

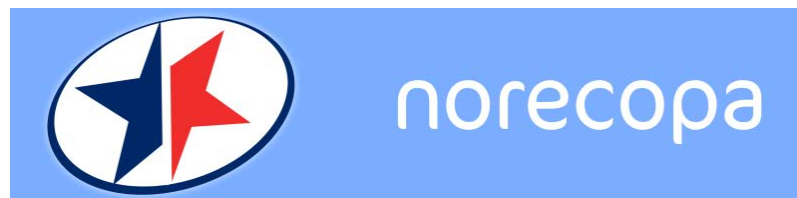
*1<sup>st</sup> Nordic Zebrafish & Medaka Care Workshop  
Oslo, 7 February 2018*

## ***Norecopa: Resources for improving animal research***

*[norecopa.no/fish/zebrafish](http://norecopa.no/fish/zebrafish)*

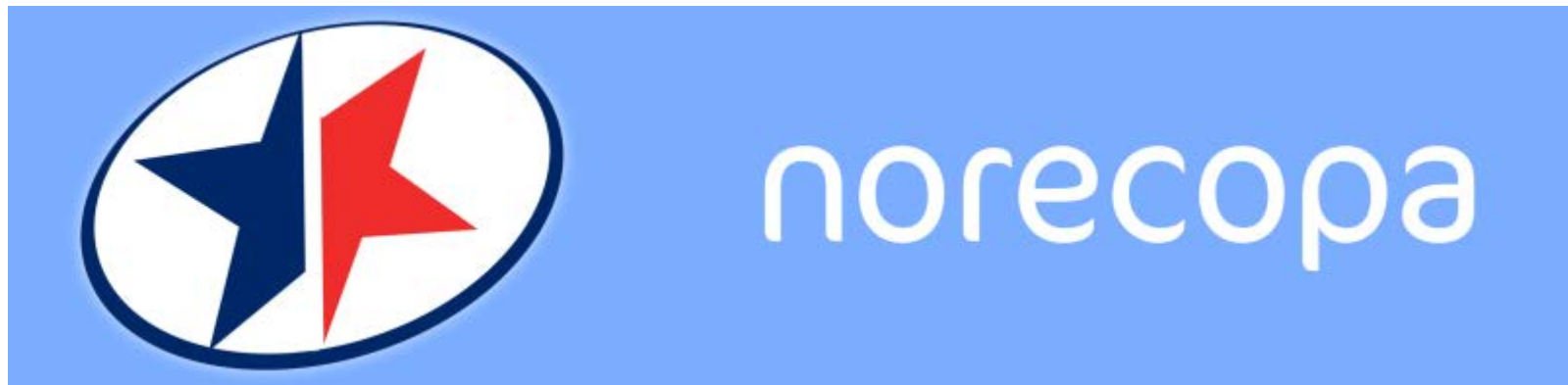
Adrian Smith

*[adrian.smith@norecopa.no](mailto:adrian.smith@norecopa.no)*



# Norecopa

National Consensus Platform for the 3Rs:  
Replacement, Reduction and Refinement of  
Animal Experiments



Established in 2007

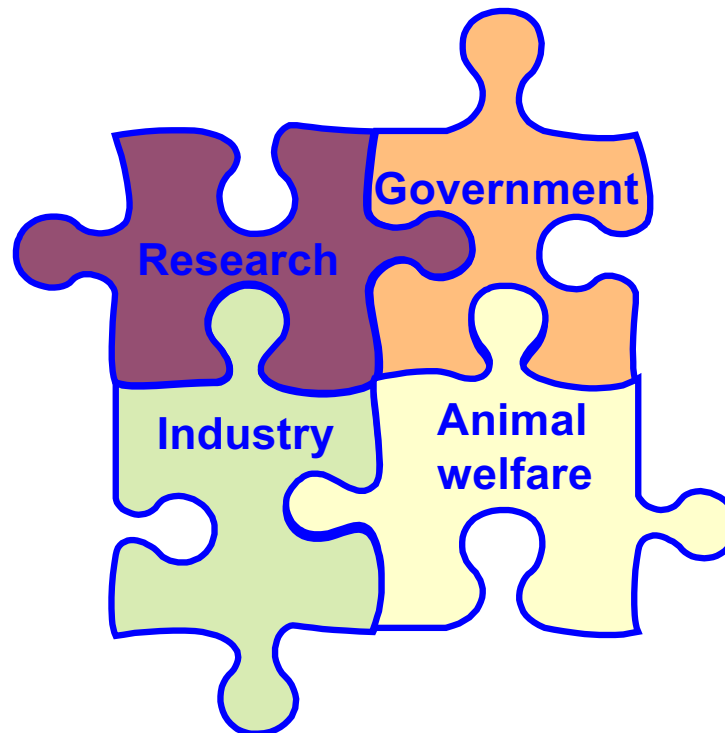
[norecopa.no/about-norecopa/the-first-10-years](http://norecopa.no/about-norecopa/the-first-10-years)

## European Consensus-Platform for Alternatives

[www.ecopa.eu](http://www.ecopa.eu)



- Following an initiative at the 3<sup>rd</sup> World Congress on Alternatives and Animal Use, Bologna 1999
- *ecopa* was established in 2000
- National Consensus Platforms (NCPs) with all 4 stakeholders equally represented:



## **The Board represents all 4 stakeholders:**

- **Bente Bergersen**, Norwegian Food Safety Authority, chair  
deputy: ~~Johan Teige, Norwegian Food Safety Authority~~
- **Siri Knudsen**, University of Tromsø  
deputy: ~~Aurora Brønstad, University of Bergen~~
- **Børge N. Fredriksen**, Pharmaq AS  
deputy: Ann Cathrin Einen, MSD Animal Health Innovation AS
- **Anton Krag**, Norwegian Animal Protection Alliance  
deputy: ~~Harald Small, Dyrebeskyttelsen Norge~~

## **Representation on other committees/fora:**

- Board of the Danish 3R Centre
- Danish National Committee
- Education & Training Platform (ETP-LAS) in Europe
- AALAS-FELASA working group on Harm-Benefit Analysis
- Norwegian National Committee?

norecopa.no

## Organisations of relevance to animal research

### Organisations within Laboratory Animal Science

[AAALAC International](#) (Association for Assessment and Accreditation of Laboratory Animal Care International)

[AALAS](#) (American Association for Laboratory Animal Science)

[ACLAM](#) (American College of Laboratory Animal Medicine)

[AniMatch](#) (an online sharing platform for the exchange of organs and tissues)

[ARSAL](#) (Asociatia Româna pentru Stiinta Animalelor de Laborator; Romanian Laboratory Animal Science Association)

[ASLAP](#) (American Society of Laboratory Animal Practitioners)

6,000 webpages  
80,000 links  
22,000 unique links  
<3.5% dead links



norecopa

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[norecopa.no](#) / [Meetings](#) / [Meetings Calendar](#)

## Meetings calendar

[\(Links to a selection of past meetings can be accessed here\)](#)

- ▶ [First Nordic Zebrafish & Medaka Workshop](#), Oslo, 7 February 2018
- ▶ [Laboratory Animal Sciences](#), a LabRoots webinar, 7-8 February 2018
- ▶ [15th CDC International Symposium on Biosafety](#), Atlanta, 10-14 February 2018
- ▶ [Workshop for Named Information Officers \(NIOs\)](#), London, 23 February 2018
- ▶ [Educating Culture of Care in Animal Research](#), London, 27 February 2018
- ▶ [Anesthesia for fish in aquaculture research](#), Bergen, 6 March 2018
- ▶ [Organising and Operating Activities in a Rodent Animal Facility](#), Varese, 14-16 March 2018
- ▶ [Ethics in Animal Experimentation, Animal Welfare and Project Evaluation](#), Barcelona, 15 March - 30 May 2108
- ▶ [Fish Veterinary Society Annual Conference](#), Edinburgh, 20-21 March 2018
- ▶ [Advanced Methods for Reproducible Science](#), Windsor, 3-7 April 2018
- ▶ [Workshop on teaching aids](#), Oslo, 11 April 2018
- ▶ [Microbiota and Gnotobiotic Rodents](#), Varese, 12-13 April 2018
- ▶ [34th LAMA/ATA Annual Meeting](#), Virginia Beach, 17-19 April 2018
- ▶ [48th Scand-LAS Symposium](#), Kristiansand, 26-28 April 2018
- ▶ [Course in Laboratory Animal Science for Research Workers](#), Oslo, 2-4 May 2018
- ▶ [CCAC National Workshop](#), Quebec City, 5 May 2018

***Newsletter 7-8 times a year***  
- something for you?



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post@norecopa.no



@norecopa



English-language newsletters

**Contact oss**

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post@norecopa.no



Norecopa on Facebook

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Org.no. 992 199 199  
Bank account: 7694 05 12030  
(IBAN: NO51 7694 0512 030)  
(payment must be marked  
'12025 Norecopa')

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**Resources developed in  
collaboration with:**



Norges miljø- og  
biovitenskapelige  
universitet



U.S. Department  
of Agriculture

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## ***International consensus meetings***

*Harmonisation of the Care and Use of:*

*Fish (2005)*

*Wildlife (2008)*

*Fish (2009)*

*Agricultural animals (2012)*

*Field research (2017)*

<http://norecopa.no/consensus-meetings>

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

## ***Impressions from “outside”***

- 1. Fish are often handled in a rather superficial fashion at scientific meetings:*

***“Wild, wet and slippery: fish in research”***

*So this meeting is an excellent exception 😊*

## **2. History repeats itself when developing new models**

*e.g. GMO, nude mice, minipigs, isolators, IVC racks, cleaner fish, zebrafish:*

*Two sets of “guidelines” emerge, that address very different questions:*

- 1. Wow that was cool, **how** do you do it?*
- 2. Hmm, **should** we really be doing this?*

*The first set are more **technical specifications** than **guidelines** in the 3R sense...*

*The second set tend to be running fast in an attempt to catch up with the first set*

**3. An extra problem with fish: the debate as to whether they can feel pain or not**

 Open Access   Creative Commons

REGULAR PAPER

## International survey on the use and welfare of zebrafish *Danio rerio* in research

K. Lidster, G. D. Readman, M. J. Prescott, S. F. Owen 

First published: 20 February 2017 [Full publication history](#)

DOI: 10.1111/jfb.13278 [View/save citation](#)

Cited by (CrossRef): 0 articles  Check for updates  Citation tools ▼

98 responses from 22 countries

Concerns include:

- methods of anaesthesia and euthanasia
- Less invasive methods than fin clipping for genotyping
- Nutrition
- Stocking density
- Lighting

<https://www.nc3rs.org.uk/news/international-survey-use-zebrafish-research-highlights-opportunities-refinement>

***A useful additional (but largely unknown) tool...***

Carol M. Newton (1925-2014)



National Library of Medicine

## ***The three S's***

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

*\*We can do this ourselves without scientific literature!*

Carol M Newton, quoted in Rowsell HC (1977): *The Ethics of Biomedical Experimentation in The Future of Animals, Cells, Models, and Systems in Research, Development, Education, and Testing* pp. 267-281, National Academy of Sciences, Washington, D.C., ISBN 0-309-02603-2.



## Fish as research animals

This page and the sections in the menu above are being used to collect links to resources concerned fish as research animals.

Guidance on planning experiments on fish is available in [the PREPARE guidelines](#).

*Additional items:*

[Severity classification of procedures used on fish](#)

[ENRICH Fish](#) : a project financed by the Research Council of Norway to improve the welfare of Atlantic salmon used in laboratory experiments

[Information in Norwegian about projects in Norway concerning fish research](#)

Other literature references and links:

- > [UK Home Office Code of Practice for the housing and care of animals bred, supplied or used for scientific purposes](#) , 2014.
- > [FAWC Opinion on the Welfare of Farmed Fish](#)

# Zebrafish

Zebrafish (*Danio rerio*) are being used in increasing numbers within molecular biology, developmental biology, neurobiology, genetics, cancer research and drug discovery, due to the low costs of maintaining them, their short generation interval, the transparency of the embryos and the ability to manipulate the genome.

Norecopa's secretary gave a presentation entitled [3Rs Resources and Guidelines for Zebrafish](#) at the NC3Rs/Cefas workshop on [Addressing the needs for refinement of laboratory fish](#) in Weymouth, 26-28 April 2016. This presentation includes:

- › international guidelines for the care and use of zebrafish
- › organisations and journals related to zebrafish research
- › suggestions on how to improve literature searches and reporting

A shorter version, just containing the 3R resources and guidelines, [is available here](#).

The Research Animals Department of the RSPCA has produced [a guidance document on the care and housing of zebrafish](#).

[Dr. Lynne Sneddon](#), Liverpool University, held a presentation at Norecopa's annual general meeting entitled [Detection and alleviation of pain in fish, which mentions zebrafish](#).

[International survey on the use and welfare of zebrafish \*Danio rerio\* in research](#) (Journal of Fish Biology, February 2017)

## Selected references on anaesthesia and analgesia of zebrafish

- › Lopez-Luna J *et al.* (2017): [Impact of stress, fear and anxiety on the nociceptive responses of larval zebrafish](#)
- › [Do Fish perceive Anaesthetics as Aversive? \(2013\)](#)
- › [Anesthesia and Euthanasia in Zebrafish \(2012\)](#)
- › [A Low-Cost Method of Skin Swabbing for the Collection of DNA samples from Small Laboratory Fish](#)
- › [Efficacy and Safety of 5 Anesthetics in Adult Zebrafish \(\*Danio rerio\*\) \(2014\)](#)
- › [A New Anaesthetic Protocol for Adult Zebrafish \(\*Danio rerio\*\): Propofol combined with Lidocaine \(2016\)](#)

## **An overview of existing guidelines for handling, bleeding, administration and identification techniques**

Penny Hawkins, Research Animals Department, RSPCA

[www.norecopa.no/norecopa/vedlegg/Fish-guidelines.pdf](http://www.norecopa.no/norecopa/vedlegg/Fish-guidelines.pdf)

## **Global update on guidelines for fish research**

Gilly Griffin, Canadian Council on Animal Care (CCAC)

[www.norecopa.no/fish2009](http://www.norecopa.no/fish2009)

## **Guidelines for anaesthesia and analgesia of fish**

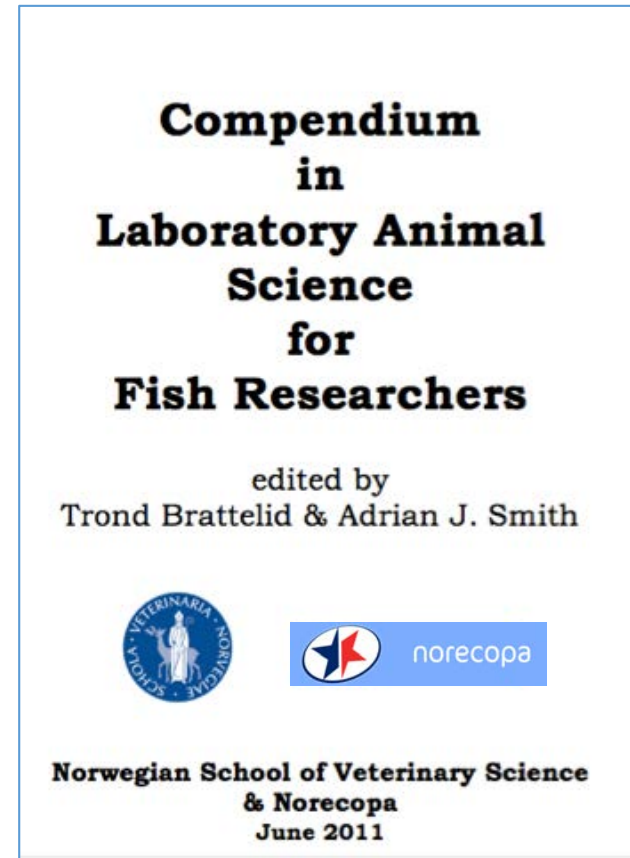
Gidona Goodman, University of Edinburgh

[www.norecopa.no/fish2009](http://www.norecopa.no/fish2009)



## Position Statements and Guidelines from Norecopa

- Food deprivation
- Toe clipping
- Pain relief
- **Fin clipping of fish**
- Biometric methods of identification
- Methods for identification of birds



# Methods of positioning fish for surgery or other procedures out of water

**Trond Brattelid & Adrian J. Smith**

Laboratory Animal Unit, Norwegian School of Veterinary Science, PO Box 8146 Dep., N-0033 Oslo, Norway



**Lateral thinking between species**



Laboratory Animals, 2000, 34,  
430-433

*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.

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.

Ramin Skibba

20 December 2016

## Pain management in pigs undergoing experimental surgery; a literature review (2012–4) FREE

A. G. Bradbury, M. Eddleston, R. E. Clutton ✉

Br J Anaesth (2016) 116 (1): 37-45. DOI: <https://doi.org/10.1093/bja/aev301>

Published: 03 October 2015

with analgesic properties, but only 87/233 (37%) described postoperative analgesia. No article provided justification for the analgesic chosen, despite the lack of guidelines for analgesia in porcine surgical models and the lack of formal studies on this subject. Postoperative pain assessment was reported in only 23/233 (10%) articles. It was found that the reporting of postoperative pain management in the studies was remarkably low, reflecting either under-reporting or under-use. Analgesic description, when given, was frequently too limited to enable reproducibility. Development of a

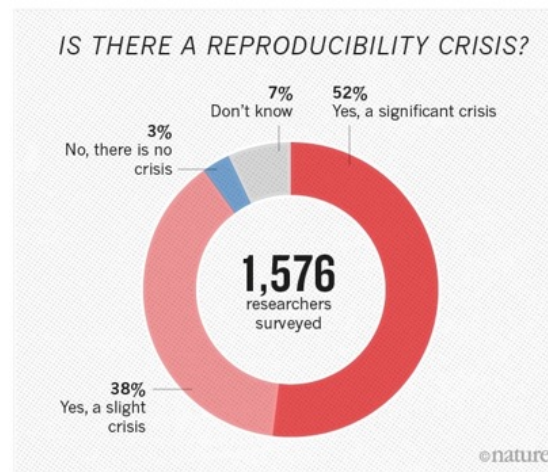
NATURE | NEWS FEATURE

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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.

## The problem with animal-based research and development:

- Despite rigorous testing, failures still occur
- Many of these occur at a late stage - sometimes after the drug is on the market
- Many of these late failures lead to serious human disease or death
- Compounds fail in people with several diseases, which are impossible to model in an animal test system
- Can/should zebrafish be used as models in complex area such as behavioural research?



colourbox.com

## Abstract

Emotional disturbances constitute a major health issue affecting a considerable portion of the population in western countries. In this context, animal models offer a relevant tool to address the underlying biological determinants and to screen novel therapeutic strategies. While rodents have traditionally constituted the species of choice, zebrafish are now becoming a viable alternative. As zebrafish gain momentum in biomedical sciences,

[online.liebertpub.com/doi/pdfplus/10.1089/zeb.2014.1041](http://online.liebertpub.com/doi/pdfplus/10.1089/zeb.2014.1041)

## **“Contingent suffering”**

indirect suffering

fear

boredom

transport stress



photo: colourbox.com

## **The lonely mouse**

Male mice housed singly develop symptoms which would be characterised as depression in humans.

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111065>



## **Zebrafish?**

<http://www.tecniplast.it/usermedia/us/3-5LTankwithFish-small.jpg>

*My claim:*

*We go to different sets of meetings and know relatively little about advances in other relevant areas.*



<https://kmondollaraday.files.wordpress.com/2011/03/information-silos.jpg>



Jackson Laboratory @jacksonlab · 18h

The JAX mouse room has changed a lot since 1953! #ThrowbackThursday



A mouse room in 1953; note wooden mouse boxes.



*So what do we have for zebrafish...?  
What qualifies as a 3R-guideline?  
Who decides? Every protocol  
published on the web?*

*Norecopa had that question in mind  
when we compiled our database **3R  
Guide (norecopa.no/3R-Guide)**.*

#### [The Zebrafish Information Network \(ZFIN\) model organism database](#)

3R Guide/10728

An online database of information for zebrafish researchers.

---

#### [The Zebrafish Information Network \(ZFIN\) Publications Database](#)

3R Guide/10762

The ZFIN publications database contains more than 20,000 records on the use of zebrafish in biomedical research, toxicology, genetics, and other areas of research.

---

#### [Guidance on the housing and care of zebrafish](#)

3R Guide/10724

This is a guidance paper produced by the RSPCA, UK.

---

#### [JoVE Science Education Database](#)

3R Guide/10926

This journal teaches laboratory fundamentals through simple, easy to understand video demonstrations.

---

#### [Newcastle Consensus Meeting on Carbon Dioxide Euthanasia of Laboratory Animals](#)

3R Guide/10663

17-page report with references from a meeting held in Newcastle 27-28 February 2006.

Supplier: [National Centre for the Replacement, Refinement and Reduction of Animals in Research \(NC3Rs\)](#)

---

#### [Humane endpoints in laboratory animal experimentation](#)

3R Guide/10703

This website aims to make animal experimentation more humane while improving the quality of science.

---

#### [Aquatic Sciences and Fisheries Abstracts \(ASFA\)](#)

3R Guide/10927

ASFA is a database covering the world's literature on the science, technology, management, and conservation of marine, brackish water, and freshwater resources and environments, including their socio-economic and legal aspects.

# What does the European legislation have to offer?

## 1. European Convention ETS123 for the Protection of Vertebrate Animals Used for Scientific or Other Purposes (1986)

### Appendix A: Guidelines for the accommodation and care of animals Revised, with species-specific guidelines from 2007

'Species-specific guidance on rainbow trout (*Oncorhynchus mykiss*), Atlantic salmon (*Salmo salar*), tilapiine cichlids, zebra fish (*Danio rerio*), sea bass (*Dicentrarchus labrax*), Atlantic halibut (*Hippoglossus hippoglossus*), Atlantic cod (*Gadus morhua*), turbot (*Scophthalmus maximus*), African catfish (*Clarias gariepenus*) is available in the background document elaborated by the Group of Experts (Part B)

The FELASA library contains documents other than workinggroup reports, guidelines, recommendations or policy documents. These can be found under the respective tabs.

**Part B of Appendix A:  
Scientific background.  
No Part B for fish!**

» ETS123 - Appendix A: guidelines for accommodation and care of animals (adopted version).  
Background information on the draft proposal for species-specific provisions presented by Groups of  
Experts for amphibians, birds, cats, dogs, ferrets, non-human primates, reptiles, rodents and rabbits.

## 2. EU Directive 2010/63 on the Protection of Animals Used for Scientific Purposes (2010)

Detailed stocking densities for

- Aquatic urodeles (salamanders, newts)
- Aquatic anurans (frogs, toads)
- Semi-aquatic anurans
- Semi-terrestrial anurans
- Arboreal anurans
- Aquatic chelonians (tortoises, turtles)
- ...

### 10. Reptiles

Table 10.1.

#### Aquatic chelonians

Body length (*) (cm)	Minimum water surface area (cm <sup>2</sup> )	Minimum water surface area for each additional animal in group holding (cm <sup>2</sup> )	Minimum water depth (cm)	Date referred to in Article 33(2)
up to 5	600	100	10	1 January 2017
Over 5 to 10	1 600	300	15	
Over 10 to 15	3 500	600	20	
Over 15 to 20	6 000	1 200	30	
Over 20 to 30	10 000	2 000	35	
Over 30	20 000	5 000	40	

(\*) Measured in a straight line from the front edge to the back edge of the shell.

## EU Directive 2010/63, Annex III, 'Species specific' section on Fish (all 33,000 species!)

?

The water flow shall be **appropriate** to enable fish to swim correctly and to maintain normal behaviour.

?

The stocking density of fish shall be **based on the total needs** of the fish in respect of environmental conditions, health and welfare.

?

Fish shall have **sufficient** water volume for normal swimming, taking account of their size, age, health and feeding method.

?

Fish shall be provided with an **appropriate** environmental enrichment, such as hiding places or bottom substrate, **unless behavioural traits suggest** none is required. ?


?

Fish shall be fed a diet **suitable** for the fish at an appropriate feeding rate and frequency. Particular attention shall be given to feeding of larval fish during any transition from live to artificial diets. Handling of fish shall be kept to **a minimum**. ?

*Further advice on the requirements of these and other species should be sought from expert specialists and care staff to ensure that any particular species needs are adequately addressed.*

ec.europa.eu/animals-in-science


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# ENVIRONMENT

European Commission > Environment > Chemicals > Animals used for scientific purposes

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## Animals used for scientific purposes

### Retrieval and provision of information on the "Three Rs" and alternatives

Accessing accurate, relevant and up-to-date information on the Three Rs is a challenge for all those use of animals.

**Legislation and implementation**



- EU legislative framework
- Implementation of Directive 2010/63/EU
- Q&A and guidance documents

**The "Three Rs" and alternative approaches**

- Replacement, Reduction and Refinement – the "Three Rs"
- Validation, acceptance and use
- EU activities to advance alternatives
- Member State activities to advance alternatives
- Finding and distributing information on alternatives
- Key resources**
- Search Tools
- Databases
- Portals and web-sites
- Journals
- Other resources and organisations

**Animals used for scientific purposes**

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



## ***So how can we advance the science and welfare when the regulations contain so little information?***

1. *Dialogue between the Animal Welfare Bodies (dyrevelferdsenheter)*
2. *Dialogue between the National Committees under the EU Directive*
3. *Educate the people with special responsibility (personer med særskilt kontrollansvar, PMSK)*
4. *Provide input to the European Commission*

***Norecopa can help with this.***



## ***Expert Working Group report on severity classification***

[http://ec.europa.eu/environment/chemicals/lab\\_animals/pdf/report\\_ewg.pdf](http://ec.europa.eu/environment/chemicals/lab_animals/pdf/report_ewg.pdf)



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

Report from a Working Group  
convened by Norecopa

**Designed to be a supplement to the EU Working Group report on the same subject, which is most relevant for traditional lab animals**

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

Laboratory Animals, 45: 219-224, 2011

[www.norecopa.no/categories](http://www.norecopa.no/categories)



**Guidance on the housing  
and care of  
Zebrafish**  
*Danio rerio*



**Barney Reed & Maggy Jennings**  
Research Animals Department, Science Group, RSPCA

**Guidance on the housing and  
care of the  
African clawed frog**  
*Xenopus laevis*



Barney T Reed

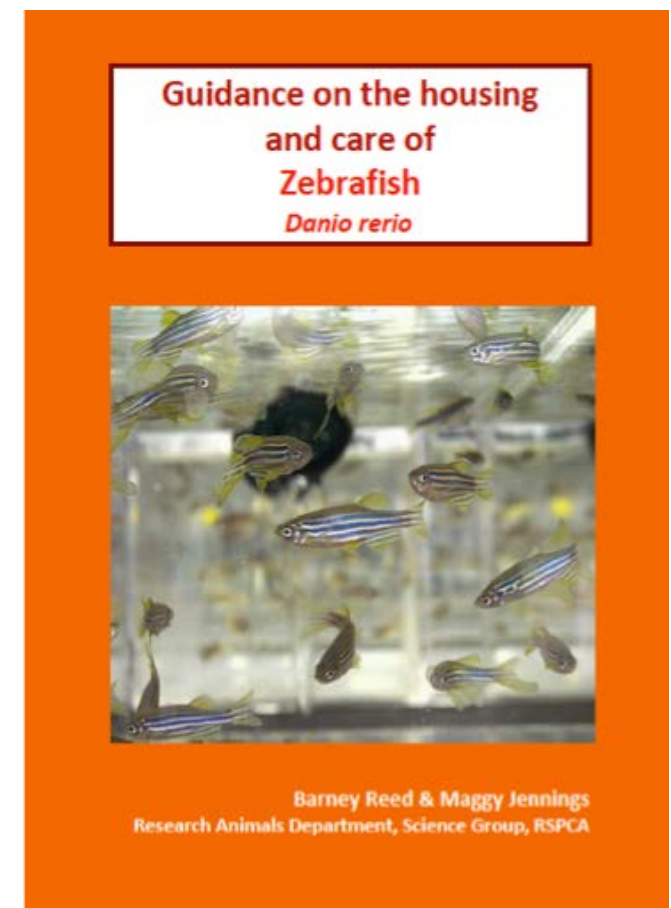
Research Animals Department - RSPCA



This report aims to improve the welfare of zebrafish by:

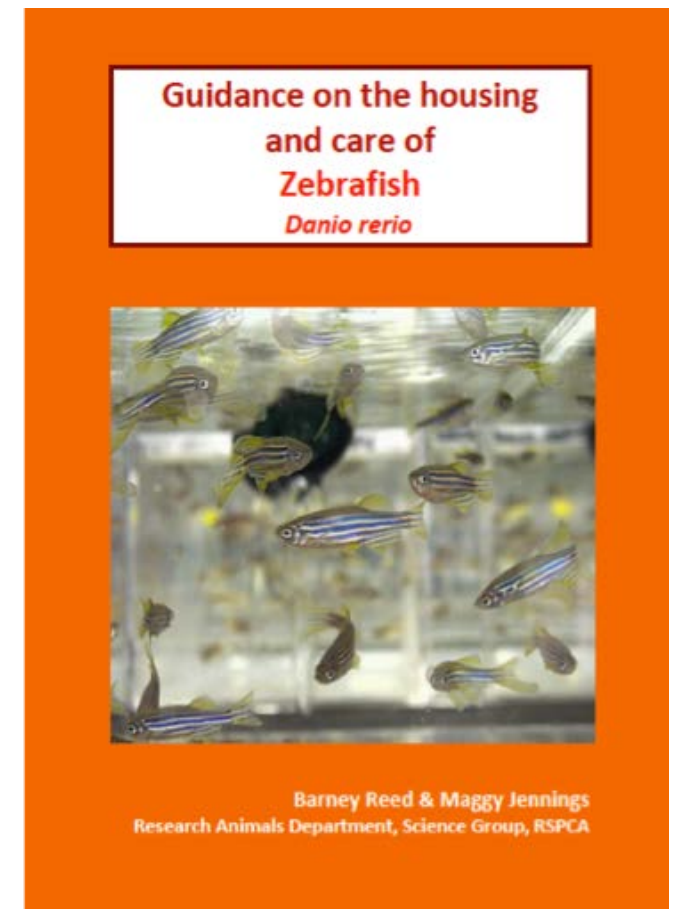
- facilitating understanding of zebrafish behaviour and thus a better appreciation of their requirements;
- highlighting current potential welfare and ethical concerns relating to the breeding, supply, housing and care of zebrafish;
- arriving, where possible, at consensus based on available evidence and sound scientific argument for appropriate environmental and care conditions for keeping zebrafish in the laboratory environment;
- providing recommendations for improving health, welfare and egg quality, for reducing the potential for stress and suffering, and for reducing the number of animals used;
- in areas where current knowledge is sparse or inconclusive, stimulating discussion and research to identify 'good practice'.

1. Introduction
2. Background information on zebrafish
  - Natural geographic range and habitat
  - Species characteristics
  - Use in research and teaching
3. Supply and transport
  - Source
  - Transport considerations
  - Quarantine
4. Housing and care
  - Lighting
  - Noise and other disturbances
  - Humidity
  - Water provision
  - Tank housing
  - Identification and marking techniques
  - Group housing
  - Catching and handling
  - Food type and feeding regime
  - Environmental enrichment
  - Assess of health and disease prevention



62 pages, including  
8 pages with  
literature references

5. Scientific procedures
  - Egg harvesting
  - Transgenesis
  - Mutagenesis
  - Genotyping
  - Cryopreservation
  - Blood collection
  - Injections
  - Analgesia and anaesthesia
  - Humane killing
6. Training of animal care staff and users
7. Concluding comments
8. References



## Guidelines for health and welfare monitoring of fish used in research

R Johansen<sup>1</sup>, J R Needham<sup>1,2</sup>, D J Colquhoun<sup>3</sup>, T T Poppe<sup>4</sup> and A J Smith<sup>1</sup>

<sup>1</sup>Norwegian School of Veterinary Science, Laboratory Animal Unit, PO Box 8146 Dep., 0033 Oslo, Norway; <sup>2</sup>The Microbiology Laboratories, North Harrow, Middlesex HA2 7RE, UK; <sup>3</sup>Section of Fish Health, National Veterinary Institute, PO Box 8156 Dep., 0033 Oslo, Norway; <sup>4</sup>Department of Basic Sciences and Aquatic Medicine, Norwegian School of Veterinary Science, PO Box 8146 Dep., 0033 Oslo, Norway

### Summary

The aim of this paper is to provide background material necessary for the development of international guidelines for the health and welfare monitoring of fish used in research. It provides an overview of present guidelines and discusses why more detailed and species-specific guidelines are needed. A major issue within fish research is to document the situation today and point out areas where improvements are needed.

**Keywords** Fish; health; welfare; monitoring; guidelines

Guidelines for monitoring and reporting the general health status and welfare of fish used in research are sparse compared with those available for mammalian laboratory animals. Despite the fact that there are more fish species than all other vertebrate species combined and that fish are studied in almost all biological disciplines (Powers 1989), most guidelines for fish encompass all species and all types of research (Casebolt *et al.* 1998). There is a great need for more species-specific guidelines for health and welfare monitoring. In some cases, these guidelines may also have to be specific to the scientific topic where they are to be used.

The number of fish used in research is increasing, due both to the rapid expansion in the fish farming industry and an increased use of fish as model organisms in basic research and chemical testing (Kane *et al.* 1996). The debate on whether to use fish or mice models started over 25 years ago (Dawe & Couch 1984). Rodent models are now frequently being replaced by fish models

(May *et al.* 1987a, Powers 1989, DeTolla *et al.* 1995).

Guidelines and legislations are often more liberal towards the use of fish than mammals. This can be illustrated by the lack of focus on humane endpoints in fish models (Ryder 2005). LD<sub>50</sub> testing is, for example, no longer allowed on mammals, but remains in use for fish (Braunbeck *et al.* 2004).

Even the reporting of numbers of fish used, and the type of research for which they are used, is confused by a lack of common international practice. Harmonization in this field is important to avoid the transfer of research from countries with high standards to those with lower ones. In Europe, all fish species and sizes are reported in the same statistical groups and the research disciplines reported are very general. Figure 1 shows, for example, an analysis of the use of live fish in Norway in 2004. This makes it difficult to monitor what fish are actually used for in research.

Reporting of the health and welfare of fish used in research is often sparse (Brattelid & Smith 2000), and may include general statements such as 'Healthy fish from a

Needs to be followed up by species-specific guidelines

# FELASA Guidelines under development

## Zebra fish: housing, husbandry, and health monitoring recommendations

This is a joint FELASA/ COST action BM0804 EuFishBioMed.

### Synopsis

The zebra fish (*Danio rerio*) has become a very popular and useful animal model in recent years. Zebra fish can replace mammalian models in a variety of scientific fields. Their mode of reproduction and the transparency of the embryos make them a unique tool for research. Many research institutions are adapting facilities and are educating personnel to be able to work with a species which in most cases is very different of the ones used traditionally. Information in the literature that can help professionals at research institutions to cope with this new challenge is spread and not easy to find. Some of the knowledge is in 'commercial' text about products and is sometimes not scientifically based. Of special interest are housing environment, husbandry practices, including health monitoring, veterinary care and experimental procedures.

<http://www.felasa.eu/working-groups/working-groups-present/zebrafish-housing-husbandry-and-health-monitoring-recommendations>



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**Editor-in-Chief:**  
Stephen C. Ekker, PhD

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More than 170 countries

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## Advancing Biomedical Research with Zebrafish and Other Aquarium Fish Models

2005 -

*Zebrafish* introduced the new section TechnoFish, which highlights these innovations for the general zebrafish community.

### TechnoFish features two types of articles:

- **TechnoFish Previews:** Important, generally useful technical advances or valuable transgenic lines
- **TechnoFish Methods:** Brief descriptions of new methods, reagents, or transgenic lines that will be of widespread use in the zebrafish community

### *Zebrafish* coverage includes:

- Comparative genomics and evolution
- Molecular/cellular mechanisms of cell growth
- Genetic analysis of embryogenesis and disease
- Toxicological and infectious disease models
- Models for neurological disorders and aging
- New methods, tools, and experimental approaches

## Toward an Integrated Zebrafish Health Management Program Supporting Cancer and Neuroscience Research

Sandra Martins,<sup>1</sup> Joana F. Monteiro,<sup>1</sup> Maria Vito,<sup>1</sup> David Weintraub,<sup>2</sup>  
Joana Almeida,<sup>1</sup> and Ana Catarina Certal<sup>1</sup>

### **Abstract**

Zebrafish is already one of the most used model organisms in biomedical sciences and other research fields. It is therefore becoming increasingly important to assure that zebrafish maintained in laboratory aquaculture conditions are raised and housed under rigorous standards that promote health and welfare to guarantee the required quality and reproducibility of research data. Specifying the programs each facility is adopting would be the first step to achieve this by allowing other facilities to compare, improve, and discuss their protocols and fish performance. We provide in this article a detailed description of an integrated facility health management program, with protocols and readouts, fully designed and aimed at maximizing fish health, welfare, and performance for research.

<http://online.liebertpub.com/doi/pdfplus/10.1089/zeb.2015.1198>






## Recommendations for Health Monitoring and Reporting for Zebrafish Research Facilities

Collymore Chereen, Crim Marcus J., and Lieggi Christine

Zebrafish. null, Vol. 0, No. 0

### Abstract

The presence of subclinical infection or clinical disease in laboratory zebrafish may have a significant impact on research results, animal health and welfare, and transfer of animals between institutions. As use of zebrafish as a model of disease increases, a harmonized method for monitoring and reporting the health status of animals will facilitate the transfer of animals, allow institutions to exclude diseases that may negatively impact their research programs, and improve animal health and welfare. All zebrafish facilities should implement a health monitoring program. In this study, we review important aspects of a health monitoring program, including choice of agents, samples for testing, available testing methodologies, housing and husbandry, cost, test subjects, and a harmonized method for reporting results. Facilities may use these recommendations to implement their own health monitoring program. 

<http://online.liebertpub.com/doi/pdfplus/10.1089/zeb.2015.1210>



[www.zebrafish.org](http://www.zebrafish.org)

## **ZIRC Health Monitoring SOPs**

Sentinel Fish Program



[.pdf](#)

Daily Monitoring of Fish Morbidity and Mortality SOP



[.pdf](#)

Fixing Zebrafish for Histopathology



[.pdf](#)

ZIRC PCR protocol for *P. neurophilia*



[.pdf](#)

## D. Procedures

1. Fish exhibiting the behavioral and physical signs below should be removed. If you have time to remove the fish, go to step 3 or 4. If you do not have time to remove the fish immediately, place a red flag on the front of the tank and write the number of affected fish and observed clinical signs on the flag (i.e. "1 skinny").

Behavioral Abnormalities	Physical Abnormalities
Fish at surface or near water inlet Rapid breathing/opercular movements Sluggish movements/lethargy Flashing/rubbing on tank surfaces Circling, twirling, spinning Loss of equilibrium	Color change Weight loss Exophthalmia/pop-eyes Distended abdomen Skeletal deformity Mass/swelling Hemorrhage/redness Gas bubbles Protruding scales Fin erosion or lesion Skin ulceration or lesion



## British Association of Zebrafish Husbandry

BAZH is a volunteer non-profit making pan-institutional society that showcases the extent of zebrafish husbandry issues and research across the UK. Established in 2010 as an informal hub for all members of the zebrafish community, from researchers, vets, legislators, and animal technologists, to meet, discuss, and collate ideas, research and knowledge. BAZH holds biannual seminars on a vast range of topics, organises social events, and publishes newsletters, as well as hosting a range of media communication formats. If you want to get involved in any capacity, such as present a talk, contribute to newsletters, websites, etc please get in touch.

[www.bazh.org.uk](http://www.bazh.org.uk)

# Papers

Search:

## Papers

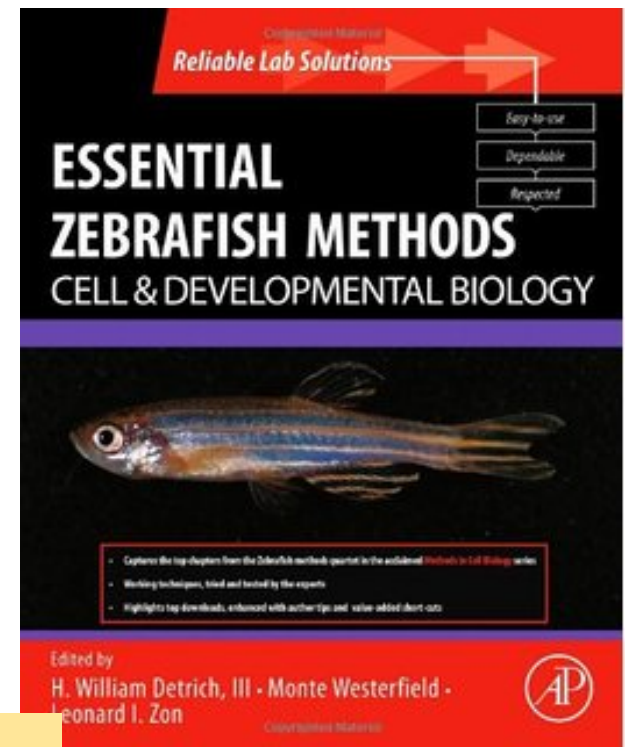
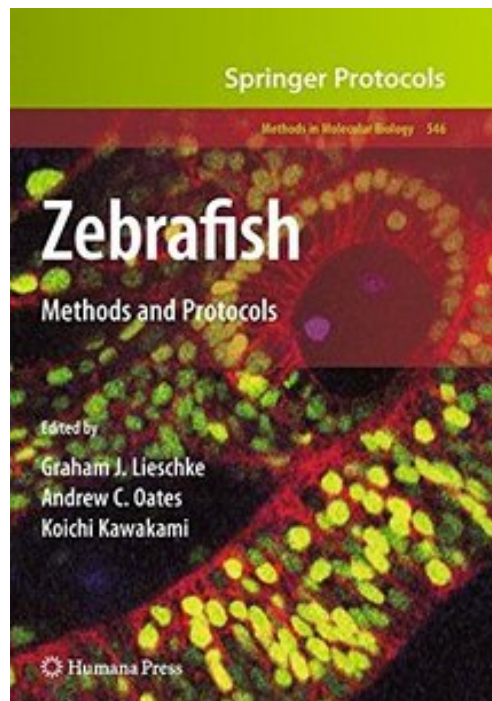
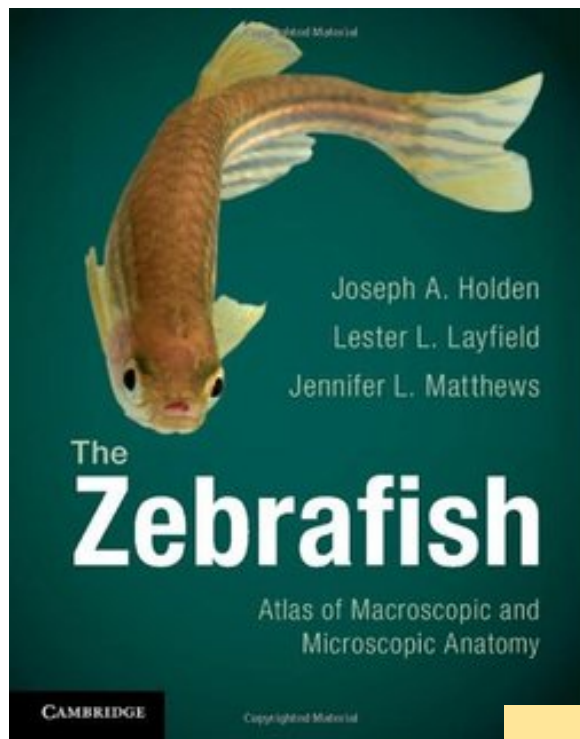
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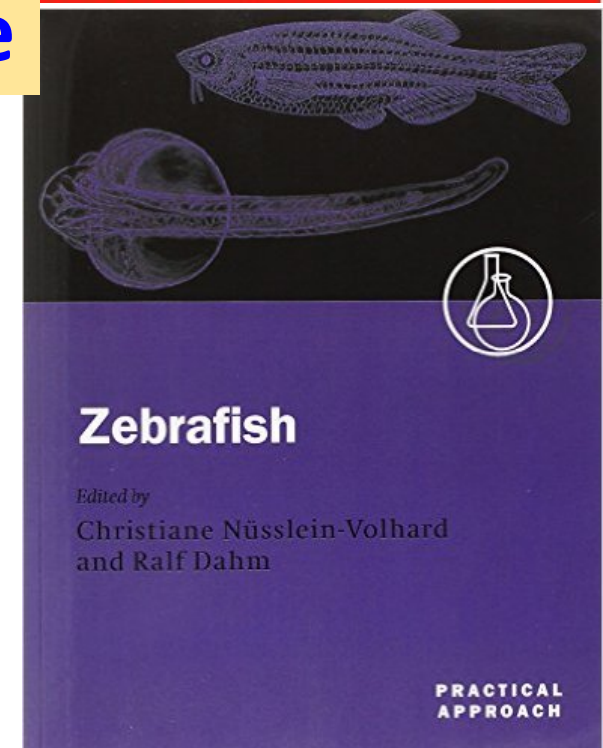
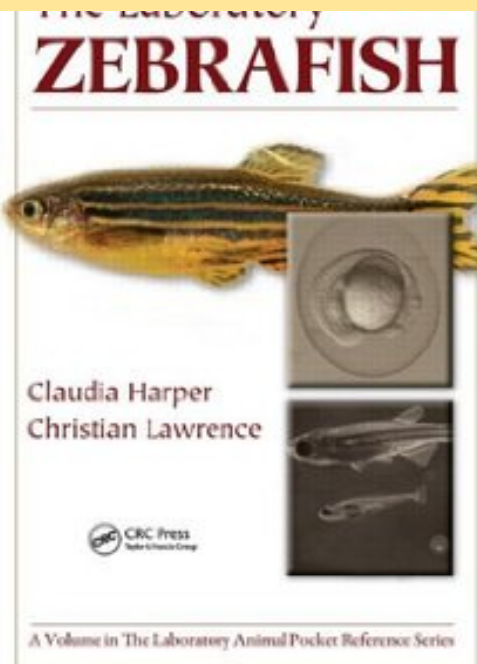
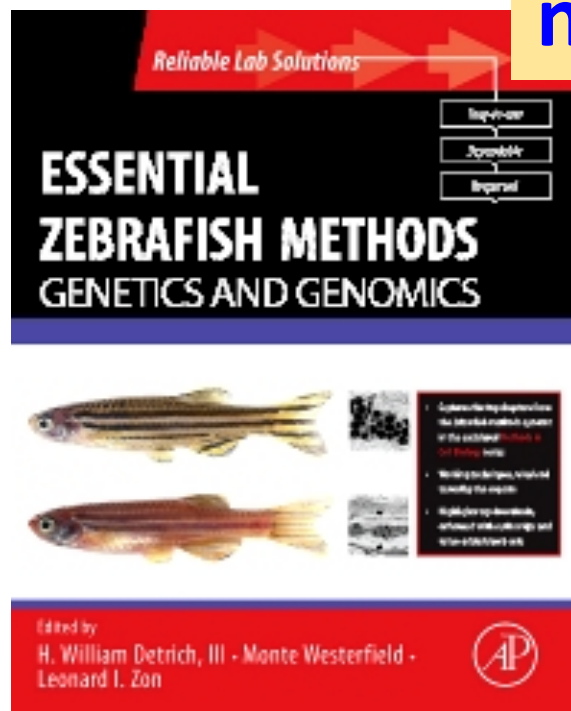
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American Veterinary Medical Association (AVMA) (2007) 'AVMA guidelines on euthanasia' [http://www.avma.org/issues/animal\\_welfare/euthanasia.pdf](http://www.avma.org/issues/animal_welfare/euthanasia.pdf).

Andrews, C. (1999) 'Freshwater fish' in *The IFAW Handbook on the Care and*



[norecopa.no/textbase](http://norecopa.no/textbase)





## The Norwegian Zebrafish Platform



Norwegian University  
of Life Sciences

[Home](#) [Documents](#) [About us](#) [Accreditation](#) [Courses](#) [Meetings](#) [Contact us](#) [Vacancies](#) [Links](#) [News archive](#) [Log in](#)



The Norwegian Zebrafish Platform had a National technology platform grant 2007- 2012 under the Functional Genomics Program, Research Council of Norway. Since 2013 zebrafish.no is part of NMBU Vetbio



### News [\(Archive...\)](#)

August 9th, 2017

[EZM2015 ABSTRACTS and ZEBRAFISH BLUES at http://zebrafish2015.org](http://zebrafish2015.org)

August 9th, 2017

### Next ZmIG mtg: to be announced

[Zebrafish and Medaka Interest Group is a forum for all interested in the zebrafish/medaka model.](#)  
Contact: [Viola.Lobert@rr-research.no](mailto:Viola.Lobert@rr-research.no)

January 17th, 2017

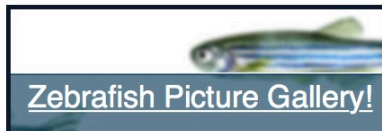
### 1st zf&m care workshop, Oslo Feb 7, 2018 at 10:00-16:00

More information contact Peter Aleström ([peter.alestrom@nmbu.no](mailto:peter.alestrom@nmbu.no)). Register (no participation fee) by e-mail: [Trude Saeteroy ts@scanbur.com](mailto:Trude.Saeteroy@scanbur.com) & [jn@scanbur.com](mailto:jn@scanbur.com)

May 4th, 2016

### NMBU professors develop e-ZFbook, a new concept of e-learning

[Read more...](#)



### ZNN Forum

## ZNN

Zebrafish Network Norway



UNIVERSITY OF  
NORDLAND

### Links

[# ZmIG # Zebrafish-medaka Interest Group # ZEBRAFISH-BLUES \(Norsk\)](#)

### ZNN Groups

[Alestrom Lab, NMBU Vetbio, Oslo](#)  
[Babiak Lab, UiN, Bodø](#)  
[Enserink Lab, OUS, Oslo](#)  
[Esguerra Lab, UiO, Oslo](#)  
[Fernandes Lab, UiN, Bodø](#)  
[Fladmark Lab, UiB](#)

[Zebrafish.no](http://zebrafish.no)



## The Zebrafish Book

[http://zfin.org/zf\\_info/zfbook/zfbk.html](http://zfin.org/zf_info/zfbook/zfbk.html)

## ZFIN Protocol Wiki

Created by Jonathan Knight, last modified on Mar 24, 2014

### Welcome to the Protocols Wiki

This is where zebrafish researchers can share experimental protocols and tips with the rest of the research community. Protocols are organized into sections corresponding to the chapters of [The Zebrafish Book, 5th edition \(4th edition on-line\)](#). Feel free to add new protocols to the appropriate section or add comments to any existing protocol.

<https://wiki.zfin.org/display/prot/ZFIN+Protocol+Wiki>



# ***How can we improve the planning of zebrafish experiments, to give better science and animal welfare?***

Be aware of the challenges with research on the non-traditional lab species

- Absence of standardised animals
- Health, housing and welfare monitoring
- Recognition of pain, suffering, distress



[https://speakingofresearch.com/2015/05/11/zebrafish\\_rising\\_star\\_animal\\_model](https://speakingofresearch.com/2015/05/11/zebrafish_rising_star_animal_model)



[http://ichef-1.bbci.co.uk/news/660/media/images/69786000/jpg/\\_69786238\\_69786233.jpg](http://ichef-1.bbci.co.uk/news/660/media/images/69786000/jpg/_69786238_69786233.jpg)

- “Normal” mortality
- Refinement of procedures
- Techniques for anaesthesia and humane killing

## *”Simple” techniques?*



Photo: T. Poppe, NMBU



[http://blogs.discovermagazine.com/notrocketscience/2011/01/12/flipper-bands-impair-penguin-survival-and-breeding-success/#.VLU6\\_8Y7\\_wo](http://blogs.discovermagazine.com/notrocketscience/2011/01/12/flipper-bands-impair-penguin-survival-and-breeding-success/#.VLU6_8Y7_wo)



Photo: NMBU

*Encourage scientists to publish 3R-improvements  
somewhere where they are visible!*



[http://www.theodora.com/rodent\\_laboratory/blood\\_collection.html](http://www.theodora.com/rodent_laboratory/blood_collection.html)



photo: NMBU

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

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

## There are many guidelines for *reporting* animal studies

- Öbrink & Waller, 1996
- Jane Smith *et al.*, 1997
- Adrian Smith & Trond Brattelid, 2000 (fish)
- Öbrink & Rehbinder: Animal definition: a necessity for the validity of animal experiments? *Laboratory Animals*, 2000
- **ARRIVE Guidelines**, 2010 (Kilkenny *et al.*, NC3Rs)
- 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

## ***But why do we need PREPARE when we have ARRIVE?***

The ARRIVE guidelines claim that they ‘provide a logical checklist with **all the things that need to be considered when designing an experiment**’ \*

In our experience when planning animal research, **a number of additional points need to be addressed at the planning stage.**

**These items not only improve study quality and animal welfare (and therefore reproducibility), but also the safety of humans and animals affected directly or indirectly by the work.**

\*<http://www.nc3rs.org.uk/sites/default/files/documents/Guidelines/ARRIVE%20Guidelines%20Speaker%20Notes.pdf>



ARRIVE

PREPARE

***Reporting guidelines like ARRIVE describe the experiment. Guidelines like PREPARE are used to plan the experiment (choose the «ingredients» and «baking time»)***



PREPARE

<https://www.bls.gov/ooh/images/3077.jpg>

ARRIVE



<https://www.dreamstime.com>



## PREPARE: guidelines for planning animal research and testing

Adrian J Smith<sup>1</sup>, R Eddie Clutton<sup>2</sup>, Elliot Lilley<sup>3</sup>,  
Kristine E Aa Hansen<sup>4</sup> and Trond Brattelid<sup>5</sup>

Laboratory Animals  
0101 1-7  
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DOI: 10.1177/0023677217724823  
journals.sagepub.com/home/lan  
SAGE

### Abstract

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

### Keywords

guidelines, planning, design, animal experiments, animal research

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

### Introduction

The quality of animal-based studies is under increasing scrutiny, for good scientific and ethical reasons. Studies of papers reporting animal experiments have revealed alarming deficiencies in the information provided,<sup>1,2</sup> even after the production and journal endorsement of reporting guidelines.<sup>3</sup> There is also widespread concern about the lack of reproducibility and translatability of laboratory animal research.<sup>4-7</sup> This can, for example, contribute towards the failure of drugs when they enter human trials.<sup>8</sup> 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.<sup>9</sup> This has understandably sparked a demand for reduced waste when planning experiments involving animals.<sup>10-12</sup> 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).<sup>13</sup> 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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Welfare (UFAW), UK

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



## **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

Items in pink are not highlighted in ARRIVE

### **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

# PREPARE



## The PREPARE Guidelines Checklist

### Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

Adrian J. Smith<sup>a</sup>, R. Eddie Clutton<sup>b</sup>, Elliot Lilley<sup>c</sup>, Kristine E. Aa. Hansen<sup>d</sup> & Trond Bratteilid<sup>e</sup>

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PREPARE<sup>1</sup> consists of planning guidelines which are complementary to reporting guidelines such as ARRIVE<sup>2</sup>.

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

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

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

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

Topic	Recommendation
<b>(A) Formulation of the study</b>	
1. Literature searches	<input type="checkbox"/> Form a clear hypothesis, with primary and secondary outcomes. <input type="checkbox"/> Consider the use of systematic reviews. <input type="checkbox"/> Decide upon databases and information specialists to be consulted, and construct search terms. <input type="checkbox"/> Assess the relevance of the species to be used, its biology and suitability to answer the experimental questions with the least suffering, and its welfare needs. <input type="checkbox"/> Assess the reproducibility and translatability of the project.
2. Legal issues	<input type="checkbox"/> Consider how the research is affected by relevant legislation for animal research and other areas, e.g. animal transport, occupational health and safety. <input type="checkbox"/> Locate relevant guidance documents (e.g. EU guidance on project evaluation).
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-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 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>(B) Dialogue between scientists and the animal facility</b>	
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.
<b>(C) Quality control of the components in the study</b>	
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 & Bratteilid 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](mailto:post@norecopa.no) | [@norecopa](https://twitter.com/norecopa)

Translated into 13 languages so far

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

[norecopa.no/PREPARE](https://norecopa.no/PREPARE)



[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](#) | [10-Experimental animals](#) |  
[11-Quarantine and health monitoring](#) | [12-Housing and husbandry](#) | [13-Experimental procedures](#) |  
[14-Humane killing, release, re-use or re-homing](#) | [15-Necropsy](#) | [Comparison with ARRIVE](#)



- [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](#) | [10-Experimental animals](#) | [11-Quarantine and health monitoring](#) | [12-Housing and husbandry](#) | [13-Experimental procedures](#) | [14-Humane killing, release, re-use or re-homing](#) | [15-Necropsy](#) | [Comparison with ARRIVE](#)

norecopa.no / PREPARE



## Harm-Benefit Assessment

[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. [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 suffering must be provided. An estimate must be made of the maximum amount of pain, distress or lasting harm to which an individual can be exposed.

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

# Quality assurance and a culture of care at all levels of the animal facility will increase implementation of the 3Rs

- SOPs describing good techniques, carried out by competent operators
- Checklist (“contract”) between researcher and the facility
- The AAALAC Program Description template\* as an overall performance checklist
  - Institutional policies on animal care and use
  - Animal environment, housing and management
  - Veterinary care
  - Physical plant
- A Master Plan as a weekly checklist for the whole facility during the year

\*<https://www.aaalac.org/programdesc/index.cfm>



## Contract between the animal facility and the research group

The division of labour and responsibilities between the two parties, with the aim of clarifying all stages of the experiment and ensuring that all necessary parameters are recorded.

	Animal facility	Researcher	Not applicable
<b>Animal:</b>			
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)			
<b>Environment:</b>			
Type of housing: barrier/conventional			
Temperature (mean $\pm$ variation)			
Light schedule			
Relative humidity (mean $\pm$ variation)			
Number of air changes in the animal room/cabinet per hour			
Environmental enrichment			
<b>Housing:</b>			
Free-range, shelf, cabinet, isolator			
Cage type and size			
Number and method of distribution of animals per cage			

PREPARE is **not just a checklist**, published once and for all.

**The PREPARE website will form a dynamic set of recommendations** which will evolve and contain more links as more species- and situation-specific guidelines are produced, and as best practice within Laboratory Animal Science progresses.

**PREPARE is not prescriptive and is not meant to suffocate creativity**, it are designed to help eliminate the artefacts caused by factors which have nothing to do with the treatment itself.



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