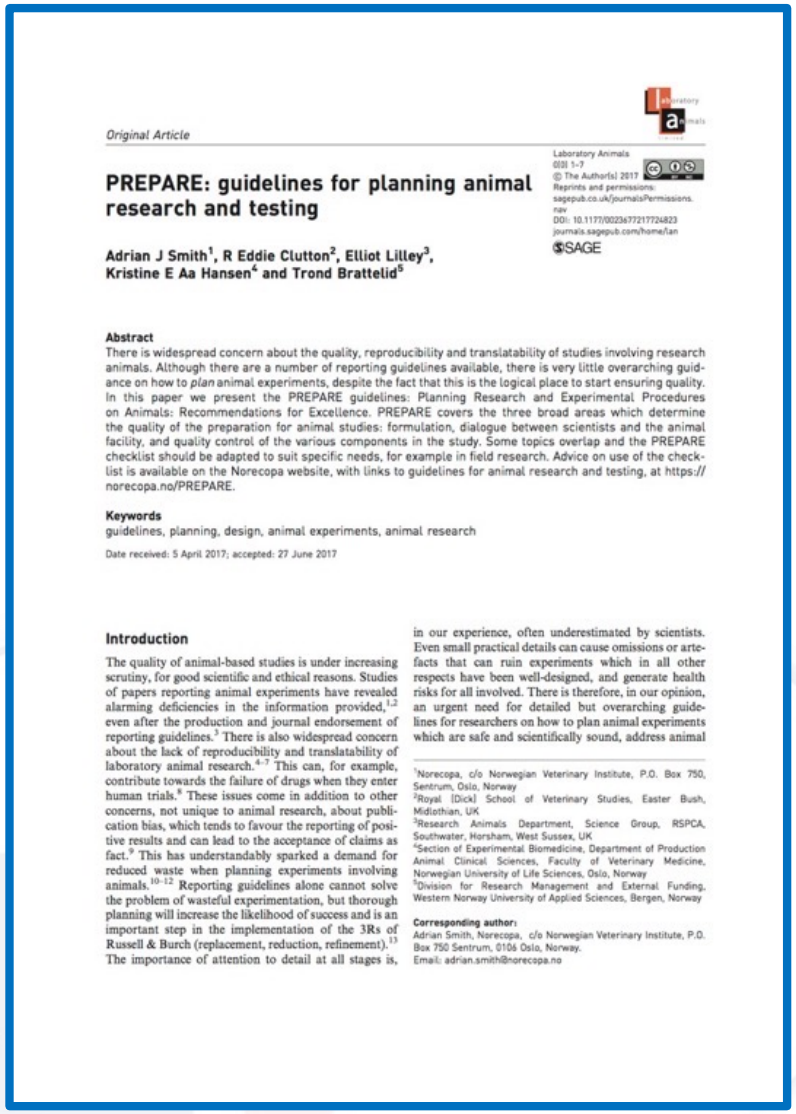

Original Article

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

Eddie Clutton, Elliot Lilley, Kristine Hansen & Trond Brattelid

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https://doi.org/10.1177/0023677217724823

Over 20,000 downloads from the journal website so far

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

norecopa.no/PREPARE

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Maybe the study should not go ahead

Systematic review of published research?

norecopa.no/PREPARE

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15. Necropsy

Items in pink are not typically highlighted in reporting guidelines

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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[c] & Trond Brattelid[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 such as ARRIVE[2].
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	☐ 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.

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.
6. Facility evaluation	☐ Conduct a physical inspection of the facilities, to evaluate building and equipment standards and needs. ☐ Discuss staffing levels at times of extra risk.
7. Education and training	☐ 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	☐ 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.

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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]

[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 such as ARRIVE[2].

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.
6. Facility evaluation	☐ Conduct a physical inspection of the facilities, to evaluate building and equipment standards and needs. ☐ Discuss staffing levels at times of extra risk.
7. Education and	☐ Assess the current competence of staff members and the need for further education or training prior

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

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.
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.
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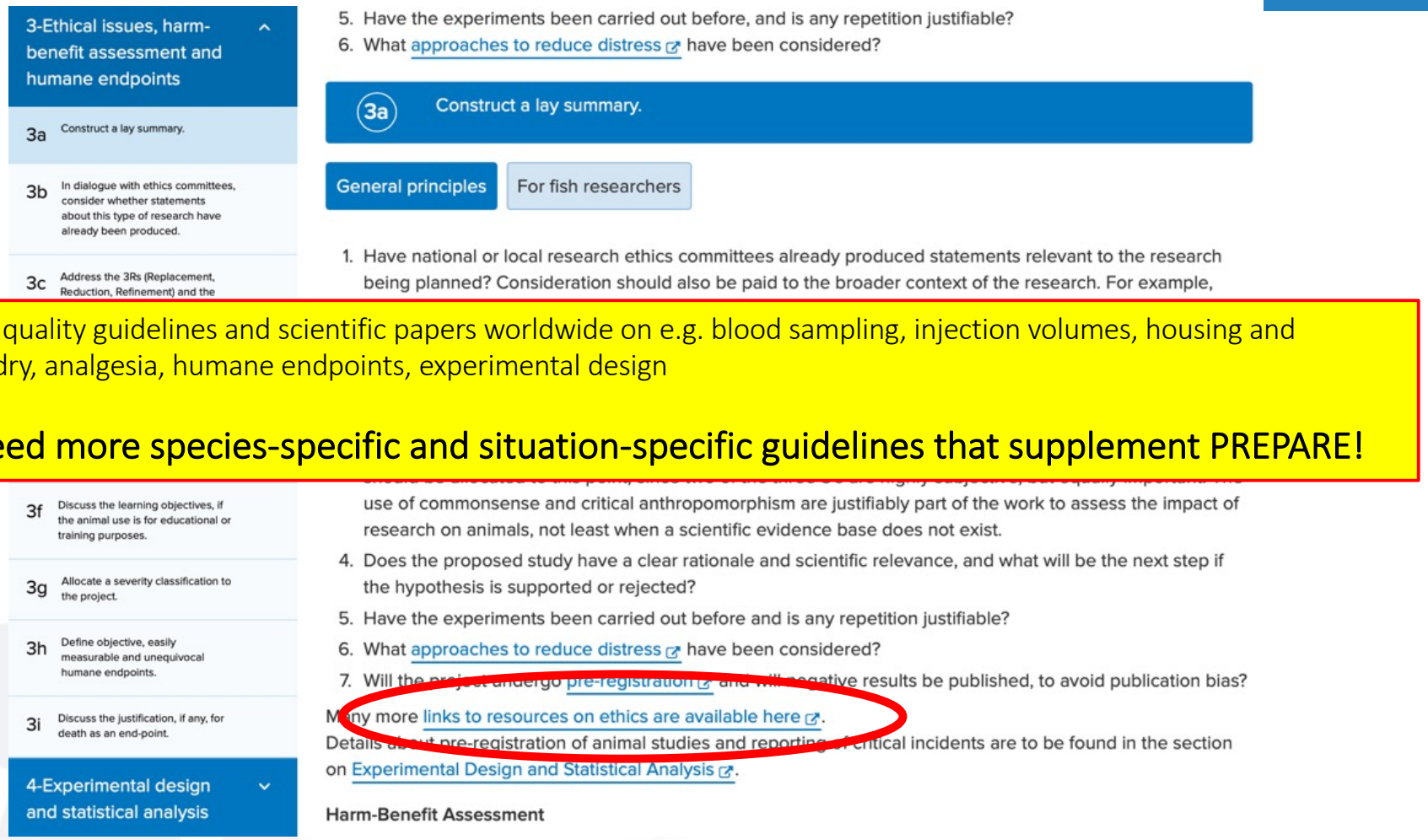

Links to quality guidelines and scientific papers worldwide on e.g. blood sampling, injection volumes, housing and husbandry, analgesia, humane endpoints, experimental design

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

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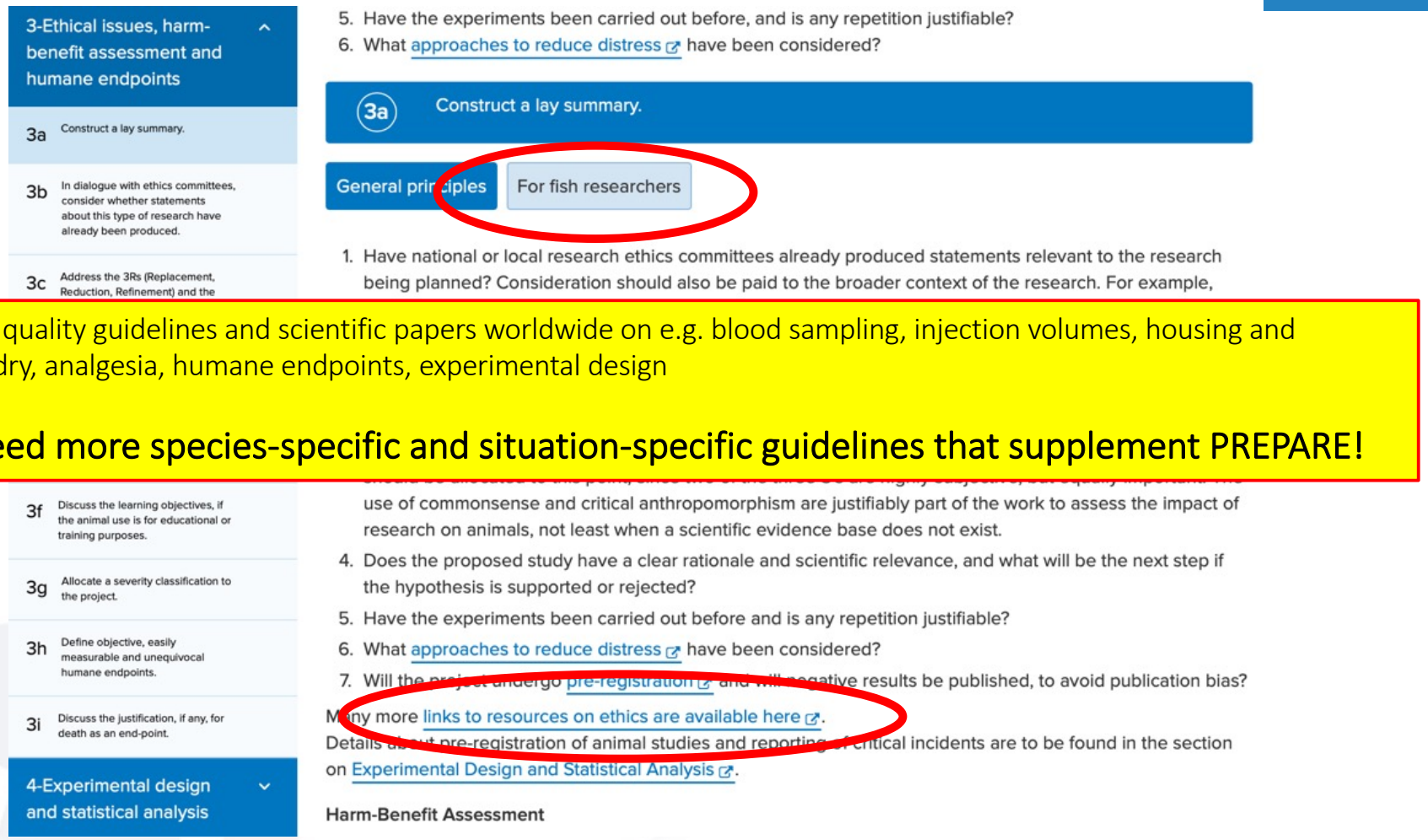


Links to quality guidelines and scientific papers worldwide on e.g. blood sampling, injection volumes, housing and husbandry, analgesia, humane endpoints, experimental design

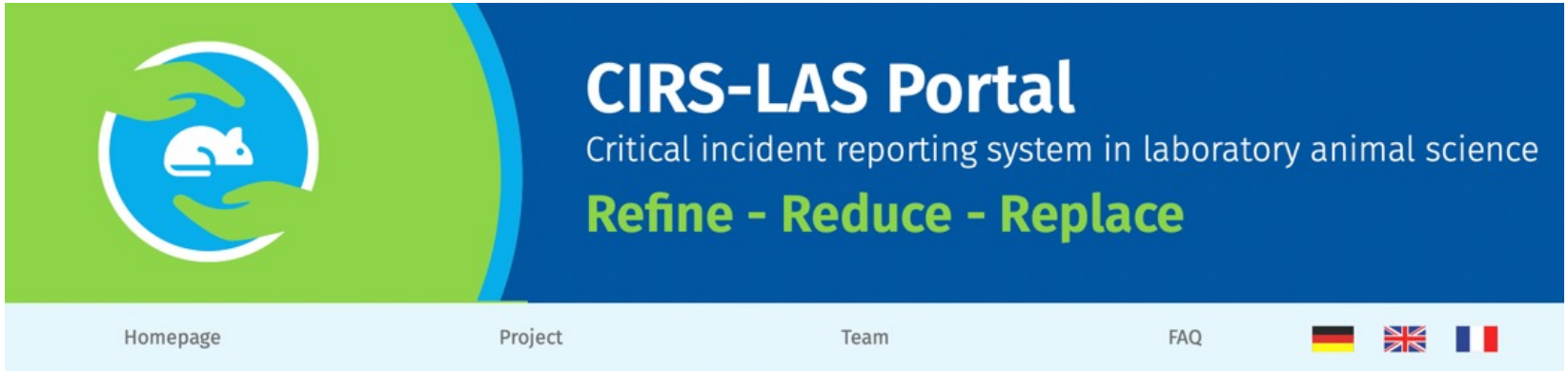
We need more species-specific and situation-specific guidelines that supplement PREPARE!

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

How do you tackle failure?

wikipedia



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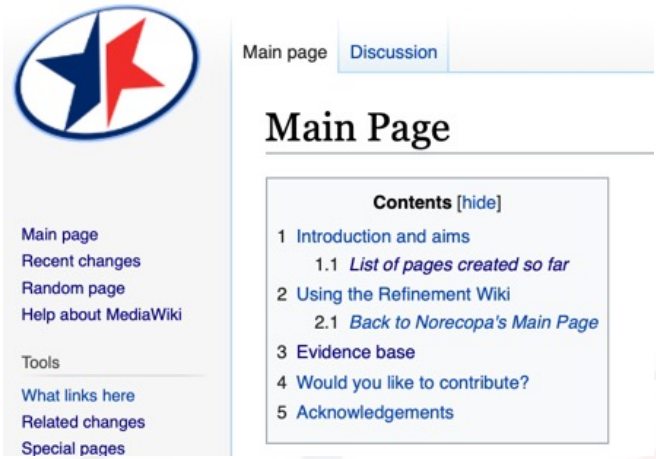
The Refinement Wiki



Susanna Louihimies

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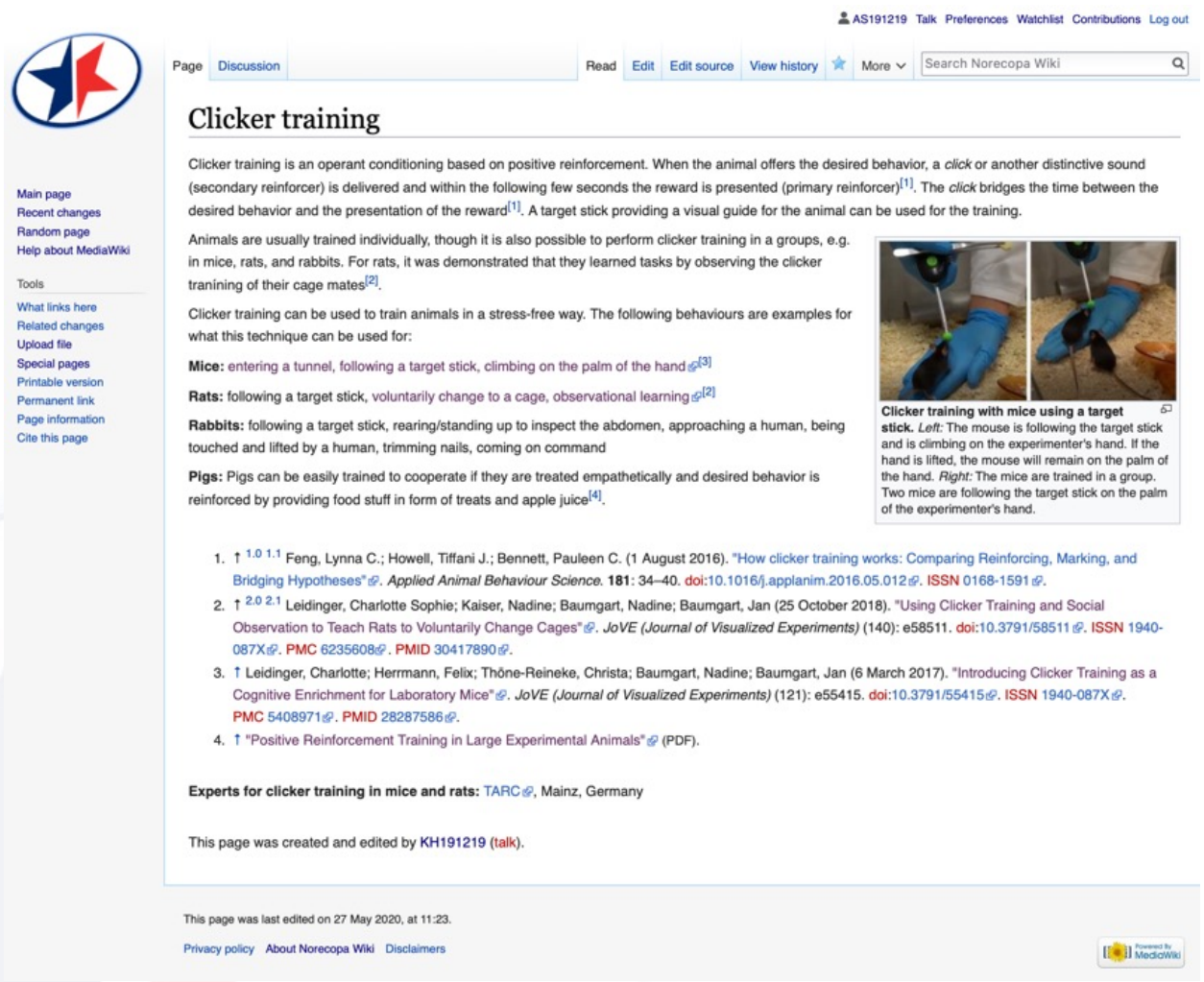
Born from the knowledge that a lot of good ideas on refinement circulate on discussion forums, but never get published.

Designed to be

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

Refinement Wiki: wiki.norecopa.no



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Clicker training

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

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

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

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

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

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

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

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

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

Experts for clicker training in mice and rats: TARC, Mainz, Germany

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

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c. 75 topics (April 2026)

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

arriveguidelines.org

The ARRIVE guidelines 2.0

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

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

ARRIVE Essential 10

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

Recommended Set

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

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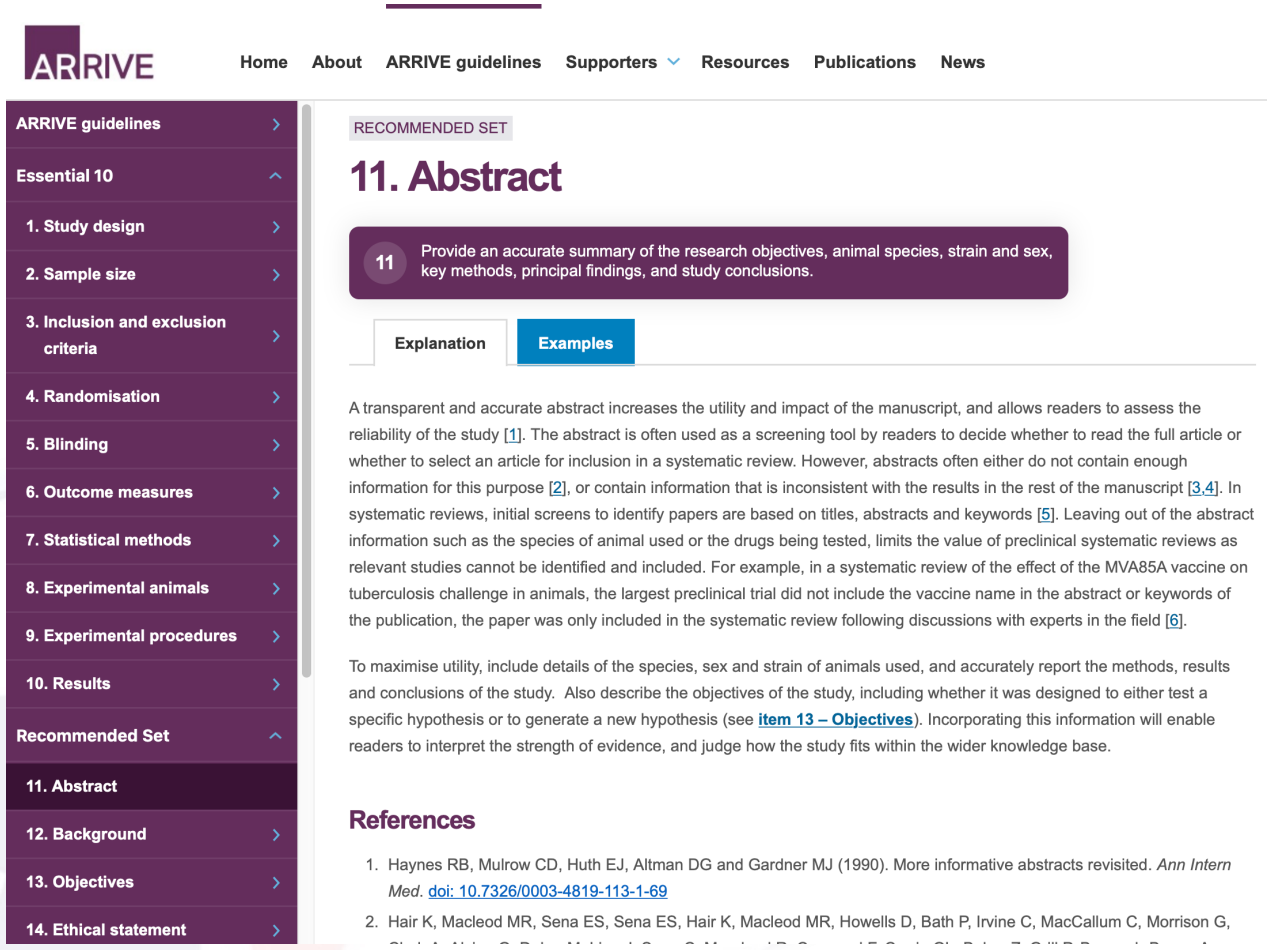
Reporting guidelines



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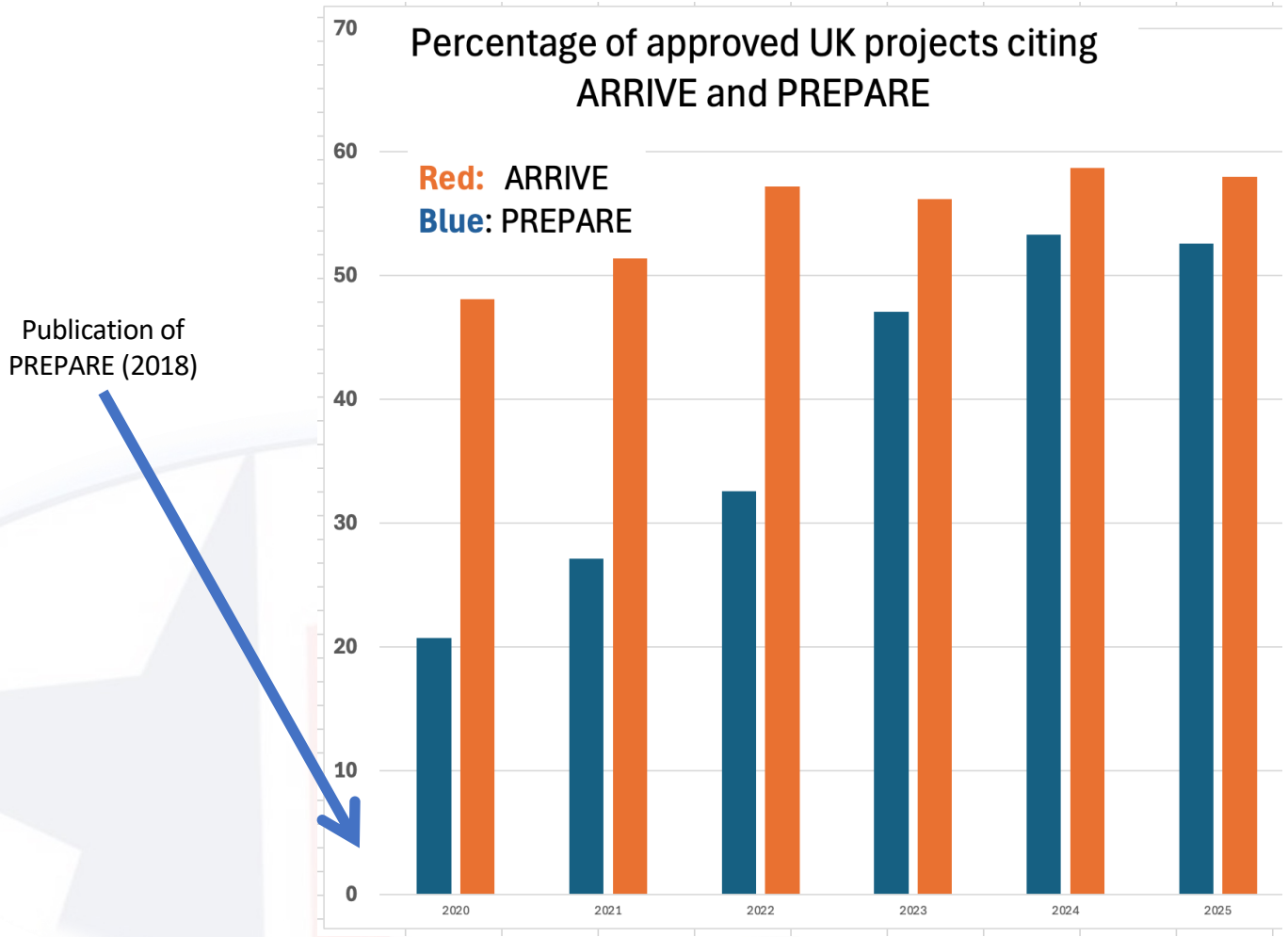
Percentage of UK approved projects that cite ARRIVE & PREPARE in their Non-Technical Summaries



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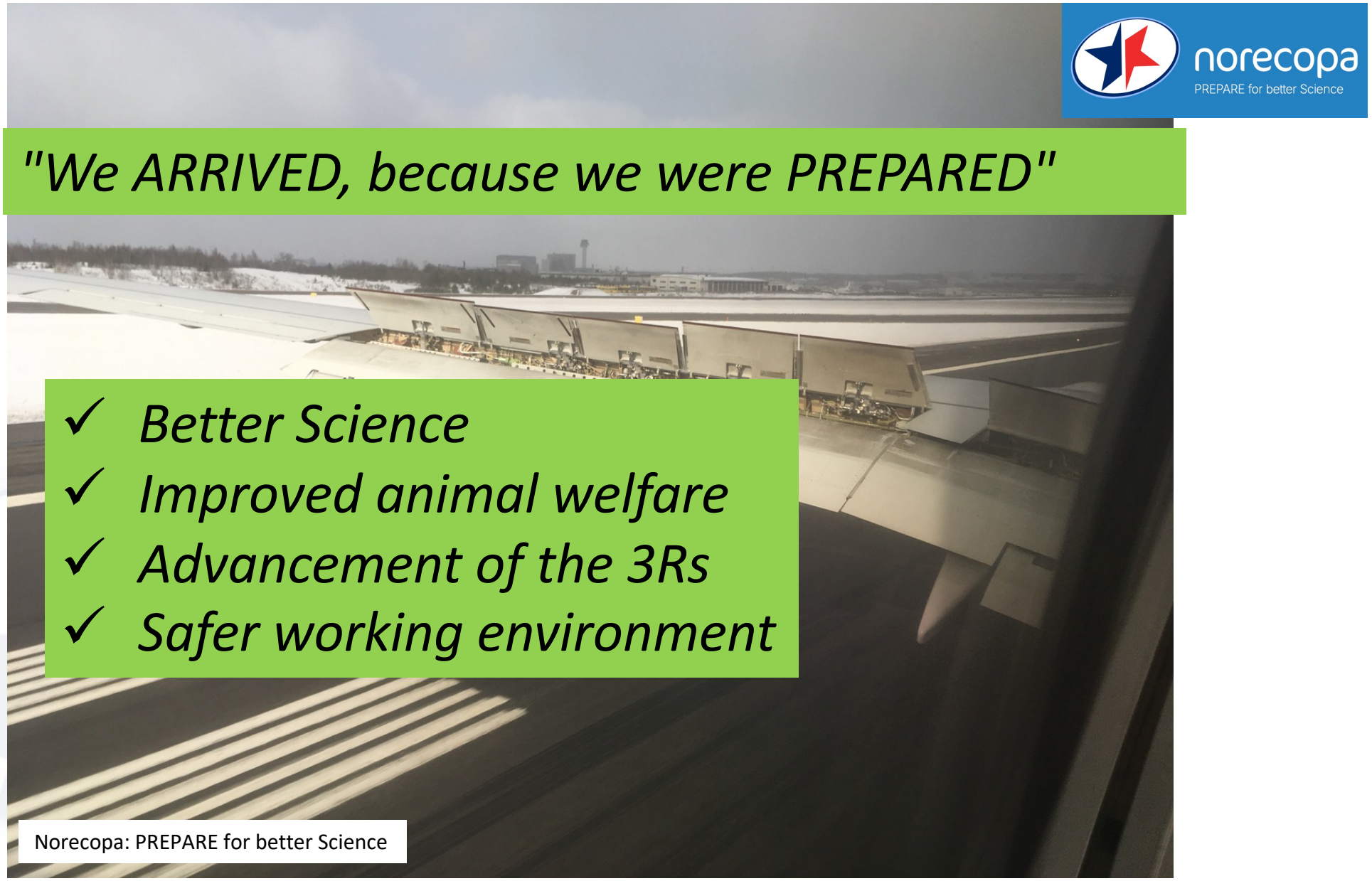

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- ✓ *Better Science*
- ✓ *Improved animal welfare*
- ✓ *Advancement of the 3Rs*
- ✓ *Safer working environment*

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Better reporting of 3R advances

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Better reporting of 3R advances

foto: NMBU

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

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

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

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

[1]Laboratory Animal Unit, National Institute of Public Health, PO Box 4404 Torshov, N-0403 Oslo and [2]Laboratory Animal Unit, Norwegian School of Veterinary Science, PO Box 8146 Dep., N-0033 Oslo, Norway

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

Summary

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

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

Not necessarily a high-impact journal

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

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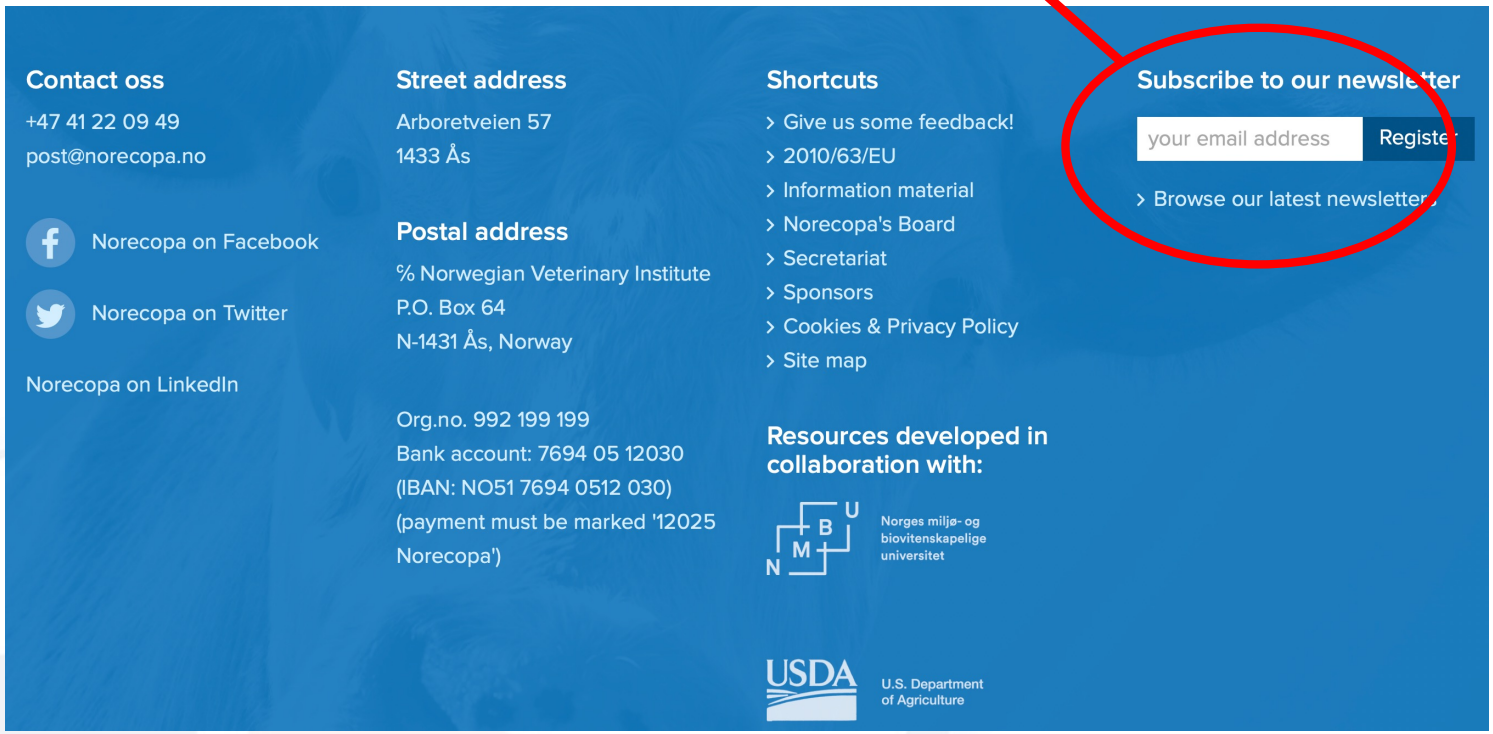

Thank you for listening!