

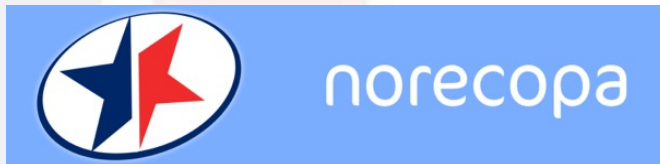
PREPARE for fish research

norecopa.no/FELASA/fish

Adrian Smith

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<https://norecopa.no>

Norecopa: PREPARE for better Science



aperitif.no

Thanks to many colleagues, including:

Aurora Brønstad, University of Bergen

Chris Noble, Nofima Tromsø

Gidona Goodman, University of Edinburgh

Susanna Lybæk, Norwegian Animal Protection Alliance

Tore Kristiansen, Institute of Marine Research, Bergen

Contributors to Norecopa's Refinement Wiki


The PREPARE guidelines, fish section:

Penny Hawkins and Chloe Stevens

Disclosure: lead author



What should we be preparing for?

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

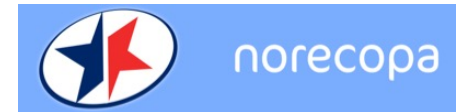
What can we learn from others?



Birdstrike
Both engines failed

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

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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.

**Communication!
Checklists!
Less than 3 minutes to do this in**



norecopa




en.wikipedia.org

All 155 passengers and crew saved

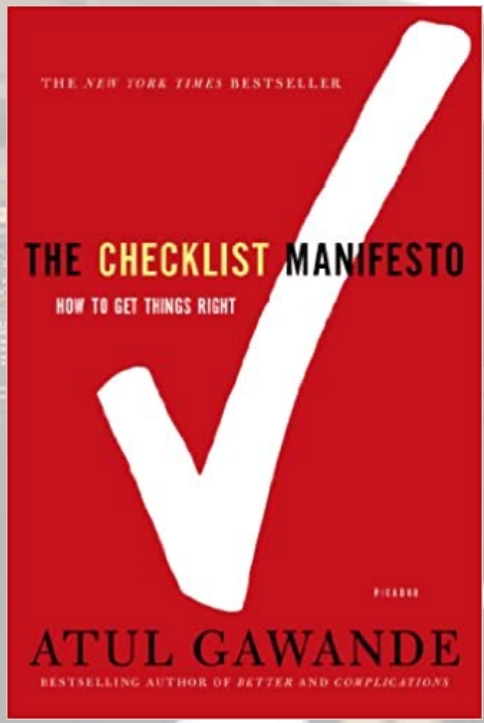
Norecopa: PREPARE for better Science

Surgical Safety Checklist



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

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



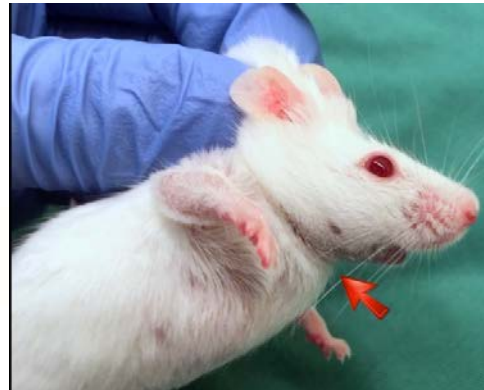
This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

© WHO, 2009

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

amazon.com/gp/product/0312430000



Sinus bradycardia
ventricular escape complexes



Labitt *et al.*, 26 February 2021

4 strains of mice, both sexes, 3 experienced handlers

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



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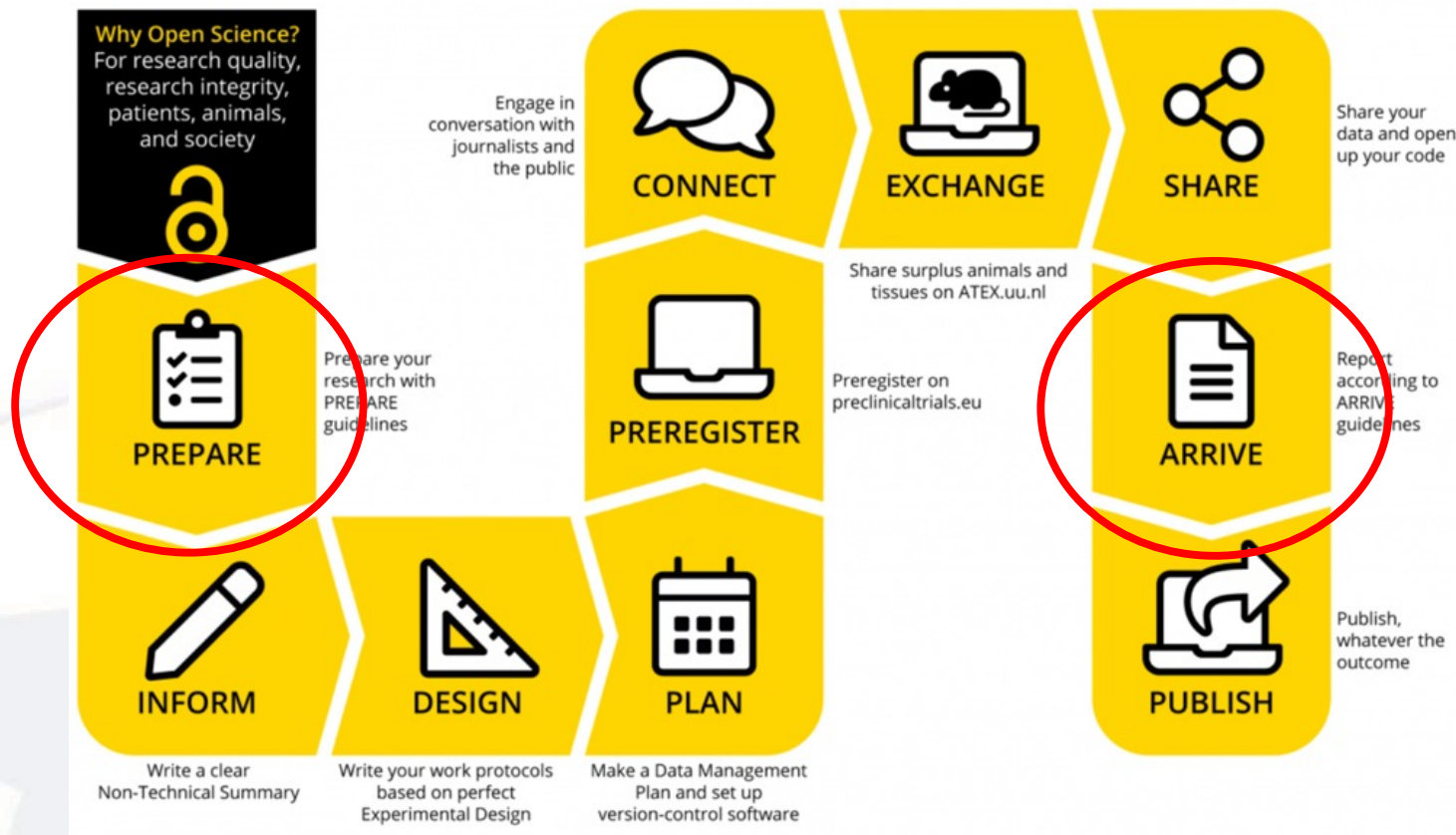


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Are we amateurs, by comparison?

Norecopa: PREPARE for better Science

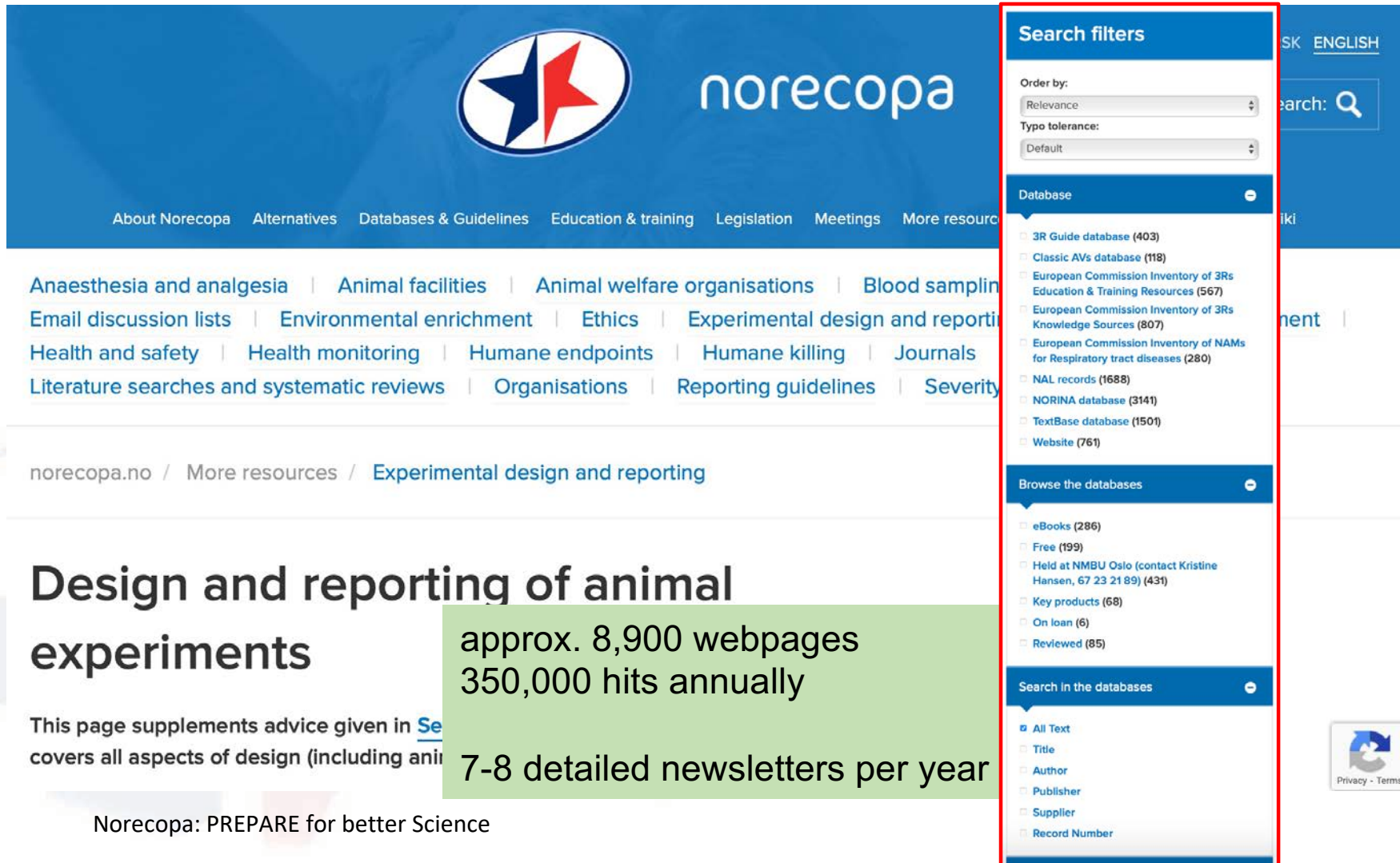
The pathway to better research: from planning guidelines to reporting guidelines



Norecopa: PREPARE for better Science

norecopa.no/PREPARE

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



The screenshot shows the norecopa.no website interface. At the top, there is a blue header with the norecopa logo (a stylized star) and the text "norecopa". Below the header, there is a navigation menu with links: "About Norecopa", "Alternatives", "Databases & Guidelines", "Education & training", "Legislation", "Meetings", and "More resources".

The main content area features a grid of links for various topics: "Anaesthesia and analgesia", "Animal facilities", "Animal welfare organisations", "Blood sampling", "Email discussion lists", "Environmental enrichment", "Ethics", "Experimental design and reporting", "Health and safety", "Health monitoring", "Humane endpoints", "Humane killing", "Journals", "Literature searches and systematic reviews", "Organisations", "Reporting guidelines", and "Severity".

Below the grid, there is a breadcrumb trail: "norecopa.no / More resources / Experimental design and reporting".

The main heading is "Design and reporting of animal experiments". To the right of this heading, there are two green callout boxes containing statistics: "approx. 8,900 webpages" and "350,000 hits annually" in the top box, and "7-8 detailed newsletters per year" in the bottom box.

Below the heading, there is a paragraph: "This page supplements advice given in [See](#) covers all aspects of design (including animal)".

At the bottom, there is a footer: "Norecopa: PREPARE for better Science".

On the right side of the page, there is a "Search filters" sidebar. It includes a search bar with a magnifying glass icon and a search button. Below the search bar, there are two dropdown menus: "Order by:" (set to "Relevance") and "Typo tolerance:" (set to "Default").

The "Database" section is expanded, showing a list of databases with their respective record counts:

- 3R Guide database (403)
- Classic AVs database (118)
- European Commission Inventory of 3Rs Education & Training Resources (567)
- European Commission Inventory of 3Rs Knowledge Sources (807)
- European Commission Inventory of NAMs for Respiratory tract diseases (280)
- NAL records (1688)
- NORINA database (3141)
- TextBase database (1501)
- Website (761)

The "Browse the databases" section is also expanded, showing a list of categories:

- eBooks (286)
- Free (199)
- Held at NMBU Oslo (contact Kristine Hansen, 67 23 21 89) (431)
- Key products (68)
- On loan (6)
- Reviewed (85)

The "Search in the databases" section is expanded, showing a list of search criteria:

- All Text
- Title
- Author
- Publisher
- Supplier
- Record Number

At the bottom right of the page, there is a "Privacy - Terms" link with a circular arrow icon.



Prepare



Original Article

PREPARE: guidelines for planning animal research and testing

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

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

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

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

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

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

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



Over 24,000 downloads from the journal website so far

Norecoba: PREPARE for better Science

PREPARE:

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

PREPARE covers 15 topics:

Formulation of the study

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

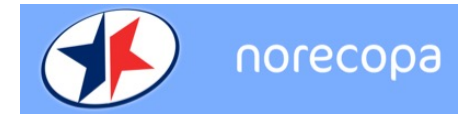
Dialogue between scientists and the animal facility

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

Methods

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

Items in pink are not typically highlighted in reporting guidelines



PREPARE



The PREPARE Guidelines Checklist Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

Adrian J. Smith¹, R. Eddie Clutton², Elliot Lilley³, Kristine E. Aa. Hansen⁴ & Trond Brattelid⁵
¹Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; ²Royal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; ³Research Animals Department, Science Group, RSPCA, Wilberforce Way, Southwater, Horsham, West Sussex, RH13 9RS, U.K.; ⁴Section of Experimental Biomedicine, Department of Production Animal Clinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences, P.O. Box 8146 Dep., 0033 Oslo, Norway; ⁵Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

PREPARE¹ consists of planning guidelines which are complementary to reporting guidelines such as ARRIVE². PREPARE covers the three broad areas which determine the quality of the preparation for animal studies:

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

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

Three Rs!

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

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

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

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



Three versions of the checklist:

1. plain pdf file
2. fillable pdf file
3. shared online version

The PREPARE Guidelines Checklist
Planning Research and Experimental Procedures on Animals: Recommendations for Excellence
 Adrian J. Smith¹, R. Eddie Clifton², Elliot Lilley³, Kristine E. Aa. Hanssen⁴ & Trond Bratthelid⁵

¹Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; ²Royal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; ³Research Animals Department, Science Group, RSPCA, Wilberforce Way, Southwater, Horsham, West Sussex, RH13 9RS, U.K.; ⁴Section of Experimental Biomedicine, Department of Production Animal Clinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences, P.O. Box 8148 Dep., 0033 Oslo, Norway; ⁵Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

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References

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Further information
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- 3-Ethical issues, harm-benefit assessment and humane endpoints ^
- 3a Construct a lay summary.
- 3b In dialogue with ethics committees, consider whether statements about this type of research have already been produced.
- 3c Address the 3Rs (Replacement, Reduction, Refinement) and the 3Ss (Good Science, Good Sense, Good Sensibilities).
- 3d Assessment and justify any likely animal harm.
- 3f Discuss the learning objectives, if the animal use is for educational or training purposes.
- 3g Allocate a severity classification to the project.
- 3h Define objective, easily measurable and unequivocal humane endpoints.
- 3i Discuss the justification, if any, for death as an end-point.
- 4-Experimental design and statistical analysis v

5. Have the experiments been carried out before, and is any repetition justifiable?
6. What [approaches to reduce distress](#) have been considered?

3a Construct a lay summary.

- General principles
- For fish researchers**

1. Have national or local research ethics committees already produced statements relevant to the research being planned? Consideration should also be paid to the broader context of the research. For example, research directed at increasing the productivity of farming at the expense of (or without improving) individual animal welfare, or wildlife research whose primary aim is population management.

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

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

3. Have the Three S's ([Good Science, Good Sense and Good Sensibilities](#)) been addressed? Sufficient time should be allocated to this point, since two of the three S's are highly subjective, but equally important. The use of commonsense and critical anthropomorphism are justifiably part of the work to assess the impact of research on animals, not least when a scientific evidence base does not exist.
4. Does the proposed study have a clear rationale and scientific relevance, and what will be the next step if the hypothesis is supported or rejected?
5. Have the experiments been carried out before and is any repetition justifiable?
6. What [approaches to reduce distress](#) have been considered?
7. Will the project undergo [pre-registration](#) and will negative results be published, to avoid publication bias?

Many more [links to resources on ethics are available here](#). Details about pre-registration of animal studies and reporting of critical incidents are to be found in the section on [Experimental Design and Statistical Analysis](#).

Harm-Benefit Assessment

1c Decide upon databases and information specialists to be consulted, and construct search terms.

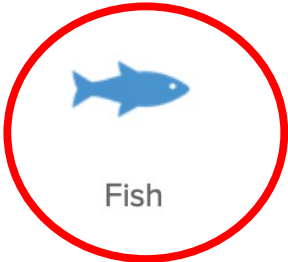
General principles

For fish researchers

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

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

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



<https://norecopa.no/meetings>

International consensus meetings

Harmonisation of the Care and Use of:

- Fish (2005)

- Wildlife (2008)

- Fish (2009)

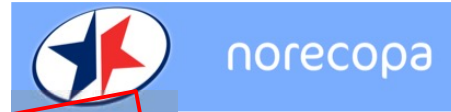
- Agricultural animals (2012)

- Wildlife (2017)

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



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



**Wanted:
Species-specific guidelines!**

**Guidance on the severity
classification of procedures
involving fish**

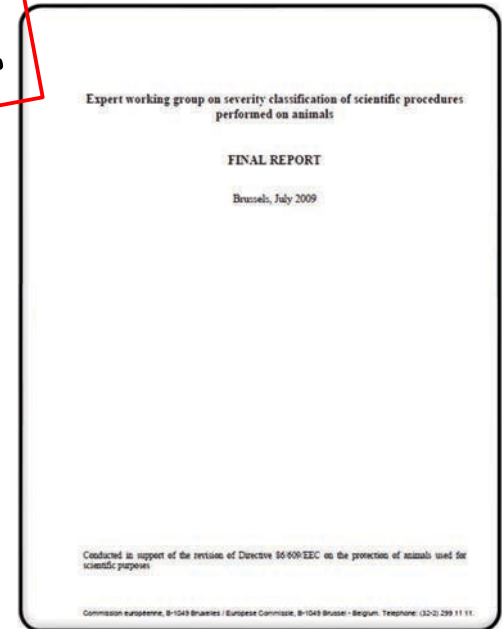
Report from a Working Group
convened by Norecopa

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

Laboratory Animals, 45: 219-224, 2011

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norecopa.no/categories



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

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



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

fish*

Filters: [clear all filters](#)

Database: 3R Guide database X

19 results

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

Search filters

Order by:
Relevance

Typo tolerance:
Default

Database

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

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TextBase:

1,500 books related to LAS:

norecopa.no/textbase

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The Welfare of Fish

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

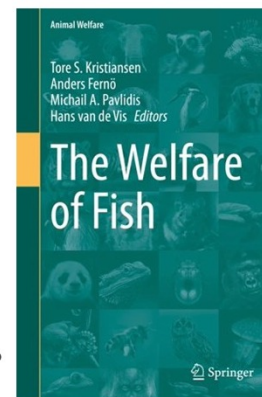
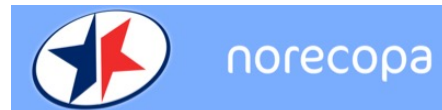
Record number: ef2a0

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

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

List of chapters:

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



1a

Form a clear hypothesis, with primary and secondary outcomes.

General principles

For fish researchers









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

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

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

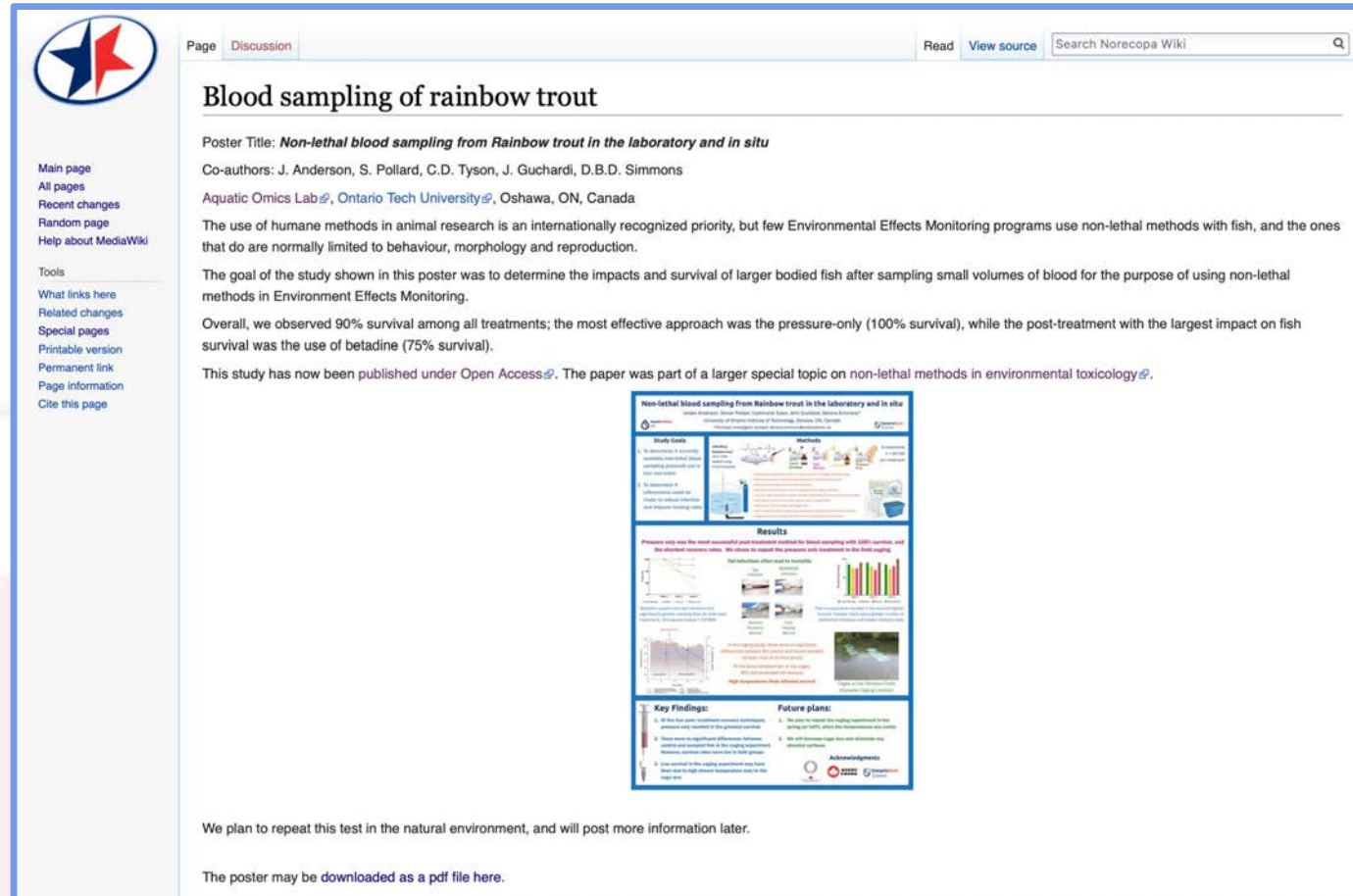
Resource hubs

The screenshot shows the RSPCA Science Home website with a dark blue header containing the RSPCA logo and a green navigation bar with links: Science Home, Companion animals, Farm animals, Animals in science, Wildlife, and Animal Sentience. Below the navigation bar are five main categories: Implementing the 3Rs, Ethical review, Focus on severe suffering, Our international work, and Reports and resources. A 'Print' icon is visible in the top right. The main content area displays a grid of eight resource hubs, each with a representative image and a title. The 'Refining procedures' hub, which features a zebrafish, is highlighted with a red circle.

 Ethical review	 Culture of care	 Severe suffering	 Welfare and severity assessment
 Housing and care	 Refining procedures	 Genetically altered animals and biotechnology	 Non-human primates

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


Refinement Wiki



The screenshot shows a MediaWiki page titled "Blood sampling of rainbow trout". The page includes a navigation menu on the left with links like "Main page", "All pages", and "Recent changes". The main content area features a title, poster title, co-authors, and a brief abstract. A central image is a poster titled "Non-lethal blood sampling from Rainbow trout in the laboratory and in situ". The poster contains sections for "Study Goals", "Methods", "Results", "Key Findings", and "Future plans". The poster text states: "Pressure only was the most successful post-treatment method for blood sampling with 100% survival, and the shortest recovery rates. We advise to repeat the pressure only treatment in the field testing." Below the poster, the page text says: "We plan to repeat this test in the natural environment, and will post more information later." and "The poster may be downloaded as a pdf file here."





Refinement Wiki

- Acclimatisation
- Adrian Smith
- Alphaxalone
- Anaesthesia in neonates
- Analgesia
- Asepsis
- Blood sampling of hamsters
- Blood sampling of pigs
- Blood sampling of rainbow trout
- Breeding strategies for mice
- Clicker training
- Contingency plans
- Decapitation
- Detecting early onset of clinical signs in the mouse model of Covid-19
- Detection of pain and distress in mice
- EMLA cream
- Embryo transfer
- Experimental Autoimmune Encephalomyelitis (EAE)
- Facial expression analysis
- Food crunchers
- General discussion on use of analgesics
- Genotyping mice
- Habituation training
- High-fat diets
- Hot Bead Sterilisers
- Housing nude mice
- Housing research fish
- Humane endpoints
- Hydrodynamic gene delivery
- Intra-ocular injections
- Intranasal administration
- Intraperitoneal injection
- Intraperitoneal pentobarbitone
- Ketamine and alpha-2 agonist combinations
- Long term anaesthesia in rodents
- Lumpfish
- Main Page
- Marble Burying Test
- Metabolic cages
- Minipumps
- Montanide adjuvant
- Mouse Grimace Scale
- Mouse handling
- Nest building material
- Oestrus suppression in ferrets
- Pneumocystis murina
- Recapping needles
- Rotarod Test
- Screening cell lines
- Sedation of cattle
- Splenectomy
- Sterilisation of instruments
- TTEAM and TTouch
- Tail vein injection
- Tramadol
- Transport stress
- Tumour cell implant into mammary fat pad
- Ulcerative Dermatitis in Mice
- Water quality
- Xenopus laevis
- Zebrafish swabbing



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Newsletter no. 3-2020 from Norecopa

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

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

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

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

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

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

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 U.S. Department
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+ webpages for past meetings and recorded meetings

norecopa.no/meetings/meetings-calendar

Webinar and Meetings calendar

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



norecopa.no/global3r

we welcome more from you!
fish centres?

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Centres

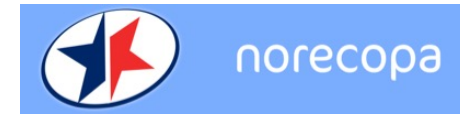
- [Replacement](#) i
- [Reduction](#) i
- [Refinement](#) i
- [ecopa](#) i

Associations

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

Aryelle Canedo *et al.* (2022)

Zebrafish (*Danio rerio*) meets bioethics: the 10Rs ethical principles in research



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revistas.ufg.br/vet/article/view/70884/38012

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Penny Hawkins (2021)

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norecopa.no/FELASA/fish

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