

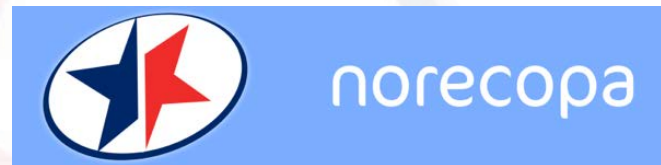
How to plan studies well

norecopa.no/CBMR

Adrian Smith
adrian.smith@norecopa.no

Norecopa

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

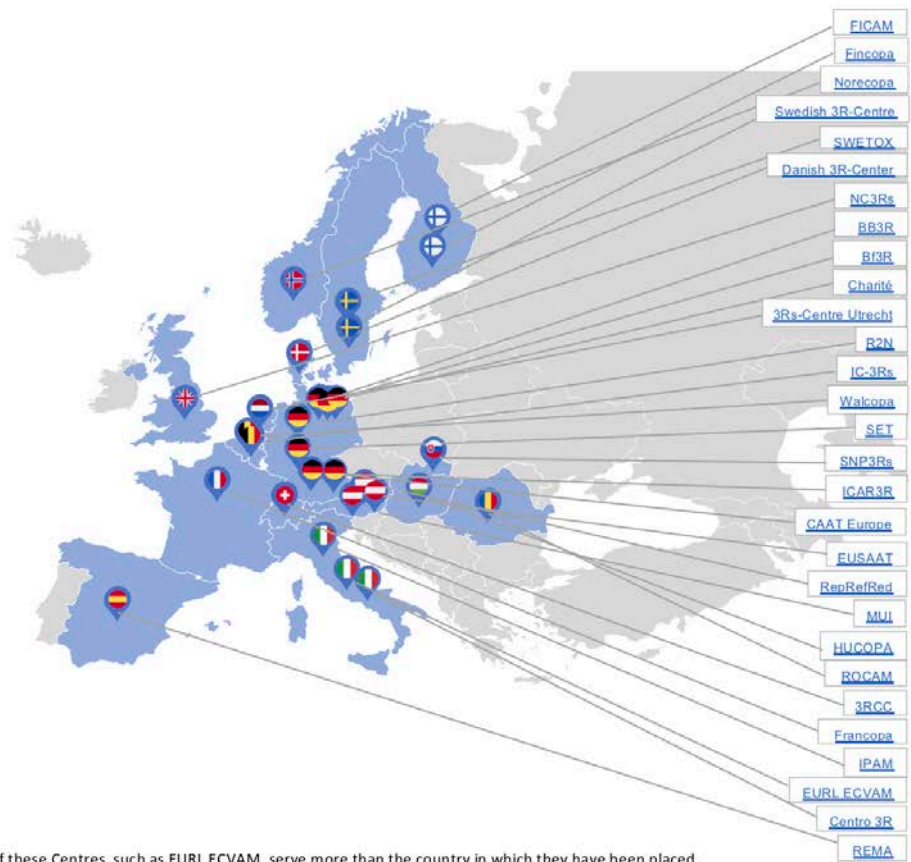


<https://norecopa.no>

Norecopa: PREPARE for better Science

European network of 3R Centres established in 2018
- many with money for 3R research

Interactive map:
norecopa.no/3REuropeOverview



Please note that some of these Centres, such as EUROL ECVAM, serve more than the country in which they have been placed.
 This overview has been compiled by Norecopa. Please report any errors or send suggestions for additions to post@norecopa.no
 Designed by PresentationGo.com. Flags from flaticon.com

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Content of this webinar (30 mins + Q&A)

- 'How to plan studies well': *am I suggesting that you are not?* An introduction to the topic and some personal views
- [Where to go for more information](#)
- **Disclosure:** I have written many of the webpages I will present, but most of them are links to other peoples' work, and were collected for teaching scientists and for managing lab animal facilities.
Novo Nordisk are among the sponsors who financed the building of Norecopa's current website
- **What's missing, and how you can help**

The views expressed in this webinar are my own and not necessarily those of Norecopa.



nature

International weekly journal of science

"The Reproducibility Crisis"

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio & Video | For
News & Comment > News > 2017 > May > Article

NATURE | NEWS

Swiss survey highlights potential flaws in animal studies

Poor experimental design and statistical analysis could contribute to widespread problems in reproducing preclinical animal experiments.

nature

International weekly journal of science

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio
Archive > Volume 533 > Issue 7604 > News Feature > Article

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

More than 70% of researchers have tried and failed to reproduce another scientist's experiments, and more than half have failed to reproduce their own experiments. Those are some of the telling figures that emerged from *Nature's* survey of 1,576 researchers who took a brief online questionnaire on reproducibility in research.

Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • <https://doi.org/10.1371/journal.pmed.0020124>

Avoidable waste in the production and reporting of research evidence

Iain Chalmers, DSc   • Prof Paul Glasziou, RACGP

Published: June 15, 2009 • DOI: [https://doi.org/10.1016/S0140-6736\(09\)60329-9](https://doi.org/10.1016/S0140-6736(09)60329-9)

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Frequently highlighted causes of the "reproducibility crisis"

1. **Publication bias** (reporting only positive results)
2. **Low statistical power**
3. **P-value hacking** (manipulating data to obtain significance)
4. **HARKing** (Hypothesizing after the results are known)
5. **Lack of randomisation and blinding**

norecopa.no/concerns



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Science Fictions

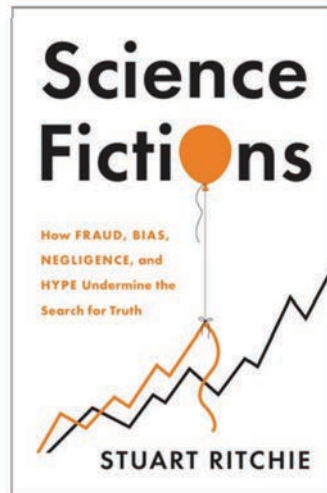
By Stuart Ritchie

Record number: 139853

An insider's view of science reveals why many scientific results cannot be relied upon – and how the system can be reformed.

Science is how we understand the world. Yet failures in peer review and mistakes in statistics have rendered a shocking number of scientific studies useless – or, worse, badly misleading. Such errors have distorted our knowledge in fields as wide-ranging as medicine, physics, nutrition, education, genetics, economics, and the search for extraterrestrial life. As *Science Fictions* makes clear, the current system of research funding and publication not only fails to safeguard us from blunders but actively encourages bad science – with sometimes deadly consequences.

Stuart Ritchie's own work challenging an infamous psychology experiment helped spark what is now widely known as the "replication crisis," the realization that supposed scientific truths are often just plain wrong. Now, he reveals the very human biases, misunderstandings, and



norecoba.no/textbase/science-fictions

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[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

November 2020

- > [Aquatic Animal Welfare Conference 2020](#), 2-6 November 2020 (virtual event)
- > [Improving the reproducibility of cell line research](#), webinar, 3 November 2020
- > [FSVO/UFAW/HSA Online Symposium: Humanely Ending the Life of Animals](#), 3-4 November 2020
- > [Symposium and Workshop: Replacing Fetal Bovine Serum \(FBS\) in Research and Testing](#), Munich, 3-4 November 2020
- > [EARA Media Training Workshop \(for Spain\)](#), online workshop, 4 November 2020
- > [ABSA 63rd Annual Biosafety and Biosecurity Conference](#), 4 - 6 November 2020 (virtual event)
- > [EARA Media Training Workshop \(for Switzerland\)](#), online workshop, 5 November 2020
- > [Minipigs in translational immunosafety assessment](#), webinar, 5 November 2020
- > [Responsible Research 101 Course: 9-19 November 2020](#)
- > [Anaesthesia, analgesia and surgery in mice and rats](#), online/Stockholm, 9-13 November 2020
- > [Do's and don'ts in rodent surgery aseptic technique](#), webinar, 10 November 2020
- > [EPAA Annual Conference](#), 10 November 2020 (virtual event)
- > [Fondamenti di Gestione di un Moderno Stabulario per Roditori](#), webinar in Italian, 10-11 November 2020

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Two frustrations:

We can solve the reproducibility crisis by

- 1) courses in Experimental Design that focus primarily on elimination of bias and the more "mathematical" aspects (e.g. randomisation, experimental units, blinding, statistical methods)

A manifesto for reproducible science

Marcus R. Munafò , Brian A. Nosek, Dorothy V. M. Bishop, Katherine S. Button, Christopher D. Chambers, Nathalie Percie du Sert, Uri Simonsohn, Eric-Jan Wagenmakers, Jennifer J. Ware & John P. A. Ioannidis

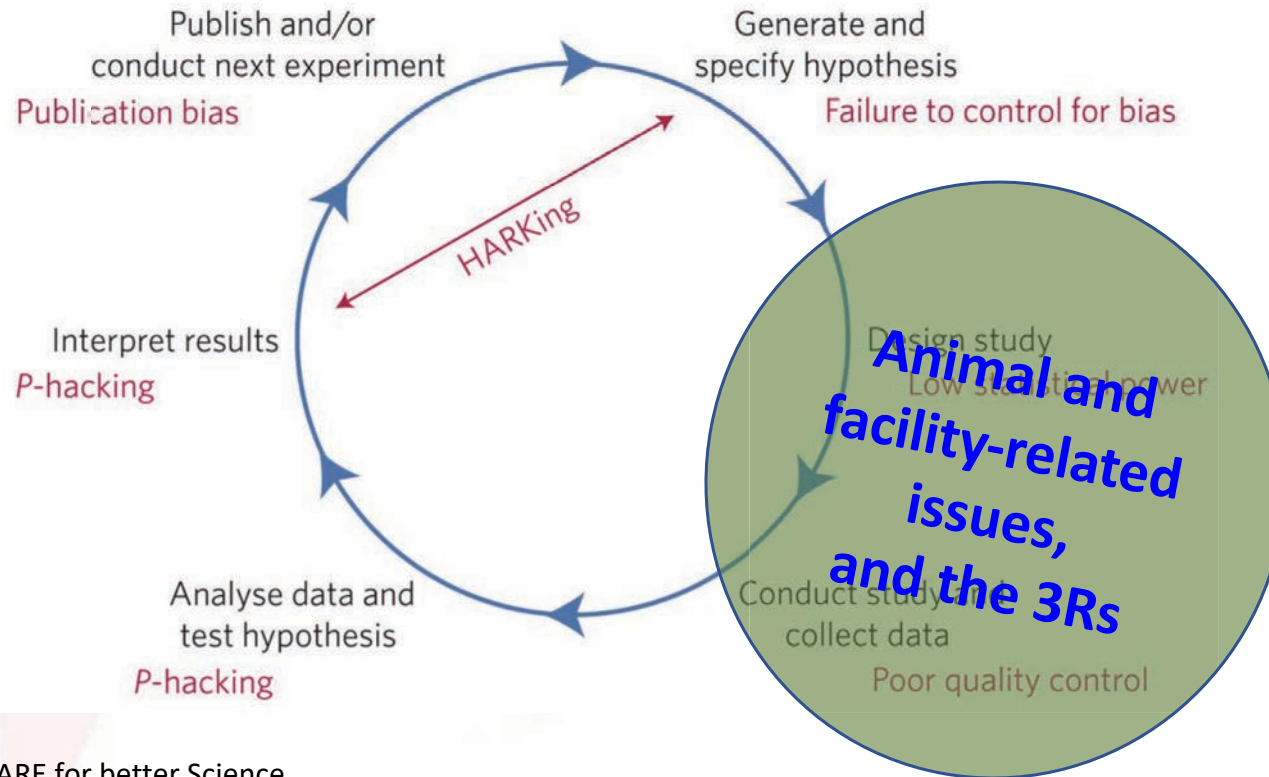
Nature Human Behaviour 1, Article number: 0021 (2017) |

33k Accesses | 518 Citations | 2593 Altmetric | Metric



Figure 1: Threats to reproducible science.

From: A manifesto for reproducible science

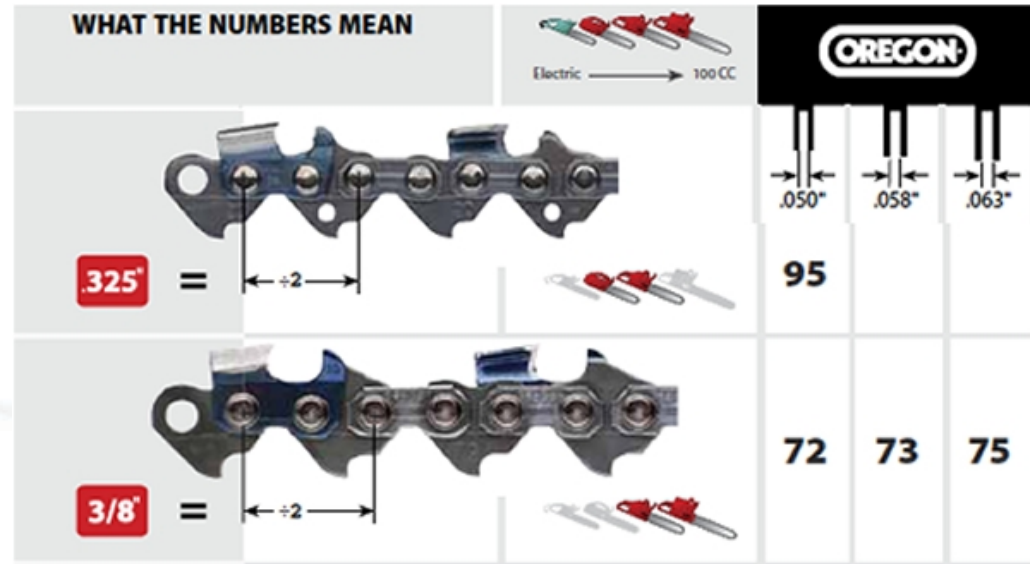




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The easy parts of design and reporting:



arborist101.com

- Chainsaw
 - Blade characteristics
 - Sparkplug type
 - Petrol/oil mixture
 - Service history
- Angle of cut in tree
- Length of tree logs



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Critical issues, behind the scenes:

- Experience of the workers
- Inspection for signs of rot and to decide felling direction
- Routines and equipment for maintenance of the chainsaw
- Additional equipment (winch, chains, straps, wedges)
- Clearing-up and transport of logs
- Health and safety precautions – clothing, onlookers
- Division of labour and costs

These issues may never get reported.



Two frustrations:

We can solve the reproducibility crisis by

2) better reporting!!



reddit.com

Reporting guidelines are not new

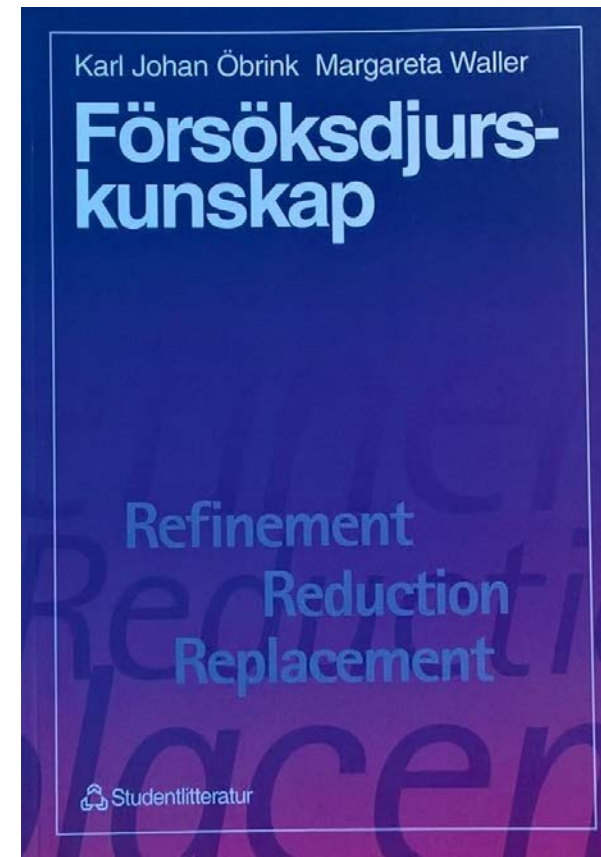
- Guidelines for specification of animals and husbandry methods when reporting the results of animal experiments (GV-SOLAS, 1985)
- Reporting animal use in scientific papers (Jane Smith *et al.*), 1997
- Öbrink & Rehbinder: Animal definition: a necessity for the validity of animal experiments? *Laboratory Animals*, 2000
- Guidelines for reporting the results of experiments on fish (2000)
- **ARRIVE Guidelines, 2010** (Kilkenny *et al.*, NC3Rs) and **ARRIVE v.2 2019**
- Gold Standard Publication Checklist, 2010 (SYRCLE)
- Institute for Laboratory Animal Research, NRC, 2011
- Instructions to authors, in many journals
e.g. Nature's Reporting Checklist



bmc.uu.se/digitalAssets/139/c_139643-l_3-k_kjo.jpg

Karl Johan Öbrink
1918-1998

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norecopa.no/textbase/foersoksdjurskunskap

1996

Hurni 1969, quoted in Öbrink and Rehbinder

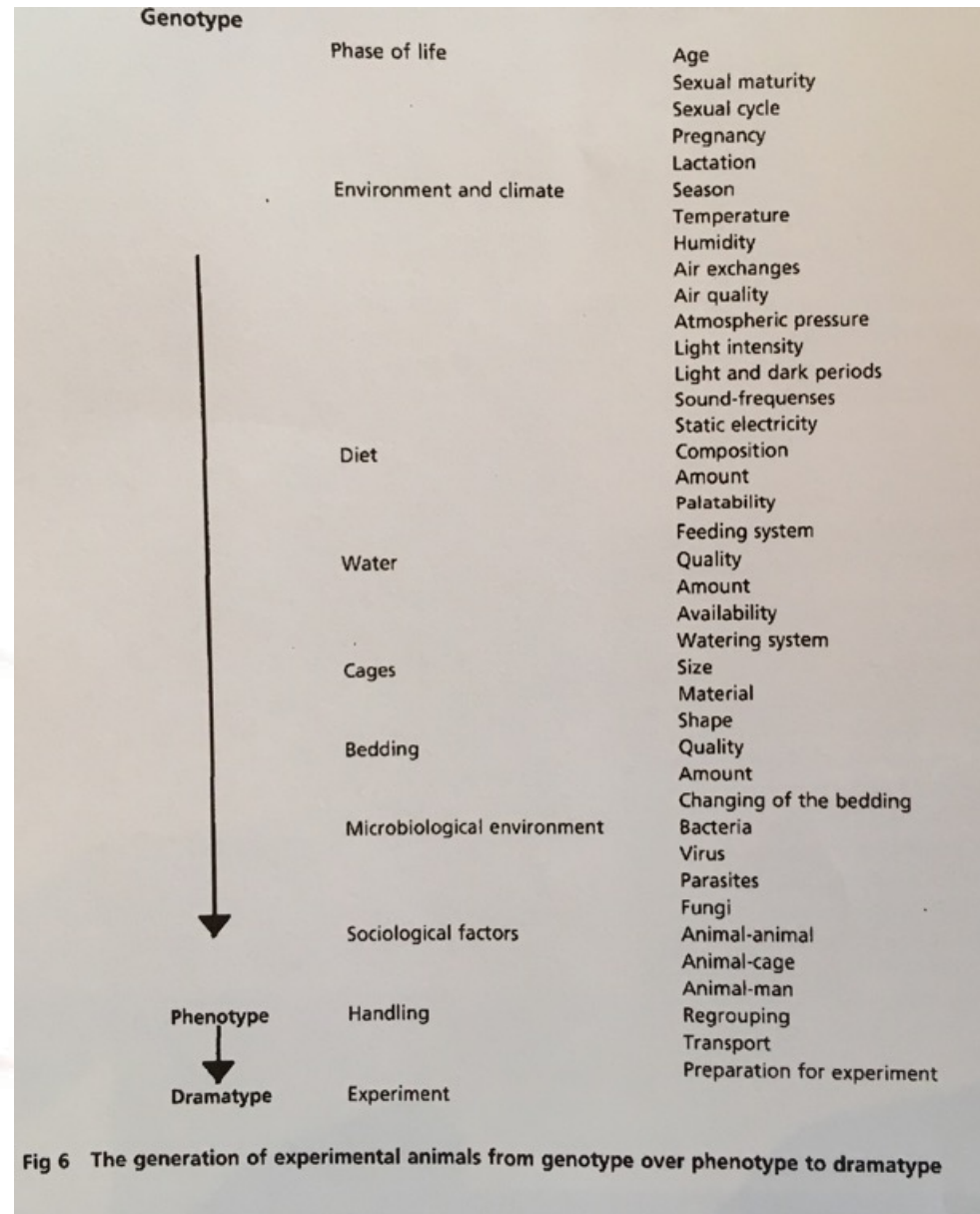


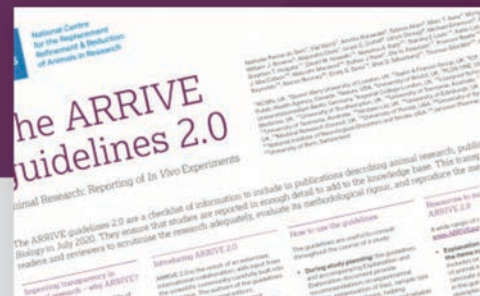
Fig 6 The generation of experimental animals from genotype over phenotype to dramatype

arriveguidelines.org

ARRIVE guidelines

The ARRIVE guidelines (Animal Research: Reporting of *In Vivo* Experiments) are a checklist of recommendations to improve the reporting of research involving animals – maximising the quality and reliability of published research, and enabling others to better scrutinise, evaluate and reproduce it.

[ARRIVE guidelines >](#)



NEWS

New ARRIVE guidelines 2.0 released

14 July 2020



Publications

All publications related to ARRIVE, including the guidelines themselves and

Norecopa: PREPARE for better Science

The ARRIVE guidelines 2.0: Updated guidelines for reporting animal research

Nathalie Percie du Sert, Viki Hurst, Amrita Ahluwalia, Sabina Alami, Marc T. Avey, Monya Baker, William J. Browne, Alejandra Clark, Innes C. Cuthill, Ulrich Dirnagl, Michael Emerson, Paul Garner, Stephen T. Holgate, [...], Hanno Würbel
[view all]

Published: July 14, 2020 • <https://doi.org/10.1371/journal.pbio.3000410>



journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000410

ARRIVE (2010) 'endorsed by more than a thousand journals'
but

'only a small number of journals actively enforce compliance'

(Swiss study in 2016: 51% of researchers publishing in journals that had endorsed ARRIVE had never heard of them)

'Important information as set out in the ARRIVE guidelines is still missing from most publications sampled:

randomisation 30-30%

blinding 20%

sample size justification <10%

all basic animal characteristics <10%'

'It is likely that the level of resource required from journals and editors currently prohibits the implementation of all the items of the ARRIVE guidelines'

Where can we find guidelines for good planning?

- Bibliographic databases are often not used adequately (poor overlapping between the databases)
- Too few scientists are aware of the specialist 3R-databases
- Scientists rarely use "3R" words when they write titles/abstracts/keywords for their papers
- Databases rarely flag papers with explicit 3R terms
- We have no single "Journal of 3R-resources"

Search for 'blood sampling mice' on Google and Norecopa.



Google search results for 'blood sampling mice' showing 31,600,000 hits on Google and 25 results on Norecopa.

Google Search Results:

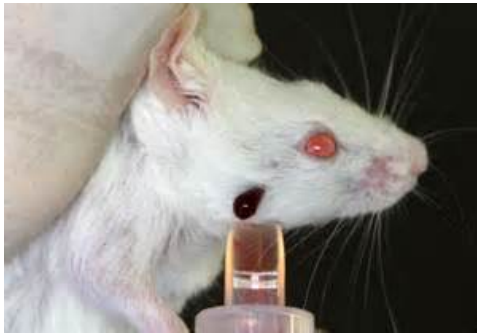
- 31,600,000 hits
- Filters: Videos, News, Shopping
- Refinement: saphenous vein, submandibular, retro orbital
- Results include:
 - A refined method of repeated blood sampling in mice** (NAL records/51742) by Kitching, A.
 - Blood sampling** article discussing pain and harm.
 - National Centre for the Three Rs (NC3Rs)** (3R Guide database/10867).
 - Films and slide shows of procedures on laboratory animals**.
 - A validated LC-MS/MS method for quantitative analysis of curcumin in mouse plasma and brain tissue...** (NAL records/51632).

Norecopa Search Results:

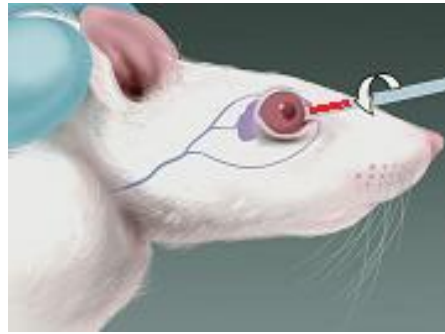
- Website (11)
- Refinement Wiki
- Filters: Browse the databases, Search in the databases, Category, 3R relevance, Type, Year, Owner/Developer, Owner (abbr.), Country, Language, Audience, 3R Relevance, Legislation framework.

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"All I need is a blood sample..."



medipoint.com/html/for_use_on_mice.html



theodora.com/rodent_laboratory/blood_collection.html



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 shock, metabolic changes due to differing storage times before centrifugation, etc.
- ✓ agree that they are feasible in the time available

norecopa.no/more-resources/blood-sampling

Artefacts and unnecessary suffering caused by poor technique



Photo: NMBU

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

What if we can't find guidelines for best practice?

Apply critical anthropomorphism (empathy + an objective, knowledge-based consideration of what is likely to be significant to the animal)

Carol M. Newton (1925-2014)



National Library of Medicine


The three S's

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

norecopa.no/3S

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NORSK ENGLISH

Search:

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[Harm-Benefit Assessment](#) | [Health and safety](#) | [Health monitoring](#) | [Humane endpoints](#) | [H](#)
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over 9,000 webpages
over 300,000 hits / year

1.  United States
2.  United Kingdom
3.  Canada
4.  India
5.  Norway
6.  Spain
7.  Australia
8.  Germany
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10.  France

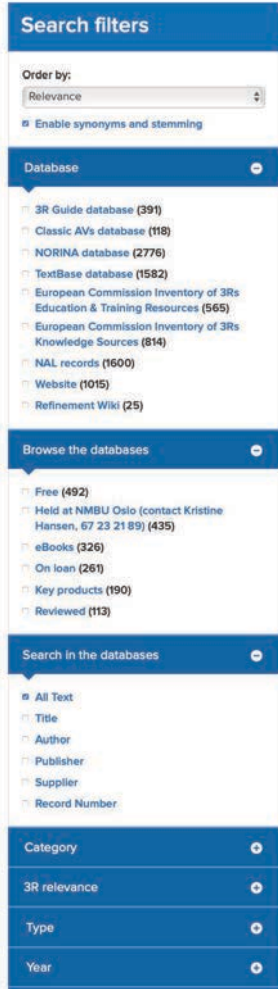
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Some of the content of norecopa.no

- Embedded **databases**, among others:
 - NORINA (2,700 animal alternatives in teaching)
 - TextBase (1,500 books on Laboratory Animal Science)
 - 3R Guide (390 guidelines for animal research)
 - EU Commission datasets of 3R resources and training courses
- A Refinement **Wiki**
- Webpages for two European **networks** (3R Centres & Culture of Care)
- The **PREPARE** guidelines for planning animal studies
- A Webinars and Meetings **Calendar**
- Overview of **courses** in Laboratory Animal Science
- **Newsletters** (7-8 per year in English)

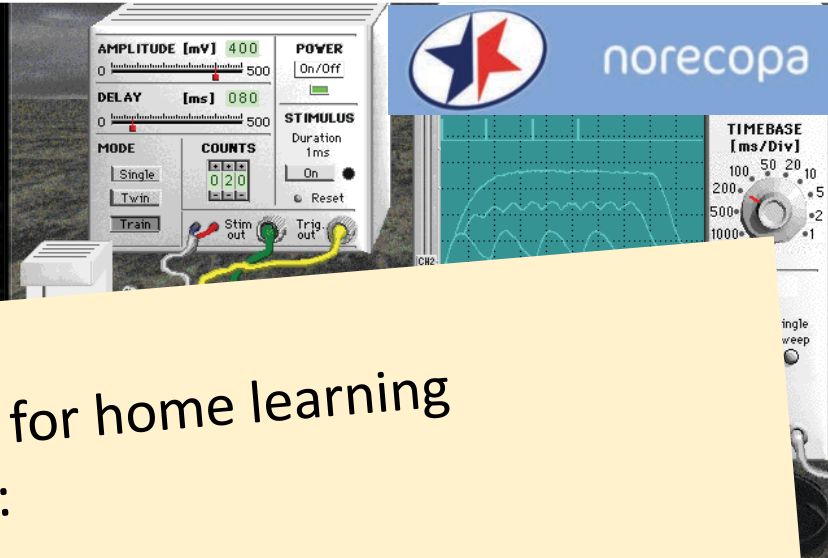
All searchable by one search engine and its filters →

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The screenshot shows the search filters interface on the norecopa website. It includes sections for 'Search filters', 'Database', 'Browse the databases', and 'Search in the databases'. The 'Database' section lists various databases with their respective record counts. The 'Browse the databases' section lists search criteria like 'Free', 'Held at NMBU Oslo', 'eBooks', 'On loan', 'Key products', and 'Reviewed'. The 'Search in the databases' section lists search criteria like 'All Text', 'Title', 'Author', 'Publisher', 'Supplier', and 'Record Number'. The bottom section lists search criteria like 'Category', '3R relevance', 'Type', and 'Year'.

norecopa.no/NORINA



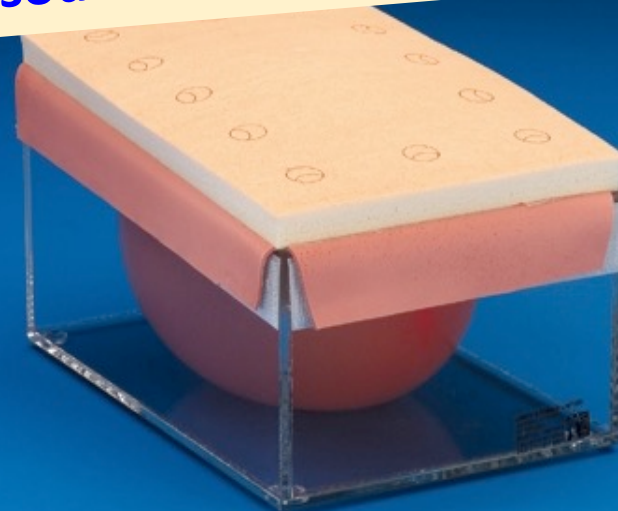
NEW:

overview of resources suitable for home learning during the Covid-19 pandemic:

norecopa.no/norina-database/resources-for-home-learning



rescuecritters.com



limbsandthings.com



norecopa

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



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



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



Testing anaesthetic depth in the chicken
Norecopa | 598 views



Blood sampling from the pig
Norecopa | 3,914 views



Subcutaneous injection in the rabbit
Norecopa | 1,479 views



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



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



Intravenous injection in a rabbit
Norecopa | 2,025 views



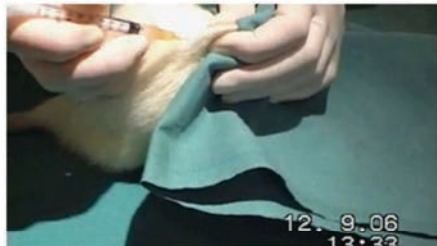
Subcutaneous injection in the chicken
Norecopa | 1,806 views

ANATOMÍA DE LA RATA

Dra. Dolores Vallejo Ruiz
Departamento de Biología de Sistemas, Universidad de Alcalá (Madrid)

Asesoría Científica: Dr. José María Orellana Muriana
Centro de Experimentación Animal, CAI Medicina-Biología, Universidad de Alcalá

Anatomía de la rata
Norecopa | 977 views



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



Lifting a rabbit
Norecopa | 2,420 views



Immobilisation of the rabbit
Norecopa | 2,072 views

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Training resources for animal research



National Legislation (EU1)

Understand the national and international legal and regulatory framework within which projects involving animals are constructed and managed and of the legal responsibilities of the people involved.



Ethics, Animal Welfare and the 3Rs (EU2)

Identify the ethical and welfare issues raised by the use of animals in scientific procedures and understand the basic principles of the 3Rs.



Basic and Appropriate Biology (EU3)

Discover the basic principles of animal behaviour, care, biology and husbandry.



Animal Care, Health and Management (EU4)

Examine information on various aspects of animal health, care and management including, environmental controls, husbandry practices, diet, health status and disease.



Recognition of Pain, Suffering and Distress (EU5)

Identify the normal condition and behaviour of experimental animals and differentiate between a normal animal and one which is showing signs of pain, suffering or distress.



Humane Methods of Killing (EU6.1)

Learn the principles of humane killing including descriptions of the different methods available and information to help you compare the methods permitted to determine the most appropriate method.



Minor Procedures without Anaesthesia (EU7)

An introduction to the theory relating to minor procedures and information about appropriate methods of handling, restraint, appropriate techniques for injection, dosing and sampling relevant to the species.



Anaesthesia for Minor Procedures (EU20)

Guidance and information for individuals who, during their work with animals, will need to apply sedation or short-term anaesthesia for a brief period and mild pain level procedure.



Advanced Anaesthesia for Surgical or Prolonged Procedures (EU21)

Guidance for individuals who, during their work with animals, anaesthetise them for surgical or other painful procedures, or will anaesthetise them for other procedures for longer than 15 minutes.



Principles of Surgery (EU22)

Guidance on the principles of pre-operative animal assessment and care, preparations for surgery including equipment preparation and aseptic technique and the principles of successful surgery.



Procedures With Care

A series of tutorials to assist you to develop your skills in the administration of substances and applying best practice in aseptic surgical techniques in laboratory rodents.



Laboratory Animal Science Webinars

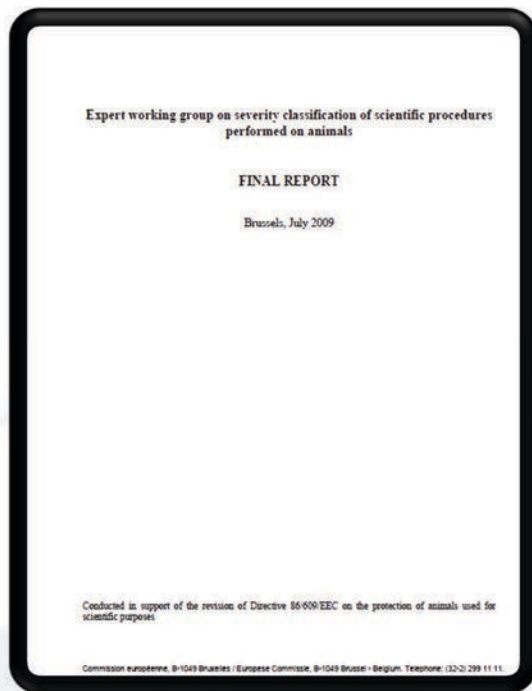
A collection of webinars on a variety of topics presented by members of our development team.

The screenshot shows the top navigation bar of the European Commission website, with the 'ENVIRONMENT' section highlighted. Below the navigation bar, there is a breadcrumb trail: 'European Commission > Environment > Chemicals > Animals used for scientific purposes'. The main content area features a header image of a white mouse in a nest, followed by the title 'Animals used for scientific purposes' and a sub-header 'Retrieval and provision of information on the "Three Rs" and alternatives'. The text discusses the challenges of accessing accurate information on the Three Rs and mentions Directive 2010/63/EU. A list of bullet points outlines the main conclusions of a report, including the need for education, updated information, and improved databases. The page also includes a sidebar with various navigation options and social media icons.



ec.europa.eu/environment/chemicals/lab_animals

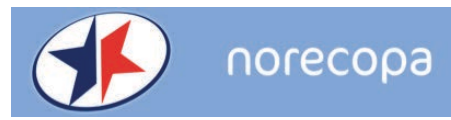
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Expert Working Group report on severity classification

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

From **3R-Guide** (390 guidelines for animal research and testing): norecopa.no/3r-guide

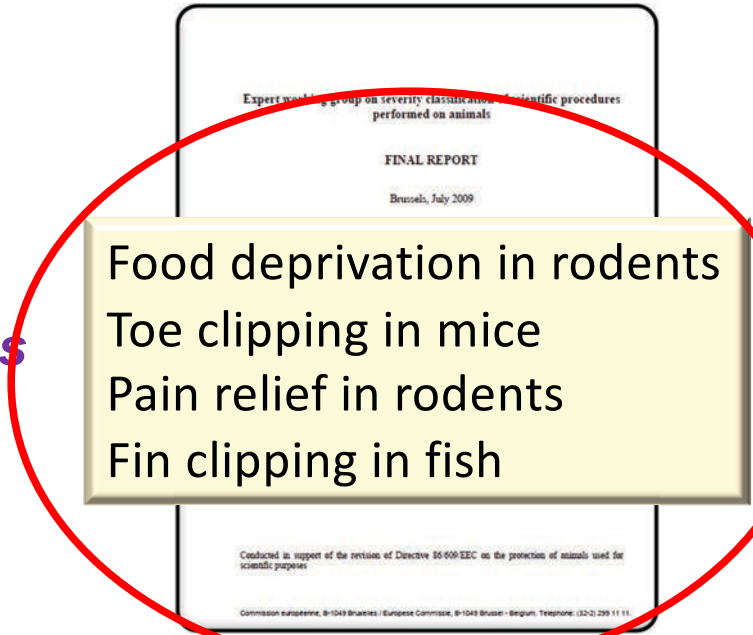


Guidance on the severity classification of procedures involving fish

Report from a Working Group convened by Norecopa

P Hawkins, N Dennison, G Goodman, S Hetherington, S Llywelyn-Jones, K Ryder and AJ Smith
Laboratory Animals, 45: 219-224, 2011
norecopa.no/categories

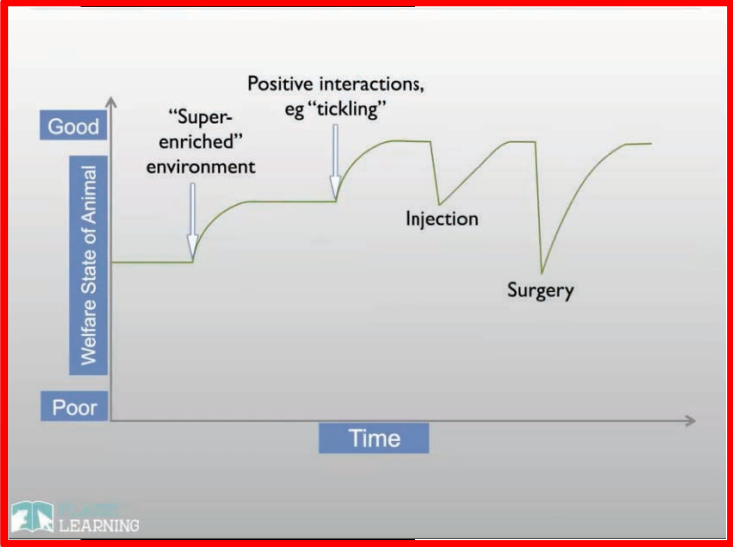
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Food deprivation in rodents
Toe clipping in mice
Pain relief in rodents
Fin clipping in fish

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

How should we assess the severity of procedures in experimental animals and how should we judge the impact of refinements?



Professor Paul Flecknell - Newcastle University and Flaire Consultants



COMPILATION OF SEVERITY CLASSIFICATIONS ACROSS EUROPE

I Interventions on body systems and functions	II Induction of diseases	III Pharmacology, other external causes	IV Housing, environment and behaviour	V Fetuses and premature animals	VI Clinical signs
Substance administration	Heart & circulation	Physical impacts	Housing & Nutrition	1. Feeding 2. Surgical interventions 3. Reproductive toxicology	1. Condition of fur, grooming, body orifices 2. Breathing, heart rate 3. Body temperature 4. Behaviour & body posture 5. Reaction to artificial stimulation; handling behaviour; reaction to physical contact 6. Food & water consumption 7. Prostration 8. Self trauma 9. Body weight
Specimen collection	Infectious diseases	1. Irradiation & chemotherapy 2. Exposure to electricity 3. Exposure to heat 4. Exposure to cold 5. Exposure to acids & basis 6. Traumatization 7. Pressure change 8. Sound & ultrasound 9. Magnetic fields 10. Chronic hypoxia	1. Housing in general 2. Gnotobiology 3. Use of metabolic cages 4. Deprivation – water 5. Deprivation – food 6. Exposure to overstimulation		
1. Collection of body fluids 2. Tissue sampling	1. Infections in general 2. Gnotobiology 3. Bacterial infections 4. Viral infections 5. Mycotic infections	Generation of pain	Breeding & Reproduction		
Surgical interventions	Neurology & sensory organs	Pharmacological studies	1. Identification method and tissue sampling for genotyping 2. Germ cells		
1. Anaesthesia 2. Surgical interventions in general 3. Abdominal and chest cavity 4. Musculoskeletal system 5. Implantation of mini-pumps, transponders 6. Organ transplantation 7. Implanted probes 8. Others	1. Convulsions 2. CNS lesions 3. Ischaemias 4. Visual system	1. Toxicity studies - general 2. Acute toxicity 3. Sub-acute toxicity 4. Chronic toxicity 5. Reproduction toxicology 6. Pharmacokinetic studies 7. Batch testing	GA animals		
	Endocrine, nutritional & metabolic diseases		1. GA animal model in the experiment 2. Phenotype characteristics 3. Generation of GA animals 4. Tissue sampling for genotyping		
	1. Endocrinology 2. Bone metabolism 3. Glucose metabolism 4. Body weight loss		Behaviour		
	Neoplasms		1. Aversive learning, conditioned avoidance behaviour and conflict tests 2. Deprivation – social 3. Deprivation – sleep 4. Deprivation – motion & mobility 5. Pharmacologically induced behavior		
	Immunology				
	1. Transplantation Cellular reactions Autoimmune reactions 4. Immunisation				

A. Zintzsch, J-B Prins & N Kostomitsopolous

norecopa.no/severity

Neglected Factors in Pharmacology and Neuroscience Research: Biopharmaceutics, Animal Characteristics, Maintenance, Testing Conditions

By Claassen, Volkert

Record number: 13335 (legacy id: 6153)

The objective of this book is to indicate those variables which in general may need a better control. Examples, gathered from the literature, are presented to illustrate the impact that those neglected variables may have on various characteristics. The book presents a series of representative studies from a broad field of interest so that insight can be obtained about the potential effects of these parameters in experimental outcomes. In this way, an impetus should be given to the critical consideration of test design and limitations of conclusions from experimental results. In part, the book is written as a reaction to frustrations endured during pharmacological research of many years' standing, and therefore the choice of examples from the literature is largely related to this discipline. As pharmacological research is to a large extent based on the other life sciences, this volume may be of interest to a much broader audience. This may certainly be the case for pharmacokineticists and toxicologists for whom drugs are the main object of study. This book may also help to improve test designs for biochemists and physiologists, not only when using drugs as tools in their experiments, but also to improve generally the control of animal characteristics and test conditions. This book is Volume 12 in a series entitled *Techniques in the Behavioral and Neural Sciences*.



Comments & References: First Edition. 496 pages. Paperback. A review is available in [Laboratory Animals](#), April 1996, Volume 30 (2).

Review:

'This book is essential reading for anybody that wishes to take the problem of experimental variability seriously. There are no magic cures offered for experimental problems, but there are many explanations offered within this book. A worthwhile addition to any library.'

norecopa.no/textbase/neglected-factors-in-pharmacology-and-neuroscience-research-biopharmaceutics-animal-characteristics-maintenance-testing-conditions

DEPART guidelines for osteoarthritis research

3R Guide database/74528

DEPART is a set of planning guidelines which emphasise specific issues that may be particularly relevant in pre-clinical studies of osteoarthritis.

CCAC Guidelines on transgenic animals

3R Guide database/10676

Topics covered include investigator and animal care committee responsibilities, proposals to create new or use existing strains, accounting, containment, reporting, responsibility of the CCAC and literature references.

Supplier: [Canadian Council on Animal Care \(CCAC\)](#)

Guidelines for biosafety laboratory competency

3R Guide database/10778

AAALAC International cites these guidelines as one of its reference resources.

Guidelines on Adequate Veterinary Care

3R Guide database/10688

This paper, written by ACLAM, an organisation consisting of veterinarians specialising in laboratory animal medicine, is a detailed description of adequate veterinary care and is intended to be applied to animals used, or intended to be used, in research, teaching or testing.

CCAC Guidelines on antibody production

3R Guide database/10638

The Canadian Council on Animal Care (CCAC) produced guidelines on antibody production in 2002.

From the 3R Guide database

Guideline collections on other 3R Centre websites



[Science Home](#) |
 [Companion animals](#) |
 [Farm animals](#) |
 [Research animals](#) |
 [Wildlife](#)

[Implementing the 3Rs](#) |
 [Ethical review](#) |
 [Focus on severe suffering](#) |
 [Our international](#)



Ethical review

Find resources for AWERBs and read about effective ethical review



Culture of care

Read articles about the culture of care with lab animals



Severe suffering

Read articles about general guidance and specific procedures




Welfare and severity assessment

Read articles about welfare and severity assessment in lab animals



Housing and care

Housing and care for rodents, rabbits, fish, amphibians and other species




Refining procedures

Read more on refining procedures for general, biotelemetry, vaccine studies and humane killing




Genetically altered animals and biotechnology

Read articles and reports about genetically altered animals and biotechnology



Non-human primates

Read our responses and articles about non-human primates



Research standards

Read more articles about research standards



Publication standards

Read more about publication standards and editorial policies



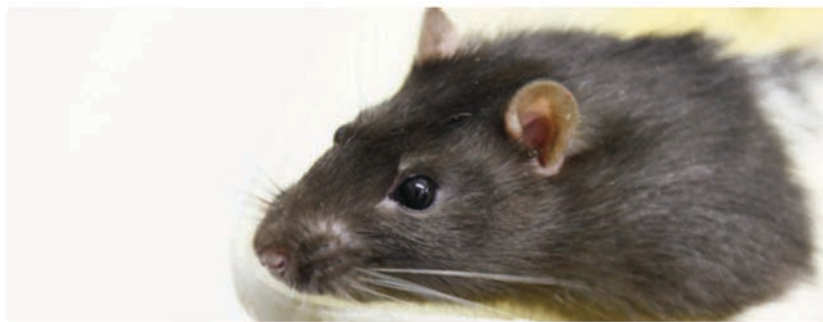
RSPCA welfare meeting reports

RSPCA welfare meeting reports for rodents, rabbits, cattle, pigs, sheep, goats, chickens and wildlife



Other papers and articles



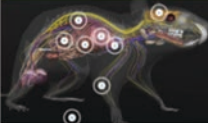

Read papers about other issues including training, openness and regulations



Research animals

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science.rspca.org.uk/sciencegroup/researchanimals

<p>The NC3Rs and the 3Rs during COVID-19</p>	<p>Webinars</p>	<p>Embedding the 3Rs in COVID-19 return to research plans</p>	<p>3Rs video presentation</p>
			
<p>Advice and resources for researchers and animal care staff.</p>	<p>Upcoming webinars and recordings of past webinars on different 3Rs topics.</p>	<p>Guidance on key considerations and resources for researchers returning to working with laboratory animals.</p>	<p>Demonstrating the 3Rs in principle and practice.</p>
<p>3Rs advice for project licence applicants</p>	<p>3Rs for the public</p>	<p>3Rs in toxicology and regulatory sciences</p>	<p>Animal technician hub</p>
			
<p>Guidance and resources to help applicants address the 3Rs aspects of a Home Office project licence application.</p>	<p>Resources and information on the 3Rs aimed at a non-specialist audience.</p>	<p>NC3Rs programmes in drug and chemical safety testing.</p>	<p>Resources to help laboratory animal technicians implement the 3Rs.</p>
<p>Blood sampling</p>	<p>Breeding and colony management</p>	<p>E-learning resources</p>	<p>Experimental design</p>
			

Pdf files of 80+ presentations held at Norecopa's meetings



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[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/presentations



Most of the presentations on this page are from events arranged by Norecopa. A few of them are from external events where Norecopa's staff have lectured.

They are grouped into

[Koenig 101017.pdf](#)

- > [General presentations](#)
- > [Care and use of animals in field research](#)
- > [Care and use of farm animals in research](#)
- > [Care and use of fish in research](#)

Title	Speaker	Affiliation	Year
General presentations			
Design of animal studies: Increasing reproducibility and animal welfare	Adrian Smith	Norecopa	2020
PREPARE before you ARRIVE: Good reporting relies on good planning	Adrian Smith	Norecopa	2019
Animal-free testing and humans-on-a-chip: How far have we come?	Leopold Koenig	TissUse GMBH, Berlin, Germany	2017
Nordic 3R-Centres: What can we offer?	Tom Bengtsen	Denmark's 3R-Center	2017
Prize-winning 3R activity in Norway	Gøril Eide	University of Tromsø, Norway	2017
Have the 3Rs made any difference?	Elliot Lilley	RSPCA, UK	2017

Guidelines for research using fish




Please also see the [PREPARE guidelines for planning and conducting animal research and testing](#).

- > [Revised version of Appendix A](#) of the "European Convention for the protection of animals used for scientific purposes". The revision came into force on 15 June 2007 and contains species-specific guidelines for a number of fish species.
- > [Guidelines for the severity classification of procedures on fish](#)
- > Wootten R (2005) [Species-specific provisions for fish](#) in the European Convention for the protection of animals used for experimental and scientific purposes (presentation at a meeting in Oslo in May 2005)
- > Griffin G (2005) [Canadian Guidelines](#) for the care & use of fish in research, teaching and testing (presentation at a meeting in Oslo in May 2005)
- > [Guidelines on: the care and use of fish in research, teaching and testing](#) (2005) [Canadian Council on Animal Care](#) (CCAC)
- > Johansen R., Needham JR, Colquhoun D., Poppe TT & Smith AJ. (2006): [Guidelines for health and welfare monitoring of fish used in research](#). *Laboratory Animals* 40(4): 323-340
- > [Considerations for a European animal welfare standard to evaluate adverse phenotypes in teleost fish](#)
- > [Guidelines for the Use of Fishes in Research](#) (2004) American Fisheries Society (AFS)
- > Ostrander GK (2000) [The Laboratory Fish](#). Academic Press, Baltimore, USA.
- > Poole T (1999) [UFAW Handbook on the Care and Management of Laboratory Animals. Volume 2: Amphibious & Aquatic Vertebrates & Advanced Invertebrates](#). Blackwell Science.
- > Casebolt DB, Speare DJ, Horney BS (1998) [Care and use of fish as laboratory animals: Current state of knowledge](#). *Laboratory Animal Science* 48, 124-136
- > DeTolla LJ et al. (1995) [Guidelines for the Care and Use of Fish in Research](#) *ILAR Journal* 37 (4)
- > Borski RG, Hodson RJ (2003) [Fish Research and the Institutional Animal Care and Use Committee](#) *ILAR journal* 44 (4)
- > Brattelid T, Smith AJ (2000) [Guidelines for reporting the results of experiments using fish](#) *Laboratory Animals* 34 131-135
- > The welfare of farmed fish at slaughter ([concerns about carbon dioxide use](#)) (HSUS report)
- > Schaeffer et al. (1992) [The Care and Use of Amphibians, Reptiles and Fish in Research](#) Scientists for Animal Welfare (SCAW)
- > [Documents for laypeople on ethics committees](#), Royal Society for the Protection of Animals (RSPCA), UK

norecoba.no/fish/guidelines

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Fish



Farm animals



Laboratory animals



Wildlife and wild fish



Cephalopods



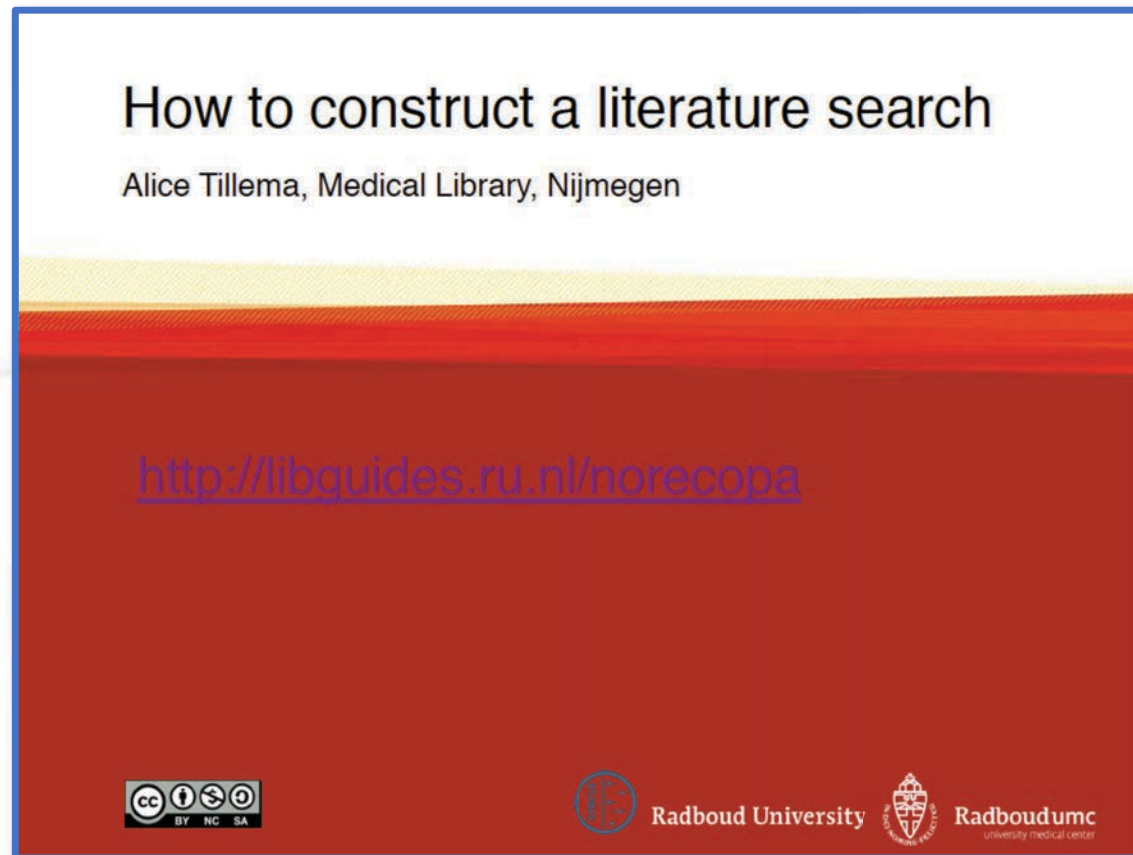
Other aquatic animals

norecopa.no/species

Alice Tillema, Radboud University:
How to construct a literature search



<http://norecopa.no/how-to-construct-a-literature-search.pdf>



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How to Search: An Overview

1. Define the Questions

Note all possible keywords and subject headings to include in your literature search, those which are related to your research, as well as those related to the 3Rs.

2. Select Appropriate Databases

Selecting the appropriate databases is critical; you will need to search in more than one database and to tailor your keywords, subject headings, and search strategies to each specific database.

3. Construct the Search Strategies

After developing keyword lists, you will need to develop search strategies, including how to expand and/or narrow your searches. Keep a record of databases and search strategies for protocol submission.

4. Evaluate Search Results

Review and evaluate your results as you go along in order to make modifications to your search strategies.

5. Manage and Report Search Results

After conducting your searches, you will need a way to keep track of the information that you have located, document the process, and create a narrative concerning any refinements, reductions, or replacements identified.

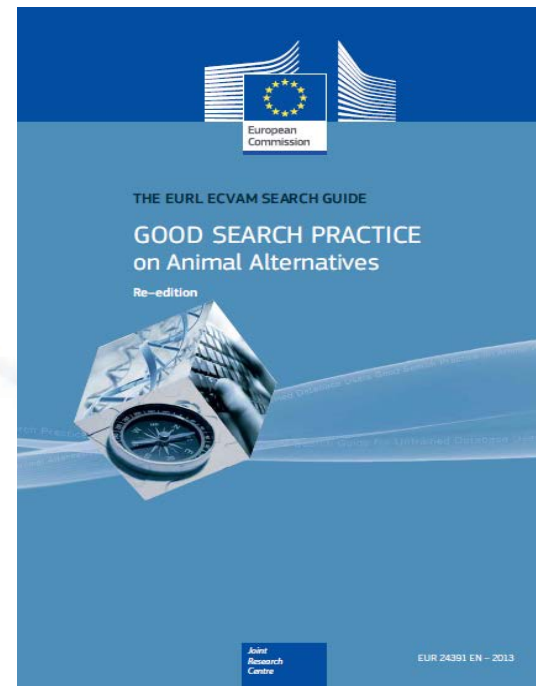
library.ucdavis.edu/guide/animal-alternatives-searching

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The EURL ECVAM Search Guide

Can be ordered free of charge
from

bookshop.europa.eu



Norecopa: PREPARE for better Science



Original Article

PREPARE: guidelines for planning animal research and testing

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

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

Keywords
guidelines, planning, design, animal experiments, animal research

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

Introduction
The quality of animal-based studies is under increasing scrutiny, for good scientific and ethical reasons. Studies of papers reporting animal experiments have revealed alarming deficiencies in the information provided,^{1,2} even after the production and journal endorsement of reporting guidelines.³ There is also widespread concern about the lack of reproducibility and translatability of laboratory animal research.⁴⁻⁷ This can, for example, contribute towards the failure of drugs when they enter human trials.⁸ These issues come in addition to other concerns, not unique to animal research, about publication bias, which tends to favour the reporting of positive results and can lead to the acceptance of claims as fact.⁹ This has understandably sparked a demand for reduced waste when planning experiments involving animals.¹⁰⁻¹² Reporting guidelines alone cannot solve the problem of wasteful experimentation, but thorough planning will increase the likelihood of success and is an important step in the implementation of the 3Rs of Russell & Burch (replacement, reduction, refinement).¹³ The importance of attention to detail at all stages is,

in our experience, often underestimated by scientists. Even small practical details can cause omissions or artefacts that can ruin experiments which in all other respects have been well-designed, and generate health risks for all involved. There is therefore, in our opinion, an urgent need for detailed but overarching guidelines for researchers on how to plan animal experiments which are safe and scientifically sound, address animal

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laboratory animals

SAGE

Pre-published under Open Access on 3 August 2017 in *Laboratory Animals*, sponsored by the Universities Federation for Animal Welfare (UFAW), UK



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

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Smith, AJ, Clutton, RE, Lilley, E, Hansen KEAa, Brattelid, T. (2018): *PREPARE: Guidelines for planning animal research and testing. Laboratory Animals*, 52(2): 135-141. DOI: [10.1177/0023677217724823](https://doi.org/10.1177/0023677217724823)

Norecoba: PREPARE for better Science



PREPARE



The PREPARE Guidelines Checklist

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

Adrian J. Smith¹, R. Eddie Clutton², Elliot Lilley³, Kristine E. Aa. Hansen⁴ & Trond Bratteid⁵

¹Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; ²Royal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; ³Research Animals Department, Science Group, RSPCA, Wilberforce Way, Southwater, Horsham, West Sussex, RH13 9RS, U.K.; ⁴Section of Experimental Biomedicine, Department of Production Animal Clinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences, P.O. Box 8146 Dep., 0033 Oslo, Norway; ⁵Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

PREPARE¹ consists of planning guidelines which are complementary to reporting guidelines such as ARRIVE².

PREPARE covers the three broad areas which determine the quality of the preparation for animal studies:

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

The topics will not always be addressed in the order in which they are presented here, and some topics in the checklist can be adapted to meet special needs, such as field studies. PREPARE includes guidance on facilities, since in-house experiments are dependent upon their quality. The full version of the guideline is available on the norecopa website, with links to global resources, at <https://norecopa.no/PREPARE>.

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

Three Rs!

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

Topic	Recommendation
(B) Dialogue between scientists and the animal facility	
5. Objectives and timescale, funding and division of labour	<input type="checkbox"/> Arrange meetings with all relevant staff when early plans for the project exist. <input type="checkbox"/> Construct an approximate timescale for the project, indicating the need for assistance with preparation, animal care, procedures and waste disposal/decontamination. <input type="checkbox"/> Discuss and disclose all expected and potential costs. <input type="checkbox"/> Construct a detailed plan for division of labour and expenses at all stages of the study.
6. Facility selection	<input type="checkbox"/> Conduct a physical inspection of the facilities, to evaluate building and equipment standards and needs. <input type="checkbox"/> Discuss staffing levels at times of extra risk.
7. Staffing and training	<input type="checkbox"/> Assess the current competence of staff members and the need for further education or training prior to the study.
8. Risk assessment and decontamination	<input type="checkbox"/> Perform a risk assessment, in collaboration with the animal facility, for all persons and animals affected directly or indirectly by the study. <input type="checkbox"/> Assess, and if necessary produce, specific guidance for all stages of the project. <input type="checkbox"/> Discuss means for containment, decontamination, and disposal of all items in the study.
(C) Quality control of the components in the study	
9. Test substances and procedures	<input type="checkbox"/> Provide as much information as possible about test substances. <input type="checkbox"/> Consider the feasibility and validity of test procedures and the skills needed to perform them.
10. Experimental animals	<input type="checkbox"/> Decide upon the characteristics of the animals that are essential for the study and for reporting. <input type="checkbox"/> Avoid generation of surplus animals.
11. Quarantine and health monitoring	<input type="checkbox"/> Discuss the animals' likely health status, any needs for transport, quarantine and isolation, health monitoring and consequences for the personnel.
12. Housing and husbandry	<input type="checkbox"/> Attend to the animals' specific instincts and needs, in collaboration with expert staff. <input type="checkbox"/> Discuss acclimatization, optimal housing conditions and procedures, environmental factors and any experimental limitations on these (e.g. food deprivation, solitary housing).
13. Experimental procedures	<input type="checkbox"/> Develop refined procedures for capture, immobilisation, marking, and release or rehoming. <input type="checkbox"/> Develop refined procedures for substance administration, sampling, sedation and anaesthesia, surgery and other techniques.
14. Humane killing, release, reuse or rehoming	<input type="checkbox"/> Consult relevant legislation and guidelines well in advance of the study. <input type="checkbox"/> Define primary and emergency methods for humane killing. <input type="checkbox"/> Assess the competence of those who may have to perform these tasks.
15. Necropsy	<input type="checkbox"/> Construct a systematic plan for all stages of necropsy, including location, and identification of all animals and samples.

References

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

Further information
<https://norecopa.no/PREPARE> | post@norecopa.no | [@norecopa](https://twitter.com/norecopa)

PREPARE:

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

PREPARE covers 15 topics:

Formulation of the study

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

Dialogue between scientists and the animal facility

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

Methods

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

Maybe the study
shouldn't go ahead

Systematic review of
published research?

PREPARE:

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

PREPARE covers 15 topics:

Formulation of the study

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

Dialogue between scientists and the animal facility

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

Methods

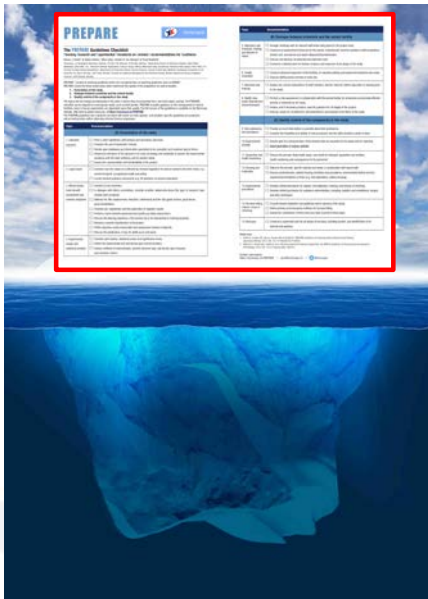
9. Test substances and procedures
10. Experimental animals
11. Quarantine and health monitoring
12. Housing and husbandry
13. Experimental procedures
14. Humane killing, release, reuse or rehoming
15. Necropsy

Items in pink are
not typically
highlighted in
reporting guidelines



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

norecopa.no/PREPARE



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The screenshot shows the top navigation bar of the norecopa website. It features the norecopa logo on the left, the text 'norecopa' in the center, and language options 'NORSK' and 'ENGLISH' on the right. Below the logo is a search bar with the text 'Search: Q'. A horizontal menu contains the following items: 'About Norecopa', 'Alternatives', 'Databases & Guidelines', 'Education', 'Legislation', 'Meetings', 'More resources', 'News', 'PREPARE', 'Species', and 'Wiki'.

- PREPARE Checklist | 1-Literature searches | 2-Legal issues | 3-Ethical issues, Harm-Benefit Assessment and humane endpoints | 4-Experimental design and statistical analysis | 5-Objectives and timescale, funding and division of labour | 6-Facility evaluation | 7-Education and training | 8-Health risks, waste disposal and decontamination | 9-Test substances and procedures |

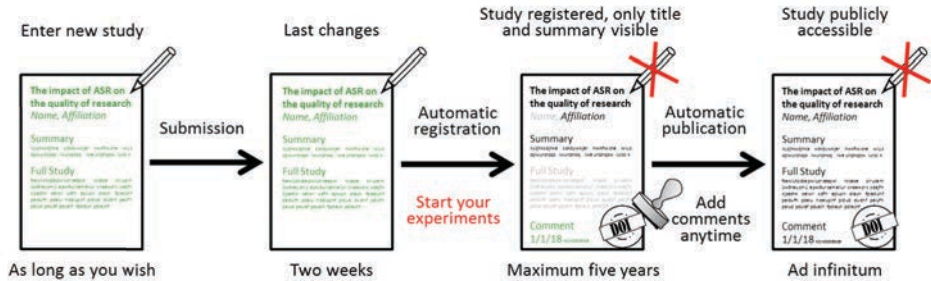
Links to quality guidelines and scientific papers worldwide on e.g. blood sampling, injection volumes, housing and husbandry, analgesia, humane endpoints, experimental design

Harm-Benefit Assessment

An evaluation of the likely sources and level of suffering of a planned procedure, followed by an assessment of the potential benefits of the research weighed against these harms, lies at the heart of [legislation in the EU](#) and elsewhere. Advice on how to conduct a harm-benefit analysis is available here. [A framework for severity assessment and severity classification](#) must be established and justified. The likely adverse effects of each procedure should be described, along with their likely incidence and methods of recognising them, with indications of how these effects can be mitigated by implementing refinement. This necessitates the involvement of personnel with the relevant expertise to recognise, assess and reduce animal suffering, especially severe suffering. [Guidance on this is available on the RSPCA website](#). Specific justification of all unalleviated animal

Pre-registration of a study

- Prevents p-hacking and HARKING
- Encourages the publication of negative results
- Ensures a detailed description of the study





Pre-registration of animal research

The pre-registration of protocols for animal research is gaining momentum, enabling peer review and as part of the work to reduce bias:

- > [Preclinicaltrials.eu](https://preclinicaltrials.eu)
- > [The Animal Study Registry \(animalstudyregistry.org\)](https://www.animalstudyregistry.org) , Germany (see also [Bert et al., 2019](#))
- > [PROSPERO](#) : An international prospective register of systematic reviews, established by the National Institute for Health Research (NIHR) in the UK
- > [Should preclinical studies be registered?](#) (Anderson & Kimmelman, 2015)
- > [Further advice on protocol registration](#)

Depositories for online protocols

- > [Protocol Exchange](#) from Nature.com
- > protocols.io
- > protocol-online.org
- > [Open Wetware](#)

<https://norecoba.no/prepare/4-experimental-design-and-statistical-analysis>



A simple but effective Master Plan



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A contract between the animal facility and the research group

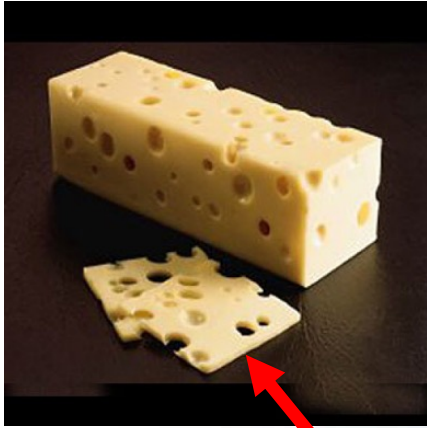
The division of labour and responsibilities

Clarifying all stages of the experiment

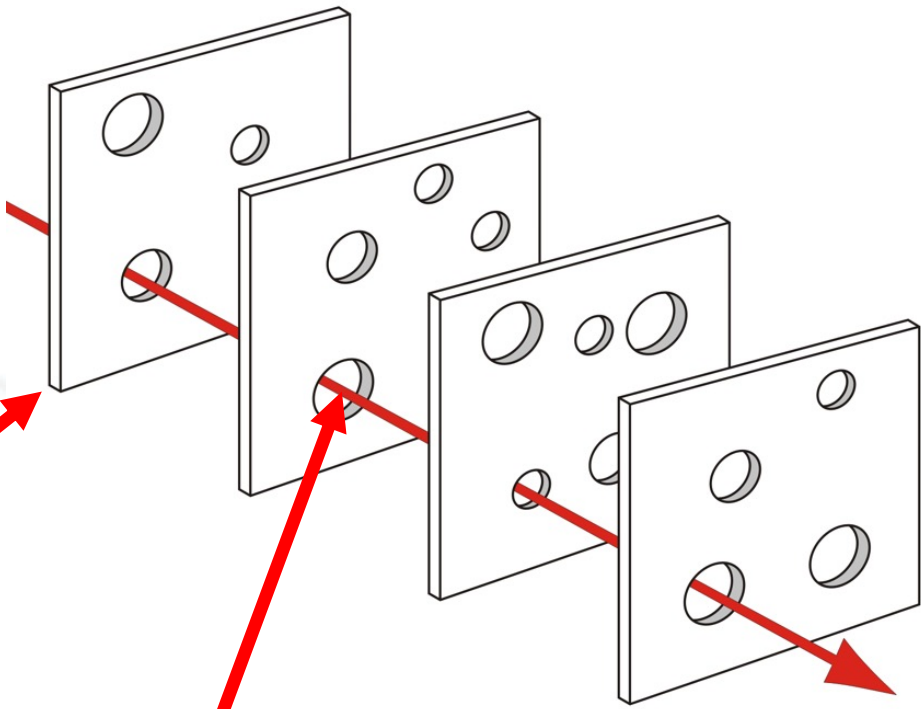
Ensuring that all necessary data are recorded

	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			

Threat and Error Management



eaugallecheese.com/Swiss-cheese



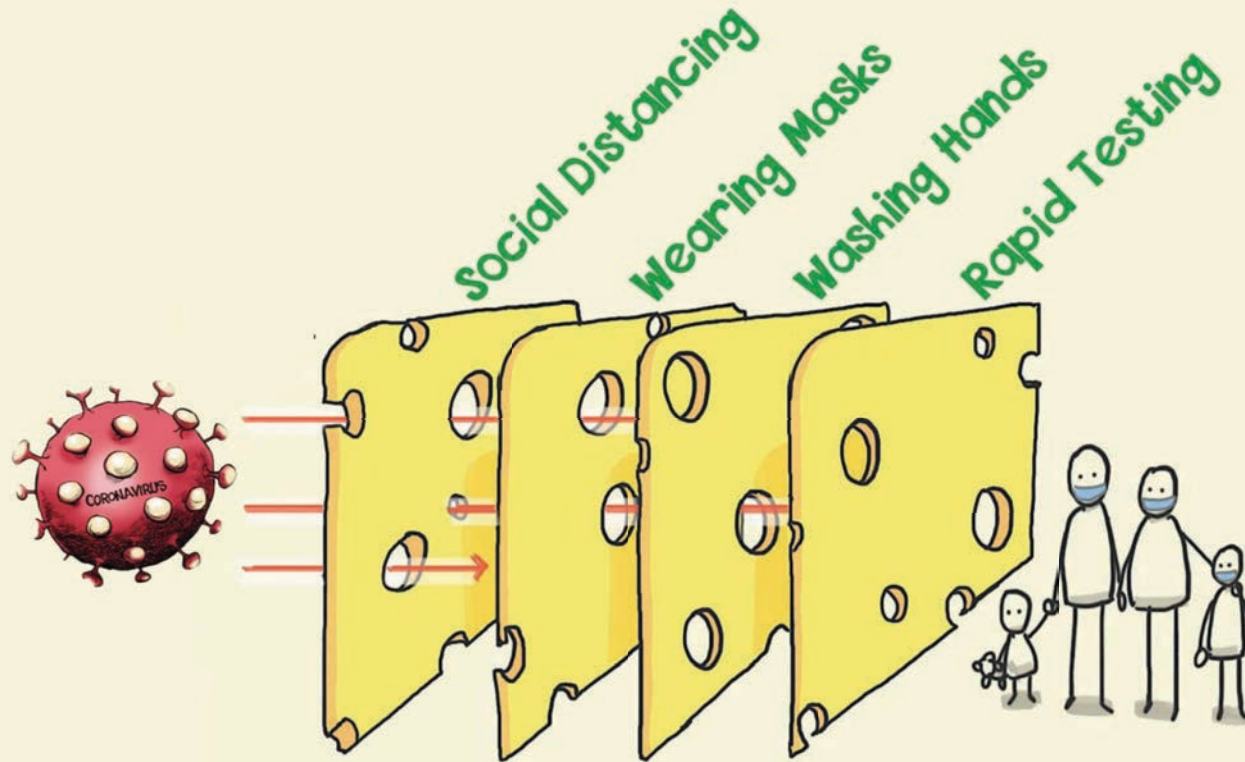
"Layer of defence"
or redundancy

Weakness / hazard

Loss

wikipedia.org/wiki/Swiss_cheese_model

The Swiss Cheese Model



All layers are important because each layer is not perfect.

Created with sketchplanations.com

twitter.com/jkwan_md/status/1313328317718843394/photo/1

Contingency and redundancy

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

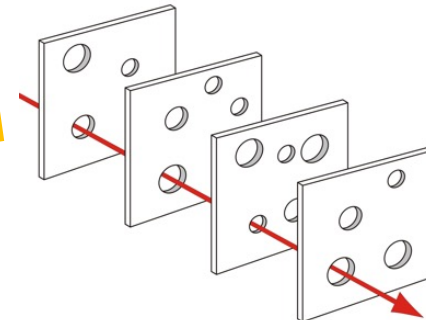


Photo: NMBU

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
 - 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

These need to be revised or supplemented in the light of Covid-19



Temporary staff at weekends and holidays

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

Those who plan animal studies should ask relevant questions about quality assurance of the animal facility itself

The AAALAC Program Description Template is a good checklist for the facility as a whole

<https://www.aaalac.org/program-description>



Disclosure:

I have prepared for and managed an animal facility with AAALAC accreditation for 10 years

No other connection to AAALAC International



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

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

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63 pages



"because we've always done it that way"

"as often as necessary"

"there are no alternatives"

A Culture of Care

The International Culture of Care Network
norecopa.no/coc

A demonstrable commitment, throughout the establishment, to improving:

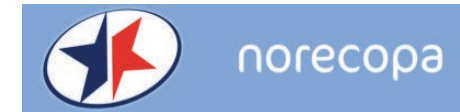
- animal welfare
- scientific quality
- care of staff
- transparency for all stakeholders, including the public

It goes beyond simply complying with the law!

Closely related to a culture of care is the concept of a **Culture of Challenge** (Louhimies, 2015).

Look for the acceptable, rather than choosing the accepted.

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Communication and the Culture of Care

Penny Hawkins, RSPCA Research Animals Department
on behalf of the International Culture of Care Network*

Effective two-way communication between scientists and animal technologists is essential for a good Culture of Care
The European Commission suggests the 'development of formal and informal communication channels, for mutual benefit with respect to science and animal welfare'
Here are some examples from International Culture of Care network members

Regular meetings

Scheduled meetings for scientists, animal technologists, vets, unit managers and AWERB members



Regular refresher/update meetings for all organised by NTCO



Special events

Duo-talks: researcher talks about their science, and animal technologists talk about techniques and animal care within the project



ELH organises an informal meeting for all, in which anyone can raise welfare issues



Building communication into existing processes

Each study has a pre-start and wash-up meeting involving everybody



Three Rs improvements reported to AWERB & shared at external user meetings



Other ideas

A 'boxless' event: anyone can submit 'out of the box' ideas to improve practice



A staff survey for all e.g. how much do you agree with statements such as 'in our group we listen to each others' ideas about animal welfare'



*norecopa.no/culture-of-care

Encourage collaboration 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



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Collaboration on the road to better preclinical research

October 6, 2020 / PLoS ONE Guest Blogger / Guest Post



<https://everyone.plos.org/2020/10/06/prepare>

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norecopa.no/PREPARE/film
a 3-minute cartoon film



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Another option to spread good practice:

norecopa.no/wiki

The Refinement Wiki

Many good ideas on refinement are posted 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 or potential collaborators



- Main page
- Recent changes
- Random page
- Help about MediaWiki
- Tools
- What links here
- Related changes
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Clicker training

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

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

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

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

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

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

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



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

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

Experts for clicker training in mice and rats: [TARC](#) ⓘ, Mainz, Germany

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

CIRS-LAS Portal

Critical incident reporting system in laboratory animal science

Refine
Reduce
Replace



Operating principles



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Recent incidents

Injury of the mesentery by vertebral kyphoplasty

Mouse neonates exposed to CO2

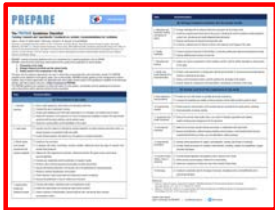
Animal escapes during transportation

Kidney damage in mouse after surgery on heating mat

Soft tissue implant in rabbit

Summary

My **3-step recipe for better science** is therefore:



1. **PLAN**, in collaboration with animal care staff from day one and consult the guidelines: *be PREPARED*



2. **WRITE** a good manuscript, showing that you have been aware of the potential causes of irreproducibility, and with enough detail that scientists can evaluate the model



3. **FLAG** any advances you have made within the 3Rs, preferably in the title or abstract (or write a separate method paper)

The **title** and **abstract** are critical, because they are often the only parts that are indexed by databases

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



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Help others plan better!



Photo: NMBU

Published later in:

"Saphenous vein puncture for blood sampling of the mouse, rat, hamster, gerbil, guinea-pig, ferret and mink"

Not necessarily a high-impact factor journal.



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