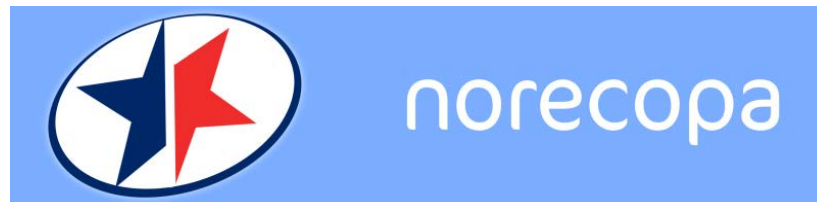


Alternatives to the Use of Animals, and the Three Rs

Adrian Smith

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



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

Norecopa

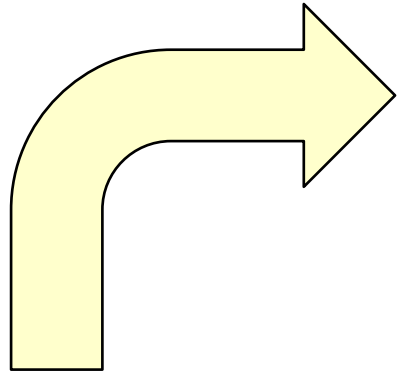
National Consensus Platform for the
Replacement, Reduction and Refinement of
Animal Experiments



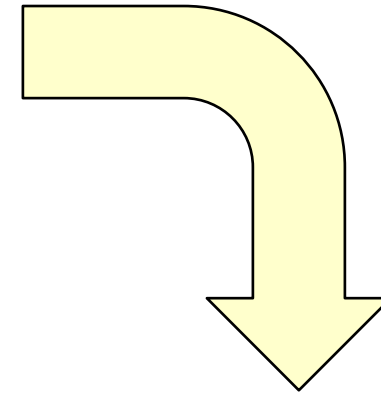
norecopa

a competence centre for the 3RS

- What is an alternative, and what types do we have?
- Where and how do we find information about them?
- Why is it hard to find and what can we do about?
- Examples of 3R sources
- Tools for searching the literature

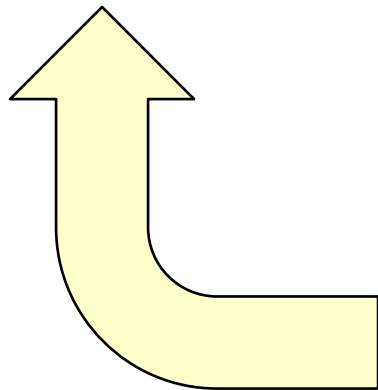


Literature
search

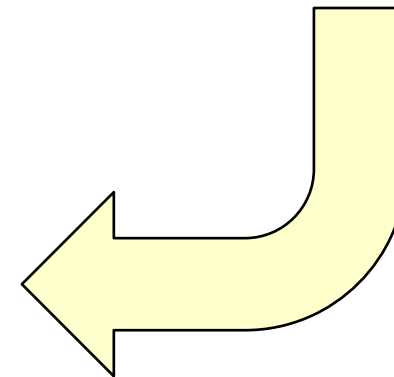


Reporting

Planning



Research



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

Missing mice: gaps in data plague animal research

Reports of hundreds of biomedical experiments lack essential information.

Monya Baker

05 January 2016

 [Rights & Permissions](#)

Two studies have unveiled widespread flaws in the reporting of animal experiments — the latest in a series of papers to criticize [shoddy biomedical research](#).

Whereas reports of clinical trials in major medical journals routinely state how many patients die or drop out of analysis during the course of a study, animal studies generally fail to report this figure — or drop animals without saying why, according to a team led by Ulrich Dirnagl at the Charité Medical University in Berlin. That lapse could significantly bias results, the team reports in the journal *PLoS Biology*¹.

In a second study in the same journal², a team led by John Ioannidis, an epidemiologist at Stanford University in California who has repeatedly called for more reproducible and transparent research, criticizes the lack of data availability and detailed protocols in biomedical papers.

What is an alternative?

A method without the use of animals that gives the same answers as an animal experiment.

Are these alternatives?

- Cell cultures
- Use of bacteria to test carcinogenicity
- Chemical analysis of biologically active compounds

N.B. Animal experiments are usually needed to develop and validate alternatives.

The potential for using alternatives

Basic research:	+ / -
Toxicological research	++
Education & training	+++ (very dependent upon objectives)
Production and testing	++++

EU Directive Article 4: Principle of replacement, reduction and refinement

Member States shall ensure

1. that, wherever possible, a scientifically satisfactory method or testing strategy, **not entailing the use of live animals**, shall be used instead of a procedure
1. that the number of animals used in projects is **reduced to a minimum** without compromising the objectives of the project
1. **refinement of breeding, accommodation and care, and of methods** used in procedures, eliminating or reducing to the minimum any possible pain, suffering, distress or lasting harm to the animals.

Article 13: Choice of methods

1. National legislation can **prohibit** certain types of methods, and Member States shall ensure that a procedure is not carried out if a method not involving live animals is recognised by the EU

1. When choosing between procedures, select those which to the greatest extent
 - a) use the **minimum number**
 - b) use animals with the **lowest capacity** to experience pain, suffering, distress or lasting harm
 - c) cause the **least pain, suffering, distress or lasting harm** and are **most likely to provide satisfactory results**

2. **Replace death as an end-point** as far as possible with early and humane endpoints so as to:
 - a) result in the deaths of as few animals as possible
 - b) reduce the duration and intensity of suffering to the minimum possible and as far as possible **ensure a painless death**

Article 16: Reuse

An animal may only be reused if

1. The actual severity of the previous procedures was **mild or moderate**
1. The animal's general state of health and well-being has been **restored**
1. The next procedure is classified as **mild, moderate or non-recovery**
1. It is in accordance with veterinary advice, taking into account the **lifetime experience** of the animal

In exceptional cases (after a veterinary examination) the competent authority can make an exception from point 1 and allow reuse if an animal has not been used more than once in a procedure entailing **severe** pain, distress or equivalent suffering

European Directive, Article 47: 3R-alternative approaches

1. *The Commission and Member States shall **contribute** to the development and validation of 3R-alternatives, and encourage research in this field*
1. *Member States shall **assist** the Commission in identifying laboratories for validation studies*
1. *The Commission shall set the priorities for these studies and **allocate** tasks*
1. *Member States shall **promote** alternatives and **disseminate** information on them*
1. *Member States shall nominate a single point of contact to provide **advice** on the regulatory relevance and suitability of alternatives proposed for validation (PARERE: **P**reliminary **A**ssessment of **R**egulatory **R**elevance)*

The image shows a screenshot of the European Commission website for 'Animals used for scientific purposes'. The page features a blue header with the 'ENVIRONMENT' logo and the European Commission logo. Below the header is a navigation bar with links for Home, About us, Policies, Funding, Legal compliance, and News & outreach. The main content area is titled 'Animals used for scientific purposes' and includes a sub-section 'Retrieval and provision of information on the "Three Rs" and alternatives'. A sidebar on the right contains a dropdown menu for 'The "Three Rs" and alternative approaches' with options like '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', and 'Key resources'. The 'Key resources' dropdown is expanded, showing 'Search Tools', 'Databases', 'Portals and web-sites', 'Journals', and 'Other resources and organisations'. A second dropdown menu on the left, 'Legislation and implementation', is also expanded, showing 'EU legislative framework', 'Implementation of Directive 2010/63/EU', and 'Q&A and guidance documents'. At the bottom, there is a section for 'Opinions of European Commission Expert Committees related to the use of animals in experiments' and social media icons for Facebook and Twitter. Red circles highlight the 'Q&A and guidance documents' link, the 'Key resources' dropdown menu, and the 'Opinions of European Commission Expert Committees...' section.

European Commission

ENVIRONMENT

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

Home About us Policies Funding Legal compliance News & outreach

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

f t

1) *Replacement alternatives*

Computer simulations

Films, video, virtual reality

Models, mannekins, simulators, robots

QSAR (Quantitative Analysis of Structure/Activity Relationships)

Cell and tissue cultures, organoids, organ perfusion

High Throughput Screening (HTS), organs-on-a-chip

Biochemical & immunological methods (RIA, ELISA)

Hybrid DNA technique, GMM

Trials on “lower” organisms, including plants

Acute experiments (terminal anaesthesia)

Trials on dead animals (ethically sourced cadavers, slaughterhouse material)

Observation of animals in their natural setting or a brief period of captivity

Animals in need of clinical veterinary care

Research animals that will be used anyway

Surplus breeders from lab animal suppliers

Trials on humans (microdosing and medical imaging)

Synthesis of new evidence from experiments that have already been performed

Replacement with a theoretical session

Choose your objectives!

You can't decide whether or not there is an alternative until you know the aim of the experiment.

- Teaching and practising:
 - laboratory skills
 - general animal handling skills
 - preparation-specific animal skills
- imparting good ethical thinking
- new knowledge and reinforcing existing
- data handling skills
- experimental design skills
- communication skills (oral, written)
- group work
- staff-student interaction

AJ Smith & K Smith, 2004

*Guidelines for humane education:
Alternatives to the use of animals in
teaching and training*

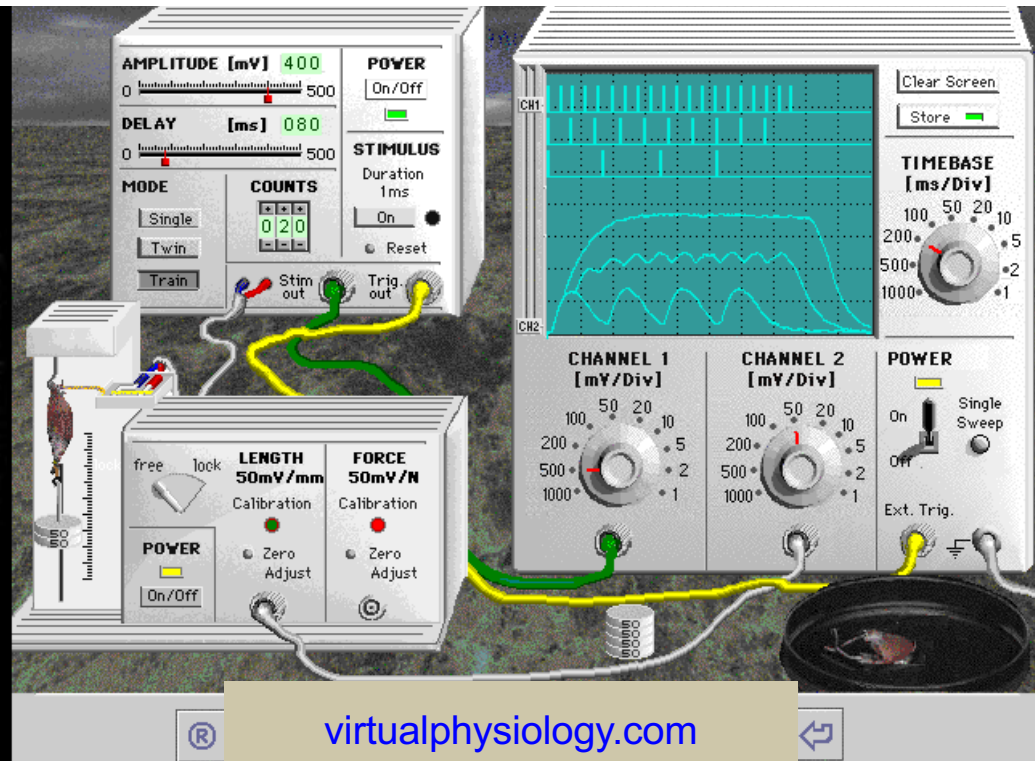
Proceedings of the 4th World Congress on Alternatives and Animal
Use in the Life Sciences, New Orleans, August 2002.

[http://www.atla.org.uk/wp-content/plugins/s2member-
files/32_S1a_3_Plenary_specialcontribution.pdf](http://www.atla.org.uk/wp-content/plugins/s2member-files/32_S1a_3_Plenary_specialcontribution.pdf)

(pages 16-26, free registration required)



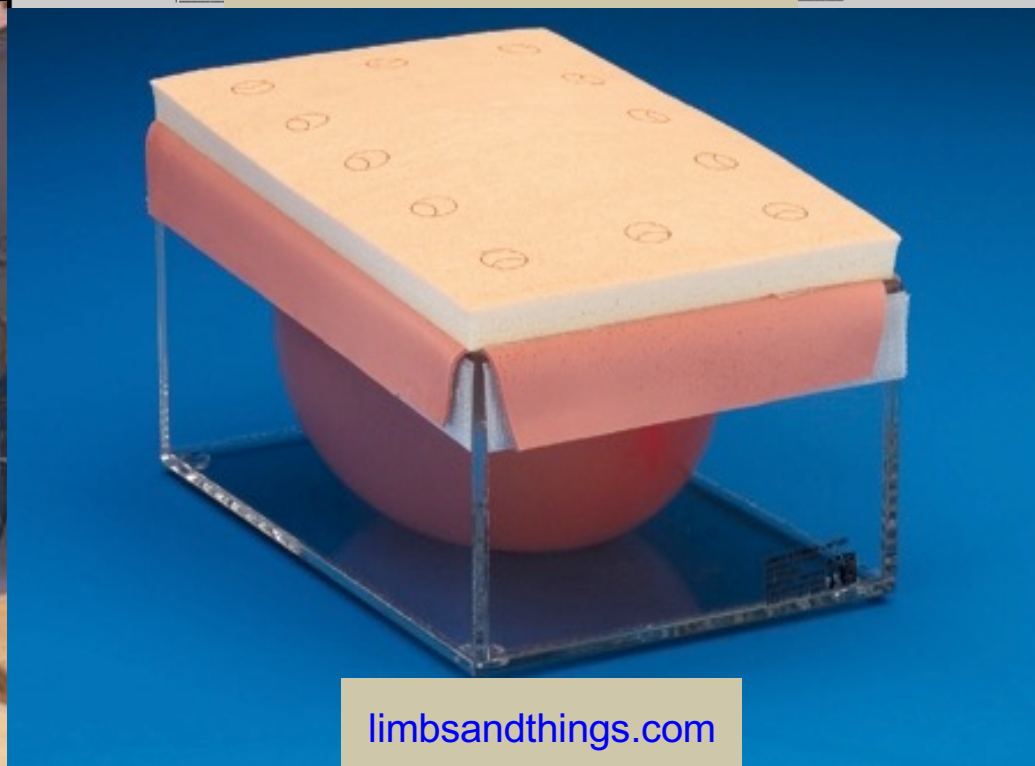
3dglasshorse.com



virtualphysiology.com



rescuecritters.com



limbsandthings.com



Rats from IKEA



Simulator for training in sterilisation of the bitch
(Rescue Critters)



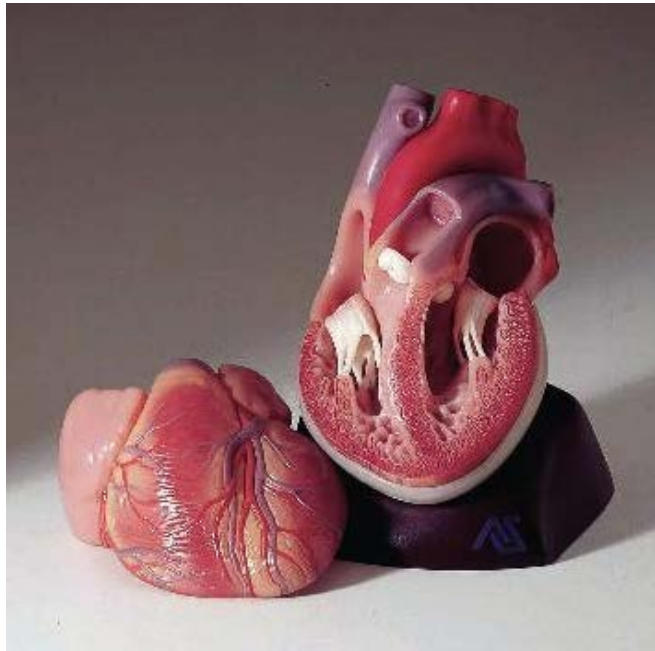
Simulator for keyhole surgery
<https://www.3-dmed.com>

Fidelity: overall proportionate difference (e.g. HiFi)

Discrimination: the extent to which the model reproduces one particular property in which we are interested



www.frame.org.uk/tag/russell-and-burch



https://www.wardsci.com/store/catalog/product.jsp?catalog_number=813015#



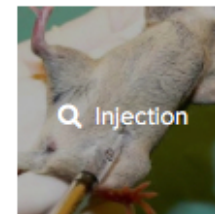
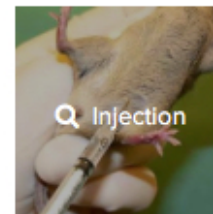
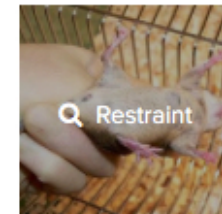
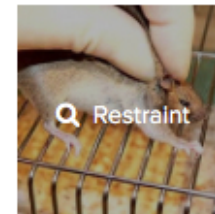
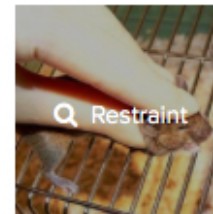
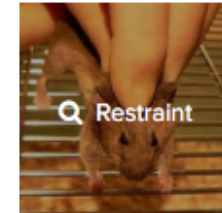
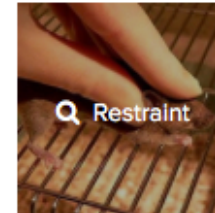
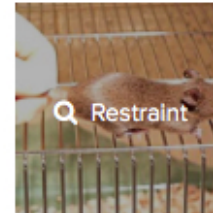
<http://www.interniche.org/ko/node/5134>



' We may need the animals, as it were, on the night; but the machines will do very well at rehearsals'

"Alternatives" may be too poor to replace animals totally, but may be excellent as briefing or debriefing aids.

Immobilisation and i.p. injection

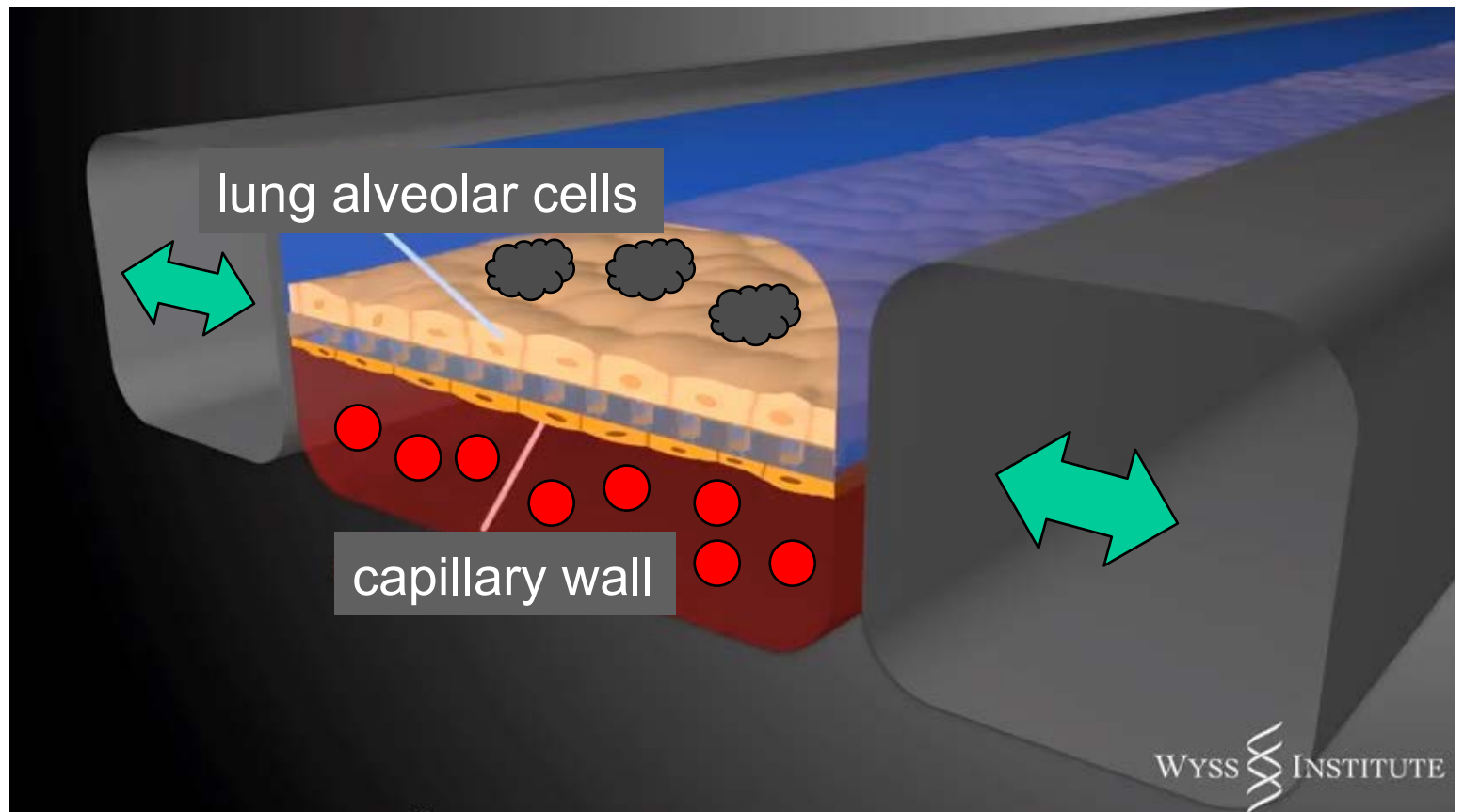
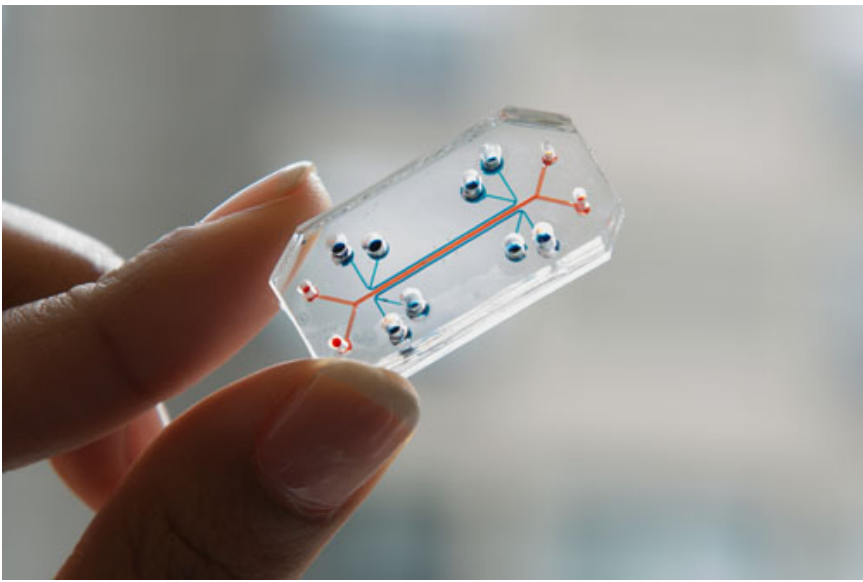


Replacement alternatives in science

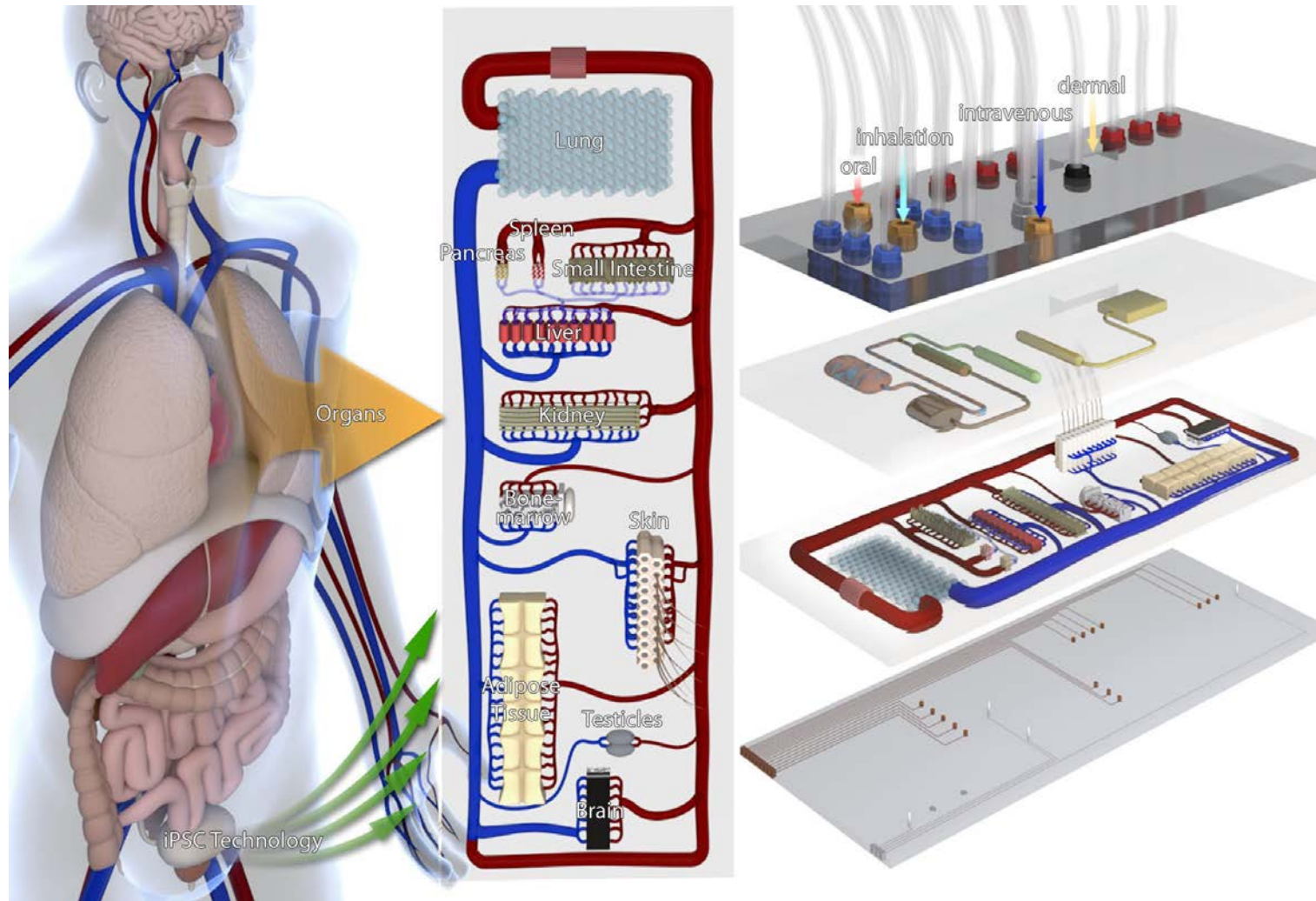
A paradigm shift is underway

Lung-on-a-chip

Wyss Institute, Harvard



Next generation Multi-Organ-Chip



Marx et al., Altern Lab Anim. 2012 Oct;40(5):235-57

- Norecopa -

Organoids

e.g. Mini-livers

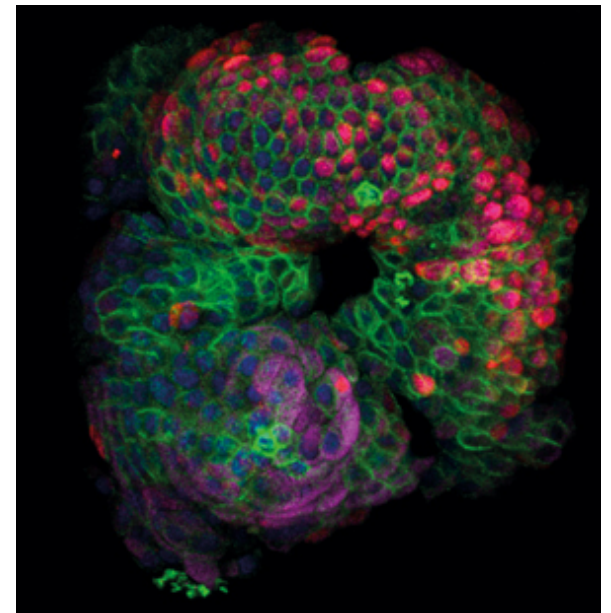
Dr Meritxell Huch, Cambridge University

Adult mouse stem cells expand into fully functioning 3D liver tissue.

Cells from one mouse could be used to test 1000 drug compounds to treat liver disease, and reduce animal use by up to 50,000.

When implanted into mice with liver disease they continued to grow, extending the survival of the mice.

Next stage is human cells: liver research and transplantation



<http://www.nc3rs.org.uk/news/mini-livers-show-promise-reduce-animal-use-science>



1997

https://en.wikipedia.org/wiki/Vacanti_mouse



2016

<http://www.nature.com/nbt/journal/vaop/ncurrent/full/nbt.3413.html>

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

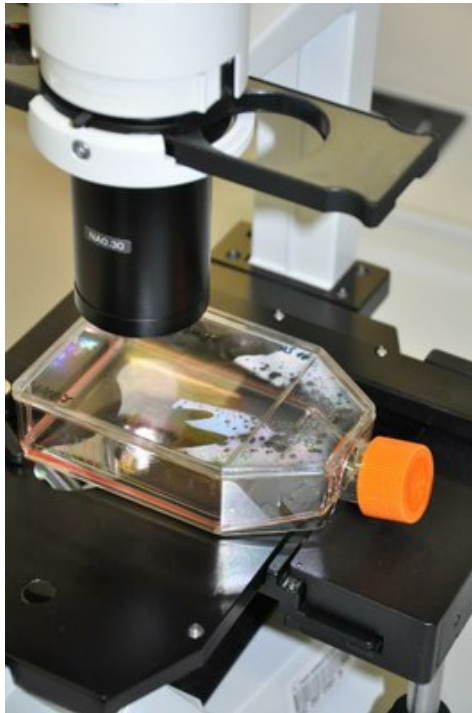


Lateral thinking between species



Laboratory Animals, 2000, 34,
430-433

High Throughput Screening (HTS)



Cell culturing and
compound management
laboratories



Robotic platform with high-throughput
liquid handler for **sample preparation**,
dilution and test-plate treatment.
Supported by optical **plate reader**, plate
washer and incubator

Data management system to trace
and process the test data



Automated **imaging**
microscope can be added
for **high-content screening**

Some of the reasons why industry still uses animals:

1. Regulatory requirements
2. Lack of validated alternatives
3. Risk of litigation

Some of the reasons why industry prefers alternatives:

1. *In vitro* methods are cheaper
2. They are faster
3. They are more reproducible

The problem:

- 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

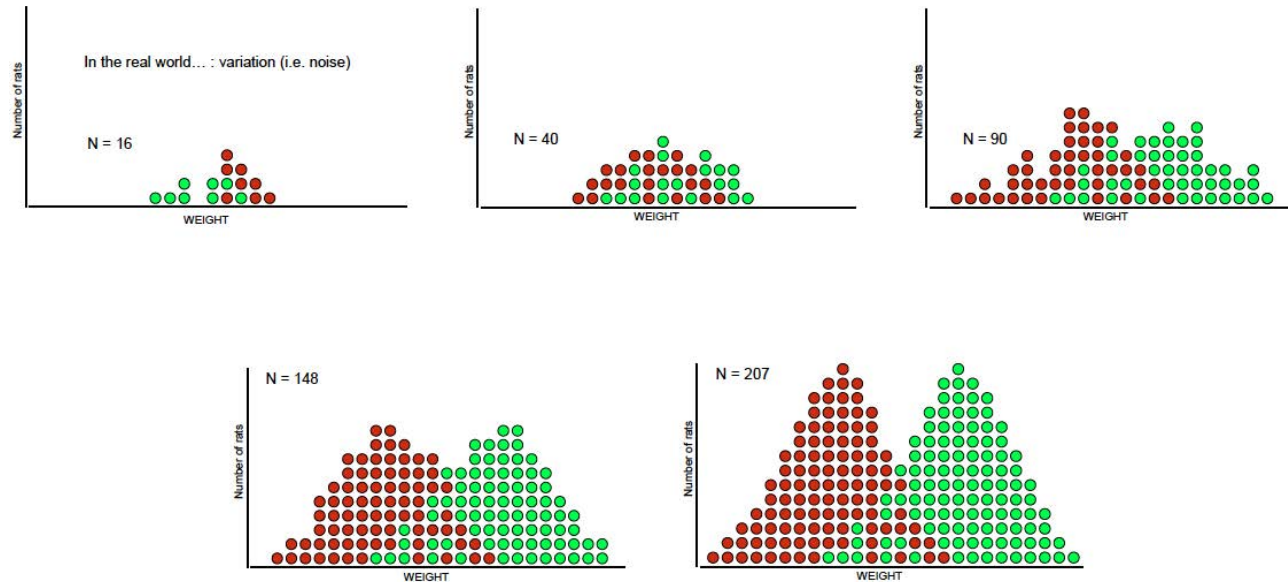


*Learning new information **without animal experiments** by Synthesis of Evidence:*

Systematic Reviews of ones that have already been published!

2) Reduction alternatives

A good statistician is the laboratory animal's best friend.
Combined with efforts to reduce experimental "noise".



<http://norecopa.no/norecopa/vedlegg/Berdoy-handout.pdf>

Sources of experimental “noise”:

- Age, sex, weight
- Stress, subclinical disease
- Room temperature, animal cage
- Environmental “enrichment”
- Temporal differences between treatments
- Climatic factors
- Position of cage in the room
- Experimenter
- Animal Technician (weekend workers)
- and many more

FRAME Training Schools

Voss, 1 – 3 February 2016

www.frame.org.uk/training-schools



NC3Rs website

<http://nc3rs.org.uk/experimental-design>



National Centre
for the Replacement
Refinement & Reduction
of Animals in Research

Guidelines for the Design and Statistical Analysis of Experiments Using Laboratory Animals

<http://ilarjournal.oxfordjournals.org/content/43/4/244.full>

NC3Rs Experimental Design Assistant (EDA)

<http://nc3rs.org.uk/experimental-design-assistant-eda>



<https://uk.sagepub.com/en-gb/eur/design-of-animal-experiments/book242188>

TextBase

TextBase publications

Your search for TextBase publications containing the text "design" in the title returned the following results (13 items, page 1 of 1):

The Design of Animal Experiments: Reducing the Use of Animals in Research Through Better Experimental Design. By Festing, Michael F.W.; Overend, Philip, Das, Rose Gaines; Borja, Mario Cortina & Berdoy, Manuel (2002). This handbook is aimed at all research scientists who use laboratory animals, with the aim of helping them to design their own experiments more effectively and/or to improve their ability to communicate with professional statisticians when designing more complex experiments.

CCAC Guidelines on: Laboratory Animal Facilities - Characteristics, Design, and Development. By Neil, David and McKay, Donald, with the collaboration of the CCAC Facilities Standards Subcommittees (2003). This document concentrates on the characteristics of a laboratory animal facility and hence do not cover all subjects matter discussed in the "Guide to the Care and Use of Experimental Animals", Volume 1, Chapters II and III, (CCAC, 1993).

Experimental Design and Analysis in Animal Sciences. By Morris, Tim R. (1999). This guide includes information for the design and analysis of experiment in animal science.

Experimental Design: A Handbook and Dictionary for Medical and Behavioral Research. By Krauth, J. (2000). Scientists planning experiments in medical and behavioural research will find this handbook and dictionary an invaluable desk reference tool.

Search TextBase

Find lab animal textbooks

- All Years -

Title

design GO!

Refine your search

- NORINA Products (49)
- 3R Guide Products (32)
- Classic AVs Products (2)
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Browse TextBase

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Latest added titles

Search

Entire website

oslovet.norecopa.no/textbase

3) Refinement alternatives

”Simple” techniques?



Photo: NMBU

Are they feasible?

For example, intramuscular injections

*"Simple" identification methods?
Do they affect the animal?*



Photo: T. Poppe, NMBU



http://blogs.discovermagazine.com/notrocketscience/2011/01/12/flipper-bands-impair-penguin-survival-and-breeding-success/#.VLU6_8Y7_wo



Photo: colourbox.com

Norecopa's Annual Meeting Oslo, 24 May 2016:

Professor Rory Wilson, Swansea:

Putting tags and transmitters on birds:

are our guidelines flights of fancy?

<https://norecopa.no/about-norecopa/annual-meetings>

Refinement to avoid **contingent suffering**

(not just direct suffering caused by the procedure)

e.g. fear, boredom, discomfort

which may be caused by

e.g. transport, housing, husbandry, social hierarchy



The Lonely Mouse


Single-housed male mice show symptoms of what in humans would be characterised as depression:

Increased hypothermia in response to treatment with a serotonergic agonist

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

http://www.labtimes.org/editorial/e_575.lasso

Evaluation of EMLA Cream for Preventing Pain during Tattooing of Rabbits: Changes in Physiological, Behavioural and Facial Expression Responses

Stephanie C. J. Keating, Aurelie A. Thomas, Paul A. Flecknell, Matthew C. Leach 

PLoS ONE, 2012, 7(9): e44437. doi:10.1371/journal.pone.0044437

In a crossover study, eight New Zealand White rabbits each underwent four different treatments of actual or sham ear tattooing, with and without prior application of a topical local anaesthetic (lidocaine/prilocaine). Changes in immediate behaviour, heart rate, arterial blood pressure, serum corticosterone concentrations, facial expression and home pen behaviours were assessed. Changes in facial expression were examined to develop the Rabbit Grimace Scale in order to assess acute pain. Tattooing without EMLA cream resulted in significantly greater struggling behaviour and vocalisation, greater facial expression scores of pain, higher peak heart rate, as well as higher systolic and mean arterial blood pressure compared to all other treatments. Physiological and behavioural changes following tattooing with EMLA cream were similar to those in animals receiving sham tattoos with or without EMLA cream. Behavioural changes 1 hour post-treatment were minimal with no pain behaviours identifiable in any group. Serum corticosterone responses did not differ between sham and tattoo treatments.

Conclusions

Ear tattooing causes transient and potentially severe pain in rabbits, which is almost completely prevented by prior application of local anaesthetic cream. The Rabbit Grimace Scale developed appears to be a reliable and accurate way to assess acute pain in rabbits.

Grimace Scales



Facial Coding Unit	Score
Orbital Tightening	0
Cheek Flattening	0
Pointed Nose	0
Whisker Change	0
Total Pain Score:	0

a.



Facial Coding Unit	Score
Orbital Tightening	2
Cheek Flattening	1
Pointed Nose	2
Whisker Change	2
Total Pain Score:	2

b.

Think "3R-Alternatives" at all stages

- Breeding
- Transport
- Acclimation
- Procedures, e.g. choice of
 - dose
 - method of administration
 - methods of data collection (blood sampling, body temperature, heart rate, blood pressure etc.)
- Pilot studies

Consult the technicians from Day 1:

- they know the possibilities (and limitations) in the animal facility
- they often possess a large range of practical skills and are good at lateral thinking
- they know the animals best
- the animals know them best

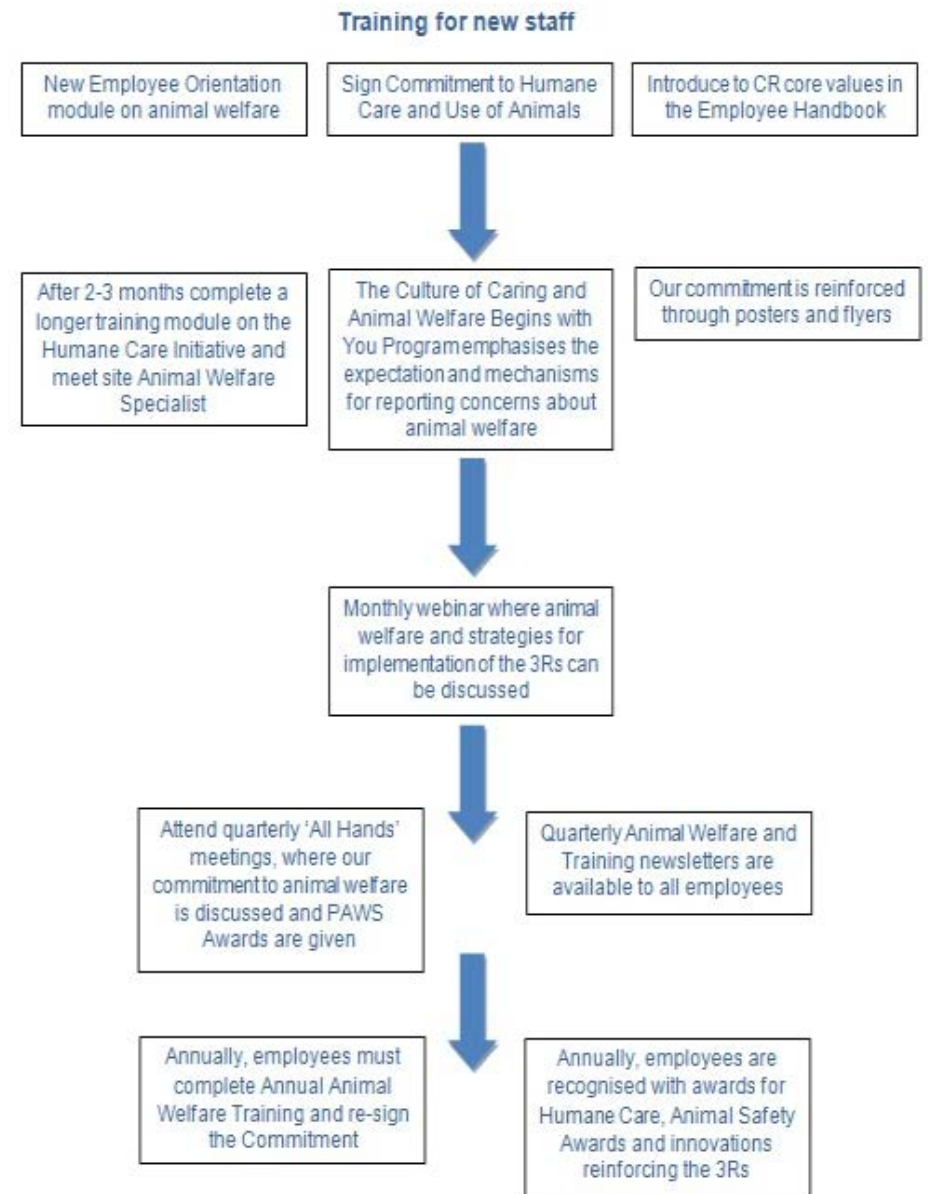


Creating a culture of care

Friday 22 August 2014

Dr Marilyn Brown, Corporate Vice President of Global Animal Welfare at the contract research organisation Charles River, has many years of experience managing experimental facilities and animal care programmes.

<https://www.nc3rs.org.uk/news/creating-culture-care>



Establishing a Culture of Care, Conscience, and Responsibility: Addressing the Improvement of Scientific Discovery and Animal Welfare Through Science-based Performance Standards

H. J. Klein and K. A. Bayne

Address correspondence and reprint requests to Dr. Klein, Merck Research Laboratories, WP42-211, West Point, PA 19486, or email Hilton_klein@merck.com.

<http://ilarjournal.oxfordjournals.org/content/48/1/3.full>

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

+ the necessary literature/resources/finances/support to implement these

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

Best.nr. 974034
MASTER PLAN 2012



Bevegelige helligdager med unntak av søndager er merket med rød.

Januar	Februar	Mars	April	Mai	Juni	Juli	August	September	Oktober	November	Desember	Opppart
1-31	1-28	1-31	1-30	1-31	1-30	1-31	1-31	1-30	1-31	1-30	1-31	1-31
Detailed description of the calendar content <p>This is a large grid calendar for the year 2012. It is divided into 12 columns representing the months. Each month's header includes the month name and the dates from 1 to the end of the month. The grid contains numerous blue circles, some of which are placed on specific dates, likely representing events or appointments. Red vertical lines are drawn through the calendar, marking certain days. The grid is overlaid on a fine grid background.</p>												

Best.nr. 974034

MASTER PLAN 2012



Bevegelige helligdager med unntak av søndager er merket med rød.

Januar	Februar	Mars	April	Mai	Juni	Juli	August	September	Oktober
1-31	1-28	1-31	1-30	1-31	1-30	1-31	1-31	1-30	1-31
Detailed description of the calendar content <p>This is a smaller grid calendar for the year 2012, similar in format to the one above. It shows the months from January to October. The grid contains blue circles and red vertical lines. The text 'st. link' is visible in the bottom left corner of the page.</p>									

An useful additional (but largely unknown) tool...

Carol M. Newton (1925-2014)



National Library of Medicine

The three S's

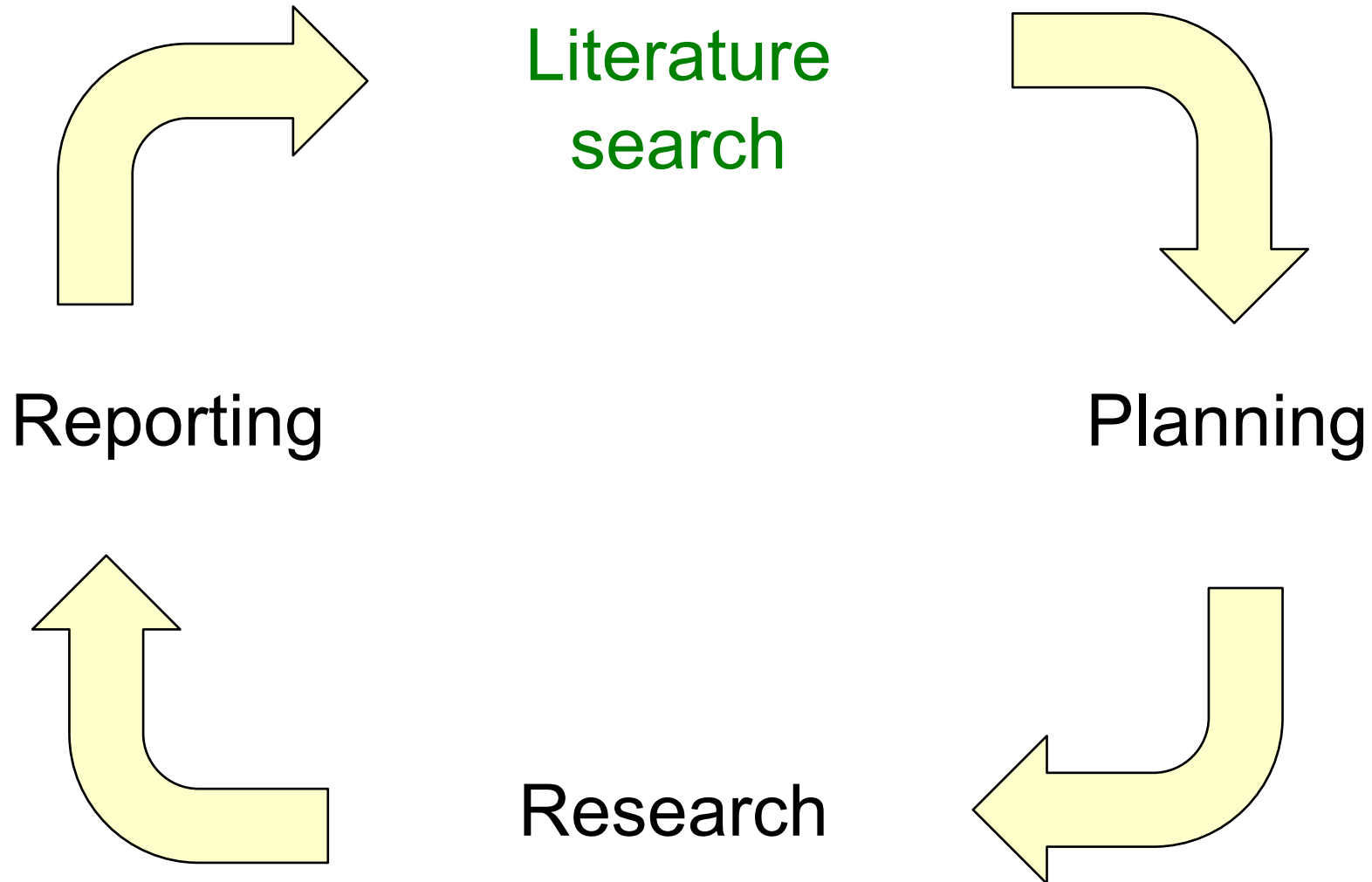
- *Good Science*
- *Good Sense**
- *Good Sensibilities**

****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.

Smith AJ & Hawkins P: *Good Science, Good Sense and Good Sensibilities: The Three Ss of Carol Newton* Submitted to *Animals*, August 2016.

Norecopa's website is designed to aid scientists in finding global 3R resources



Correct literature searches are a vital part of the work to advance the 3Rs

Searching for alternatives

- *What's the problem? We have Google!*
- *How you can improve the situation*
- *Principles of setting up a search*
- *Resources to help you*

Why is 3R literature hard to find?

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

Kilkenny C et al. (2009)

271 papers, mostly in 2003-2005

<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0007824>

Many studies did not

- *describe the animals adequately*
- *describe how the sample size was chosen*
- *describe how the animals were allocated to the treatment groups, and whether the observations were performed blind.*

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

Visibility! Not necessarily in a high-impact journal.



Most-Cited Articles as of August 1, 2016 -- updated monthly

Rankings based on citations to online articles from HighWire-hosted articles.

1. Working Party Report:

W. Nicklas, P. Baneux, R. Bood, T. Decelle, A. A. Deeny, M. Fumanelli, and B. Illgen-Wilcke

Recommendations for the health monitoring of rodent and rabbit colonies in breeding and experimental units

Lab Anim January 1, 2002 36: 20-42, doi:10.1258/0023677021911740

» [Full Text \(PDF\)](#)

2. Articles:

C. Moolenbeek and E. J. Ruitenber

The 'Swiss roll': a simple technique for histological studies of the rodent intestine

Lab Anim January 1, 1981 15: 57-59,
doi:10.1258/002367781780958577

» [Abstract](#) » [Full Text \(PDF\)](#)

3. Papers:

Annelise Hem, Adrian J. Smith, and Per Solberg

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

Lab Anim October 1, 1998 32: 364-368,
doi:10.1258/002367798780599866

» [Abstract](#) » [Full Text \(PDF\)](#)

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» [Affiliated Societies](#)

Does the Internet give us everything we need to know on alternatives?



colourbox.com

The Surface Web

*The Deep
(Invisible) Web*

What is the Surface Web useful for?

- Searching for a specific document which we know exists
- Looking for a starting-point for information on a specific topic
- Finding "grey literature" (e.g. unpublished reports)

The Deep Web

Many times larger than the Surface Web, material may be:

- Encrypted
- Registration/subscription
- Password or Captcha protected databases
- Dynamic, contextual or scripted webpages
- Unlinked content
- Not formatted for, or accessible by, standard search engines e.g. text in image or video files
- Material on company intranets



colourbox.com

We would also find more 3R literature if there was greater use of 3R descriptors...

Using PubMed to access data in MEDLINE:

MESH (Medical Subject Headings) thesaurus

The image displays three screenshots of PubMed search results, each with a red circle highlighting the search term and the total number of results. The first screenshot shows the search term "Animal Use Alternatives"[Mesh] with 2989 results. The second screenshot shows "Animal Testing Alternatives"[Mesh] with 2635 results. The third screenshot shows "Animal Experimentation"[Mesh] with 6572 results. Each screenshot also includes options for RSS, Save search, and Advanced search, and a dropdown menu for Summary, 20 per page, and Sort by Most Recent.

Other databases have their own thesauri. A thesaurus can be useful to build up a list of suitable keywords, even if you use another database.

Principles of setting up a search

- Efficiency – minimise the number of irrelevant or poor-quality results
- Effectivity – maximise the number of high-quality results

Systematic Reviews

- The process of systematically locating, evaluating and **synthesizing evidence** from scientific studies in order to obtain a reliable overview

Synthesis of evidence by **meta-analysis**

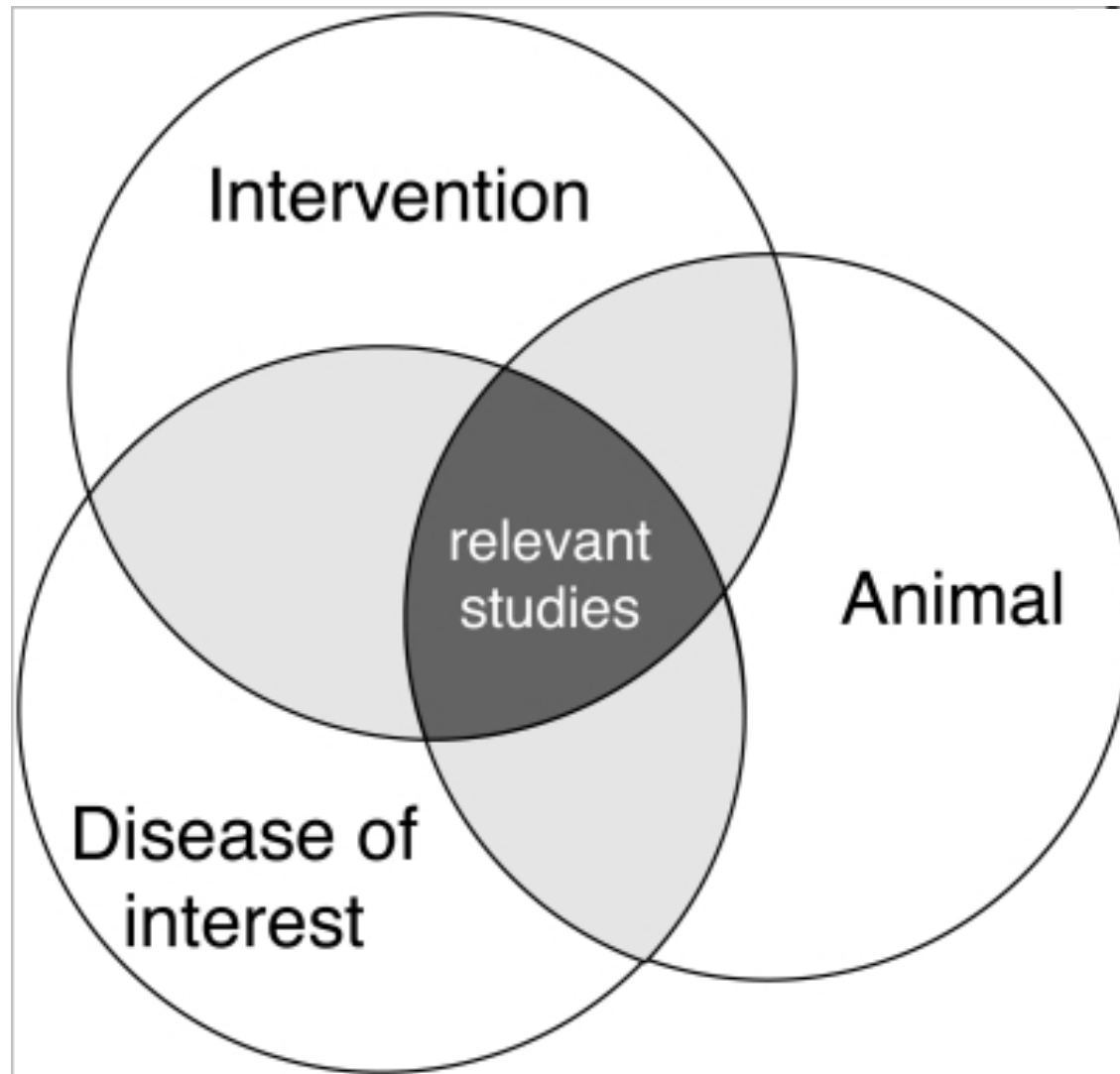
- The use of statistical methods to summarize the results of independent studies

Guidelines for systematic reviews:

<http://3rs.ccac.ca/en/research/systematic-reviews.html>

A step-by-step guide to systematically identify all relevant animal studies:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3265183>



Read! A step-by-step guide to systematically identify all relevant animal studies
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3265183>

Construct and try out search strategies for each of the four **Search Components (SC)**:

1. Intervention/exposure
2. Outcome measures
3. Animal population to be studied
4. Health problem of interest

e.g.

The effect of (SC1) group-housing on (SC2) blood pressure in (SC3) rats used in (SC4) diabetes research

Only then combine into one search string:
SC1 AND SC2 AND SC3 (AND SC4)



Identifying search terms: Thesauri and synonyms

A thesaurus is a closed list of terms used to index and search databases. Often a good idea to start a search with a database using a thesaurus.

- “animal use alternatives” in the NLM MeSH (Medical Subject Headings) used by MEDLINE/PubMed
- NAL’s thesaurus for alternatives to animals
<http://www.nal.usda.gov/awic/alternatives/alternativeanimalusethesaurus.htm>
- EURL ECVAM’s thesaurus (focus on *in vitro* toxicology):
http://ecvam-dbalm.jrc.ec.europa.eu/f_main.cfm?idmm=7

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

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

How to construct a literature search

Alice Tillema, Medical Library, Nijmegen

<http://libguides.ru.nl/norecopa>



Radboud University



Radboudumc
university medical center

Norecopa - Literature Search: Search tips

[Find other LibGuides](#)

[Search](#)

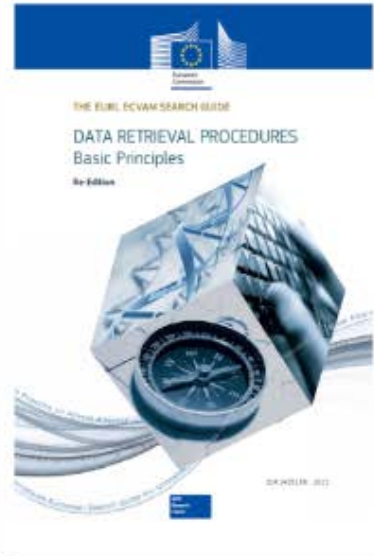
Start page for Norecopa AGM 24 May 2016

[Home](#)

[Search tips](#)

Search Guide

[ECVAM Search Guide](#) (see
[Download Content](#))




PubMed

-  [PubMed Practical](#)

[PubMed with incorporated animal filter \(SYRCLE\)](#)

How to construct a comprehensive search strategy

- Formulate a specific research question
In animal models for Alzheimer's Disease what is the effect of supplementation of omega-3 fatty acids on cognition and neurodegeneration?
- Determine which elements of the question will be your search components (SC)
animals, alzheimer, omega 3 fatty acids
- Make a list of search terms** for every SC containing
 - MeSH term e.g. alzheimer disease[MeSH]
 - synonyms e.g. alzheimer, alzheimer's, alzheimers, dementia
- Create a search string for each SC using **OR** between the search terms
[Search string for component Alzheimer at SYRCLE website](#)
- Perform searches with separate search strings in PubMed
- Use *History (Advanced)* to combine search strings with AND. [Example](#)
-  ** [Tips for turning a list of search terms into a search string \(in Word\)](#)

SYRCLE

[A step by step guide to systematically find all relevant animal studies](#)

[SYRCLE Tools and support for systematic reviews](#)

[SYRCLE Training materials for Systematic Review workshop](#)

A step-by-step guide to systematically identify all relevant animal studies

Marlies Leenaars¹, Carlijn R Hooijmans¹, Nieky van Veggel^{1,2}, Gerben ter Riet³, Mariska Leeflang⁴, Lotty Hooft⁵, Gert Jan van der Wilt⁶, Alice Tillema⁷ and Merel Ritskes-Hoitinga¹

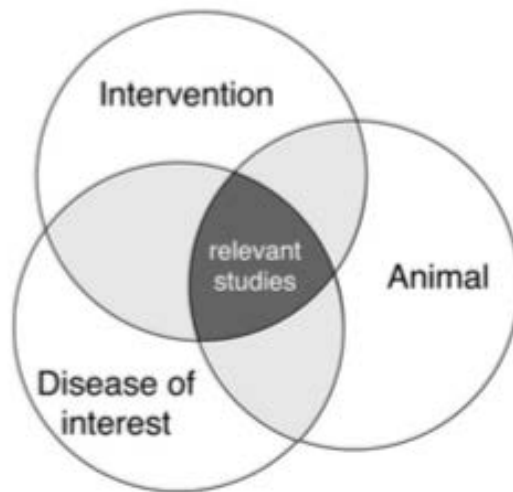


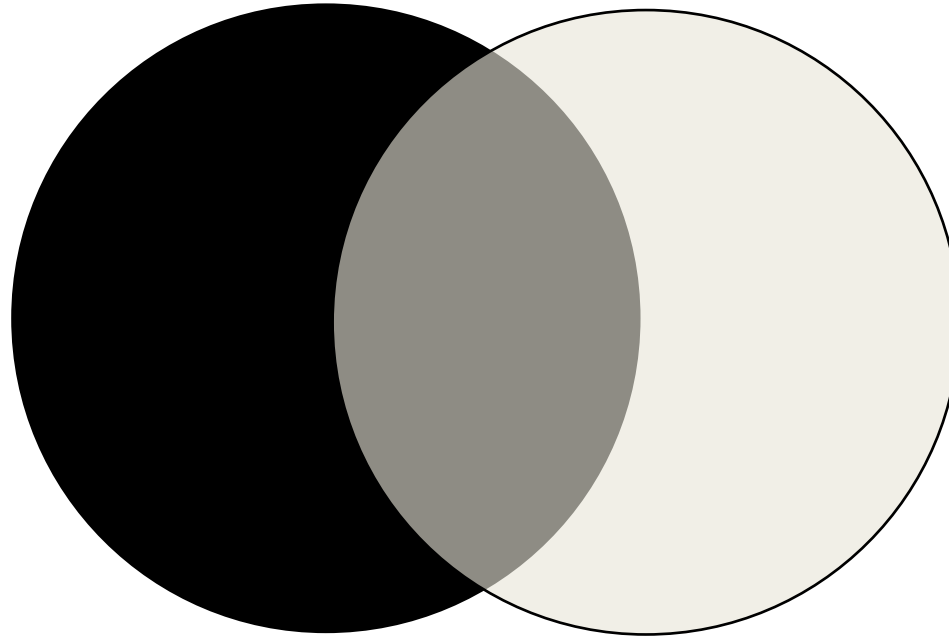
Figure 1 Combining components in the search strategy (adapted from Higgins and Green³)

Text search filter:

```
("animal experimentation"[MeSH Terms] OR "models, animal"[MeSH Terms] OR "invertebrates"[MeSH Terms] OR "Animals"[Mesh:noexp] OR "animal population groups"[MeSH Terms] OR "chordata"[MeSH Terms:noexp] OR "chordata, nonvertebrate"[MeSH Terms] OR "vertebrates"[MeSH Terms:noexp] OR "amphibians"[MeSH Terms] OR "birds"[MeSH Terms] OR "fishes"[MeSH Terms] OR "reptiles"[MeSH Terms] OR "mammals"[MeSH Terms:noexp] OR "primates"[MeSH Terms:noexp] OR "artiodactyla"[MeSH Terms] OR "carnivora"[MeSH Terms] OR "cetacea"[MeSH Terms] OR "chiroptera"[MeSH Terms] OR "elephants"[MeSH Terms] OR "hyraxes"[MeSH Terms] OR "insectivora"[MeSH Terms] OR "lagomorpha"[MeSH Terms] OR "marsupialia"[MeSH Terms] OR "monotremata"[MeSH Terms] OR "perissodactyla"[MeSH Terms] OR "rodentia"[MeSH Terms] OR "scandentia"[MeSH Terms] OR "sirenia"[MeSH Terms] OR "xenarthra"[MeSH Terms] OR "haplorhini"[MeSH Terms:noexp] OR "strepsirhini"[MeSH Terms] OR "platyrrhini"[MeSH Terms] OR "tarsii"[MeSH Terms] OR "catarrhini"[MeSH Terms:noexp] OR "cercopithecidae"[MeSH Terms] OR "hylobatidae"[MeSH Terms] OR "hominidae"[MeSH Terms:noexp] OR "gorilla gorilla"[MeSH Terms] OR "pan paniscus"[MeSH Terms] OR "pan troglodytes"[MeSH Terms] OR "pongo pygmaeus"[MeSH Terms] OR ((animals[tiab] OR animal[tiab] OR mice[Tiab] OR mus[Tiab] OR mouse[Tiab] OR murine[Tiab] OR woodmouse[tiab] OR rats[Tiab] OR rat[Tiab] OR murinae[Tiab] OR muridae[Tiab] OR cottonrat[tiab] OR cottonrats[tiab] OR hamster[tiab] OR hamsters[tiab] OR cricetinae[tiab] OR rodentia[Tiab] OR rodent[Tiab] OR rodents[Tiab] OR pigs[Tiab] OR pig[Tiab] OR swine[tiab] OR swines[tiab] OR piglets[tiab] OR piglet[tiab] OR boar[tiab] OR boars[tiab] OR "sus scrofa"[tiab] OR
```

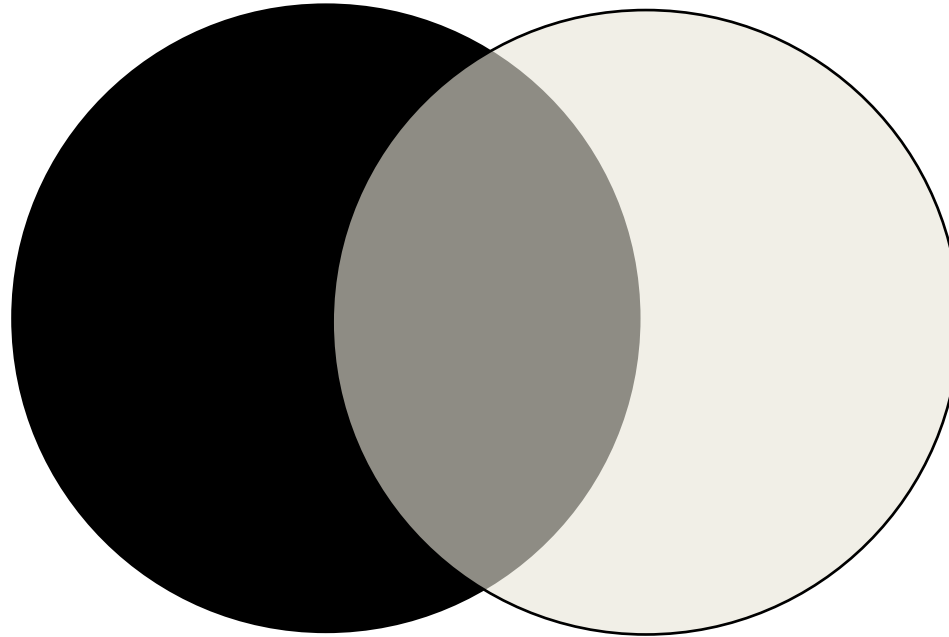
...to ensure that you access recent papers also, not just the ones that have been indexed.
Relatively few papers are indexed with 3R MESH terms in MEDLINE

Boolean logic



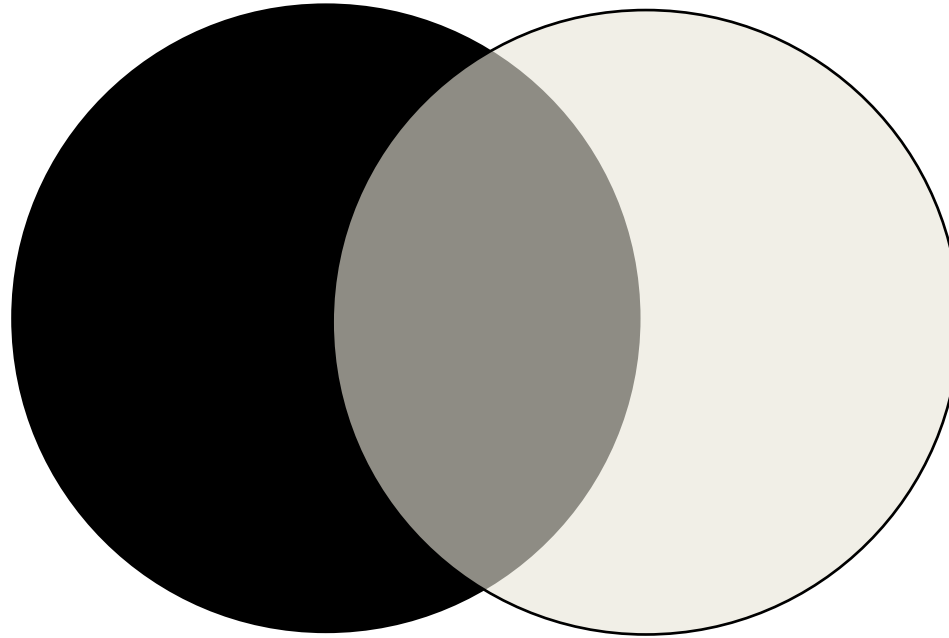
Transgenic AND Mice
(grey)

Boolean logic



Transgenic OR Mice
(everything)

Boolean logic



Transgenic NOT Mice
(black)

Boolean logic

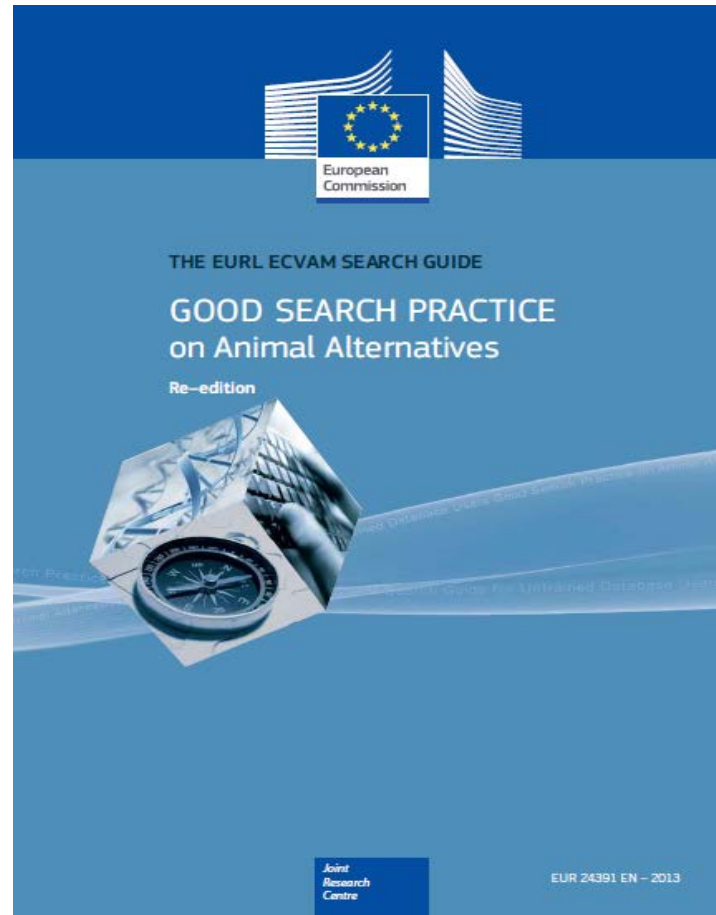
Transgenic AND (mice OR rats OR (pigs NOT guinea))

protection NEAR animals NEAR scientific

The EURL ECVAM Search Guide

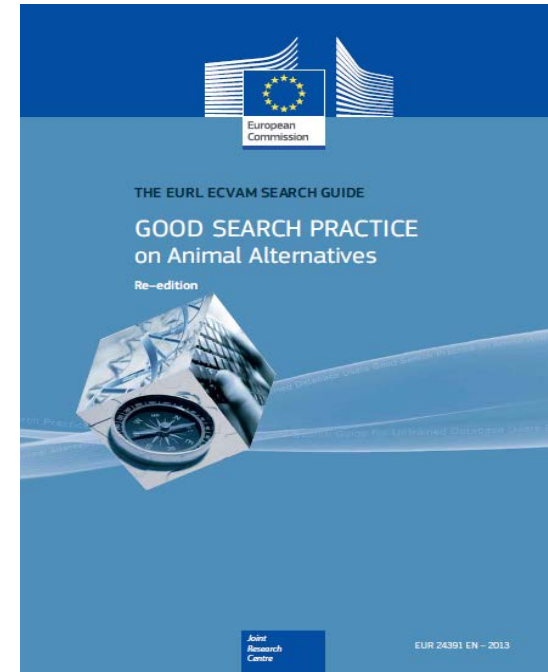
Can be ordered free of
charge from

bookshop.europa.eu

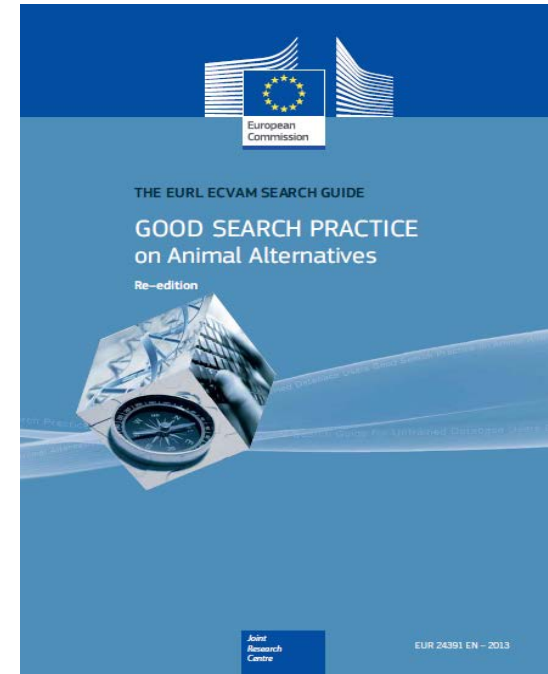


Contents

- Data sheets on
 - Journals
 - Databases
 - Meta-databases
 - Database hosts
 - Open Access resources
 - Organisations
 - Web search engines



Contents

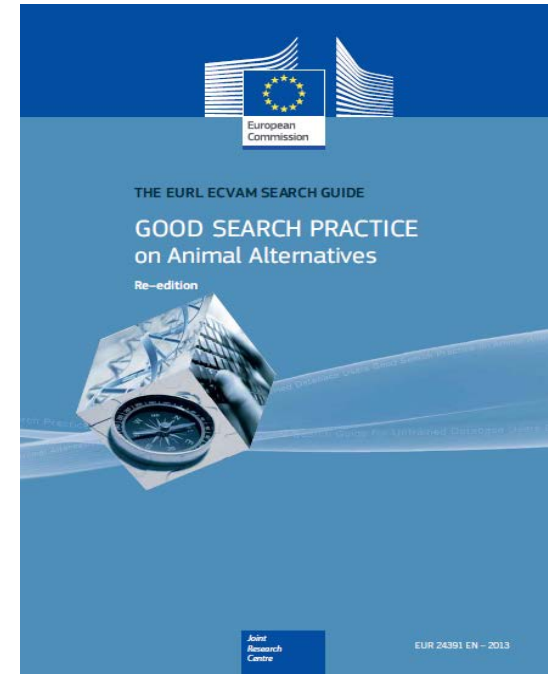


- Data Retrieval Procedures
(basic principles)
- Check-list for searching for information on alternative methods
- Tables comparing the features of
 - Databases
 - Journals
 - Organisations

Contents

Seven Golden Steps to Successful Searching

1. Clearly define and be aware of your specific information need
2. Identify the fundamental components of your scientific approach
3. Choose the most appropriate information resources
4. Compile relevant and necessary search terms
5. Start your search with a simple query in a 3Rs specific context
6. Limit search results from more extensive resources
7. Broaden the search horizon



Archive your searches and the key documents

- Avoidance of repeating searches
- Documentation of searches
- Generation of bibliographies for publications
- Search function

*The world congresses on the 3Rs are important 3R-
drivers and disseminators of information:*

wc9prague.org

*891 abstracts, 49 countries, 1000 participants
(the next one is in September 2017 in Seattle)*

*1996: 2nd World Congress on Alternatives and Animal Use in the Life
Sciences, Utrecht:*



*1997: Altweb (Alternatives to
animals on the web)*

<http://altweb.jhsph.edu>

the global clearinghouse for information on alternatives to animal testing

SEARCH ALTWEB

HOME

ABOUT US

RESOURCES

ALTEX

FEATURED ITEMS

PUBLICATIONS

NEWSLETTER

ESPAÑOL

CAAT HOME



Chemical Information Day
November 11, 2009

REGISTER NOW!

Network with scientific,
industry, and regulatory experts
from the US and Europe

Search for Alternatives

A Detailed, Step-by-Step Guide to Alternatives Searches

ALTERNATIVES NEWS

CAAT Chemical Information Day: Nov. 11, 2009: REGISTER NOW!

Wed, 04 Nov 2009 16:31:06 GMT

ILAR to Publish Guidelines for Scientific Publications Involving Animal Studies

Fri, 30 Oct 2009 20:18:49 GMT

October 2009 AltTox Digest Available

Fri, 30 Oct 2009 16:31:06 GMT

TOOLS

Print this page

Subscribe to news feed

Resize Text

Social Media



SHARE

NEW ALTEX



<http://altweb.jhsph.edu>

Examples of 3R sources

- ***National 3R centres***
- ***3R congress proceedings***
- ***Guidelines papers***
- ***Journals***
- ***Discussion groups***
- ***Training schools***

National 3Rs Centres

The screenshot shows the homepage of the National Centre for the Replacement, Refinement & Reduction of Animals in Research (NC3Rs). The header includes the NC3Rs logo and name, a search bar, and social media icons. The navigation menu contains links for Home, The 3Rs, Our science, 3Rs resources, Funding, News, Events, and About us. The main content area features a large image of a laboratory with a teal overlay text: "An institutional framework for the 3Rs". To the right is a word cloud with terms like "research", "reduction", "refinement", and "replacement", with a purple overlay text: "Our Science". Below the word cloud is a purple box with the text: "2015 Funding Panel vacancies: now recruiting".

NC3Rs National Centre for the Replacement, Refinement & Reduction of Animals in Research

Login | Register

Search this site

Home The 3Rs Our science 3Rs resources Funding News Events About us

An institutional framework for the 3Rs

Our Science

2015 Funding Panel vacancies: now recruiting

www.nc3rs.org.uk

Centres giving information on alternatives



UCCAA

University of California
Center for Animal Alternatives



www.lib.ucdavis.edu/dept/animalalternatives



Animal Welfare Information Center

U.S. DEPARTMENT OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

awic.nal.usda.gov

Animal welfare organisations

The screenshot shows the RSPCA website interface. At the top right, it says 'ONLINE' and 'AND ADVICE 0300 1234'. The left sidebar contains a navigation menu with categories like 'Campaigns', 'Animal Care', 'SEARCH', 'ABOUT THE RSPCA', 'ADVICE CENTRE', 'NEWS', 'CAMPAIGNS', 'GOOD BUSINESS AWARDS', 'ANIMAL CARE', 'REHOMING', 'HOW YOU CAN HELP', 'EDUCATION', 'SCIENCE GROUP', 'FREEDOM FOOD', 'LOCAL RSPCA', 'RSPCA INTERNATIONAL', 'PUBLICATIONS', 'CAREERS', and 'UNDER 8TEENZ'. Below the menu is a 'PET INSURANCE' logo and 'My RSPCA Help' links.

The main content area is titled 'Reducing suffering - Rabbit welfare' and includes a link to 'back to research animals home'. The central focus is a report titled 'Refining rabbit care' by RSPCA and UFAW, described as 'A resource for those working with rabbits in research'. Below the report title is a summary: 'Thousands of rabbits are used in research and testing throughout the European Union every year, mostly in pharmaceutical research and development. The lives of laboratory rabbits can be greatly improved by providing housing and care that caters for their physical and behavioural needs.'

Three smaller sections are visible on the right side of the page:

- Reducing suffering: introduction**: 'For as long as animals are used in research and testing, every step must be taken to reduce suffering and improve welfare...' with a 'more' link.
- Refinement**: 'The research animals department promotes initiatives that will lead to improvements in laboratory animal housing and care and reductions in suffering caused by procedures...' with a 'more' link.
- Rodent welfare**: 'Working to improve the welfare of laboratory rodents is extremely important because the vast majority of animals used in research and testing are mice and rats...' with a 'more' link.

At the bottom of the page, there is a section for the 'UFAW/RSPCA Rabbit Behaviour and Welfare Group' with the text: 'During 2008, the UFAW/RSPCA Rabbit Behaviour and Welfare Group published a report providing practical guidance on refining laboratory rabbit husbandry'.

www.rspca.org.uk/sciencegroup/researchanimals

Canadian Council on Animal Care (CCAC)

+
Guidelines for lab, farm, fish and wildlife research

HOME

Send us your feedback

Three Rs Microsite

CCAC web site

Step-by-step Three Rs search strategy

Quick Info

CCAC guidelines & policies on animal care protocols

Where to do a Three Rs literature search

Is your Three Rs Search complete?

Animal use protocol worksheet

www.ccac.ca

Three Rs Search Guide

If you plan to use animals for scientific purposes, you must complete an animal use protocol and submit it to an animal care committee for approval prior to commencement of the study. The animal use protocol outlines how the Three Rs will be implemented in the proposed animal-based procedures. To find the most up-to-date information on the Three Rs, investigators typically conduct a structured information search. To assist investigators with this search, the CCAC has produced the Three Rs Search Guide.



The Three Rs Search Guide provides detailed instructions on how to conduct a Three Rs information search in the [Step-by-Step Three Rs Search Strategy](#).

Journals

ATLA (Alternatives to Laboratory Animals)

Animal Welfare (UFAW)


ILAR Journal

Laboratory Animals

Comparative Medicine

See <http://norecopa.no/other-resources/journals> for
more

It doesn't have to be the latest issue or most recent report...

THE NATIONAL ACADEMIES  [Current Projects](#) [Publications](#) [Directories](#) [Search](#) [Site Map](#) [Feedback](#)

[ILAR HOME](#)
[ILAR JOURNAL ONLINE](#)
[MEMBERSHIP AND SUBSCRIPTIONS](#)
[FUTURE ISSUES](#)
[SUBMISSIONS](#)
[LOCAL SEARCH](#)

[Volume 43 - 2002](#)
[Volume 42 - 2001](#)
[Volume 41 - 2000](#)
[Volume 40 - 1999](#)
[Volume 39 - 1998](#)
[Volume 38 - 1997](#)
[Volume 37 - 1995](#)
[ILAR News -- Volume 36 and previous](#)

ILAR Journal Volume 41(2)

- [Contents](#)
- [Front Matter](#)

ILAR NATIONAL RESEARCH COUNCIL
INSTITUTE FOR LABORATORY ANIMAL RESEARCH

Volume 41, Number 2 2000

A publication for biomedical investigators, laboratory animal scientists, institutional officials for research, and members of animal care and use committees.

Humane Endpoints for Animals Used in Biomedical Research and Testing

[Translation Guidelines for ILAR Reports](#)
[ILAR's Home Page](#)
[Introduction: Reducing Unrelieved Pain and Distress in Laboratory Animals Using Humane Endpoints](#)
William S. Stokes
[Recognizing Pain and Distress in Laboratory Animals](#)
E. Carstens and Gary P. Moberg
[Defining the Moribund Condition as an Experimental Endpoint for Animal Research](#)
Linda A. Toth
[A Systematic Approach for Establishing Humane Endpoints](#)
David B. Morton
[Humane Endpoints and Cancer Research](#)
James Wallace
[Humane Endpoints for Genetically Engineered Animal Models](#)
Melvin B. Dennis, Jr.
[Humane Endpoints for Infectious Disease Animal Models](#)
Ernest D. Olfert and Dale L. Godson
[Refinement of Vaccine Potency Testing with the Use of Humane Endpoints](#)
Coenraad F.M. Hendriksen and Björn Steen
[Humane Endpoints and Acute Toxicity Testing](#)
M. J. ...

<http://ilarjournal.oxfordjournals.org>

Guidelines as a source of 3R resources

*R Johansen, JR Needham, DJ Colquhoun, TT
Poppe & AJ Smith*

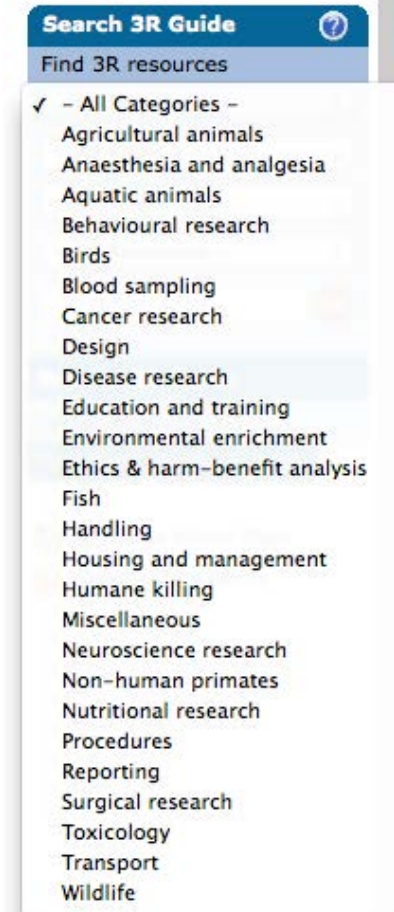
Guidelines for health and welfare monitoring of fish used in research

Laboratory Animals, 2006, 40: 323-340

<http://www.lal.org.uk/pdffiles/GuidelinesFish.pdf>

For a global view of guidelines, see 3R Guide:

<https://norecopa.no/3r-guide-database>



Email discussion groups

e.g. CompMed + archive

LAREF

VOLE

Norwegian forum for contact persons

See <https://norecopa.no/other-resources/email-discussion-lists> for more

Documentation of a search for alternatives is required by Norwegian law when applying for permission to conduct animal experiments, and it is ***your*** responsibility!

AJ Smith & T Allen, 2005

The use of Databases, Information Centres and Guidelines when planning research that may involve animals

Animal Welfare, 14 (4): 347-359

<http://oslovet.norecopa.no/SmithAllen.pdf>

3R Guide

3R Guide

www.3RGuide.info

Databases, Guidelines, Regulations, Information Centres, Journals, E-mail lists



Audiovisual products

NORINA
oslovet.norecopa.no/NORINA

Textbooks

TextBase
oslovet.norecopa.no/textbase

Search strategies in a nutshell

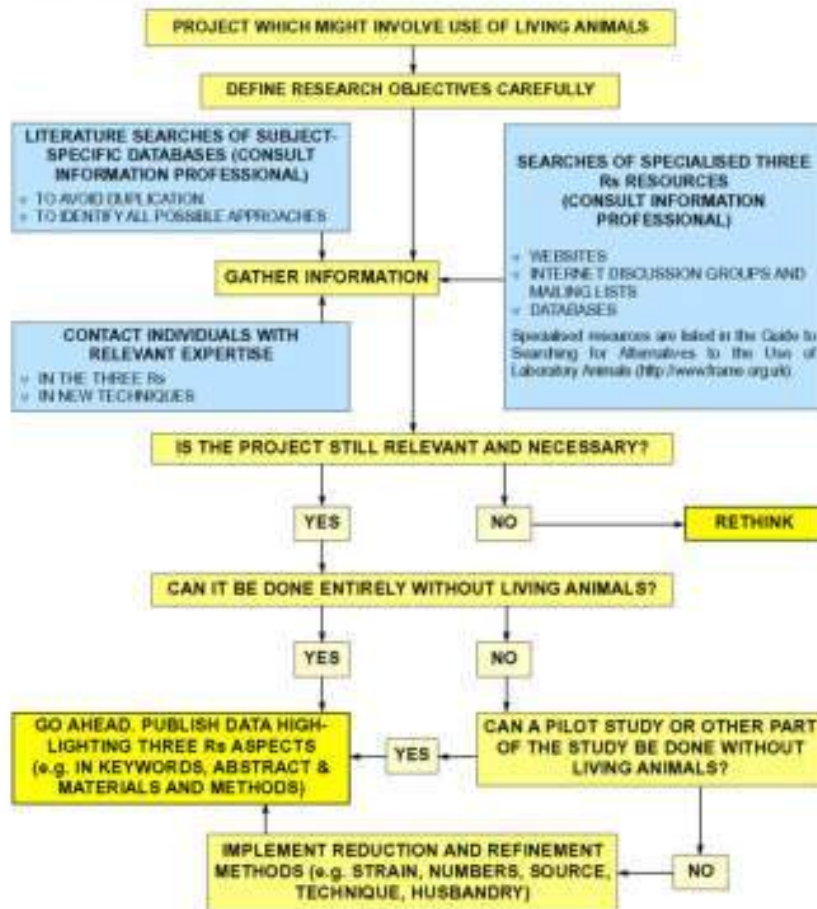


colourbox.com

- Define the search as well as possible
- Identify synonyms and 3R terms
- Remember the differences between British & American English
- Use several databases (little overlapping)
- Learn the differences between the search engines (read the instructions!)
- Get used to using Boolean logic and check which terms are supported by the search engine
- Learn how to expand/narrow your search
- Look for core articles and key authors
- Use the possibilities on the Internet to get in touch with the best research labs

EARLY PLANNING FOR A PROJECT WHICH MIGHT INVOLVE THE USE OF ANIMALS

Scientists using animals in scientific procedures have an ethical and legal obligation to ensure that the Three Rs, namely Reduction, Refinement and Replacement, are implemented wherever possible. This strategy was designed by the Focus on Alternatives* group to help scientists meet this obligation. The strategy should be applied at the beginning of a project, and at regular intervals throughout. Advice should be sought from the Ethical Review Process and Home Office Inspectorate.



*Membership of the Focus on Alternatives committee includes the Dr Harwen Trust, FRAME, The Humane Research Trust, The Lord Dunsley Fund, RSPCA, St Andrew Animal Fund and UFAW. Copies of the poster are obtainable from FRAME, 95-98 North Sherwood Street, Nottingham, NG1 4EL. Tel: 0115 958 4340. Fax: 0115 959 3570. E-mail: frames@frame.org.uk

Focus on Alternatives (FoA)

A consortium of UK animal welfare organisations

<https://norecopa.no/media/6663/earlyplanningposter.pdf>
and

<https://norecopa.no/media/6672/investigationposter.pdf>

Norecopa

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



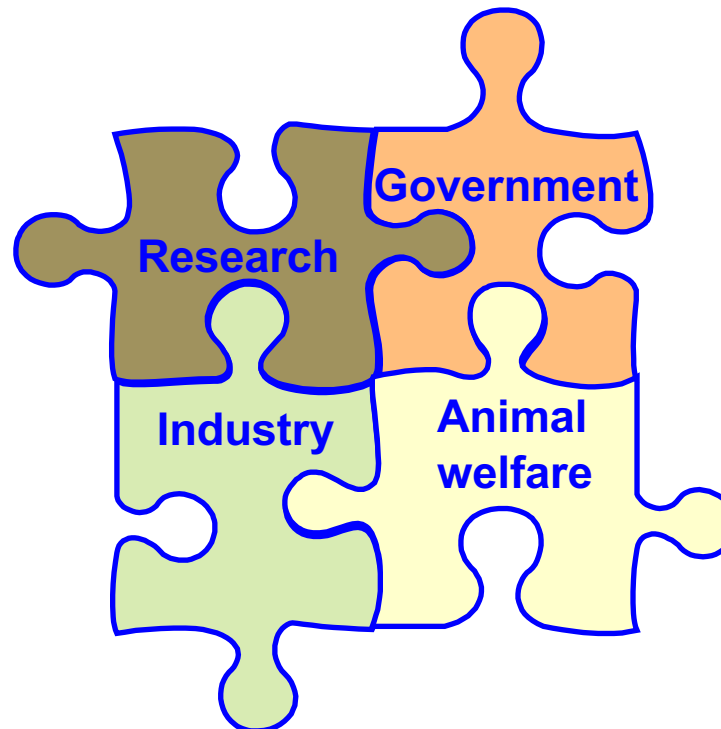
norecopa

European Consensus-Platform for Alternatives

www.ecopa.eu



- Following an initiative at the 3rd World Congress on Alternatives and Animal Use, Bologna 1999
- Established in 2000
- National Consensus Platforms (NCPs) with all 4 stakeholders equally represented:



The organisation is registered in Brønnøysund with

- *statutes*
- *its own Board*
- *Annual General Meeting as the highest organ*
- *secretariat (50% position) attached to the Norwegian Veterinary Institute*

Norecopa's budget from the State for 2016 is NOK 1.300.000,-

In addition: members fees (NOK 200/1000,- per year).

International consensus meetings

Harmonisation of the Care and Use of:

Fish (2005)

Wildlife (2008)

Fish (2009)

Agricultural animals (2012)

[*http://norecopa.no/meetings*](http://norecopa.no/meetings)

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

Expert working group on severity classification of scientific procedures
performed on animals

FINAL REPORT

Brussels, July 2009

Conducted in support of the revision of Directive 86/609/EEC on the protection of animals used for scientific purposes

Commission européenne, B-1049 Bruxelles / Europese Commissie, B-1049 Brussel - Belgium. Telephone: (32-2) 299 11 11.

Expert Working Group report on severity classification

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

Working Party Report

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

P Hawkins (Convenor)¹, N Dennison², G Goodman³, S Hetherington⁴, S Llywelyn-Jones⁵, K Ryder² and A J Smith⁶

¹Research Animals Department, BSPCA, Wilberforce Way, Southwater, West Sussex RH13 9RS, UK; ²Animals (Scientific Procedures) Inspectorate, Home Office, PO Box 6779, Dundee DD1 9WW, UK; ³Biological Services, The University of Edinburgh, Chancellor Building, 49, Little France Crescent, Edinburgh EH9 1JH, UK; ⁴CERAS, Patefield Road, Lowestoft, NR33 0HT, UK; ⁵King's College London, Biological Services Unit, 4th floor, Hodgkin Building, Guy's Campus, London SE1 1UL, UK; ⁶Norecopa, c/o Norwegian Veterinary Institute, PO Box 750 Sentrum, N-0108 Oslo, Norway
Corresponding author: P Hawkins. Email: phawkins@spca.org.uk

Abstract

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

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

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

Background

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

assessments undertaken by bodies such as regulatory authorities and ethical committees when deciding whether or not a project should be licensed or funded.

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

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Laboratory Animals 2011; 1-6

More (species- and situation-) specific guidance may be necessary to implement the 3Rs

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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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)

Animals in research:



Fish



Farm animals



Laboratory animals



Wildlife and wild fish



Cephalopods



Other aquatic animals

Norecopa promotes use of "The Three Rs":

Replace

Replacement of animal experiments with alternatives

Reduce

Reduction of the number of animals used in experiments

Refine

Reduction of pain and suffering in animal experiments

Norecopa aims for consensus between the four stakeholders:

Government and Regulatory Authorities - Research and teaching - Industry - Animal protection and welfare

Who are you?

Are you a researcher, student or are you generally interested in animal welfare? Here you will find relevant information to help you achieve your goals.



Contact oss

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Norecopa on Facebook

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N-0106 Oslo, Norway

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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Jerry K-9 CPR Mannikin (Dog)

Record number: 8821 (legacy id: 4905)
Category: [Handling \(TextBase\)](#) - [Medicine](#)
Type: [Simulator](#)

A product line of animal CPR (Cardiopulmonary Resuscitation) training mannequins. Type: Simulator. Category: Handling & Veterinary Medicine.

[Jerry K-9 CPR Mannikin](#) is a full size dog for CPR (Cardiopulmonary Resuscitation) training. Features: Working lungs, artificial pulse, disposable and cleanable parts. Designed to perform CPR compressions, mouth-to-snout resuscitation. Also designed to splint and bandage. In addition, a non-removable, long oblique fracture of the right femoral leg bone can now be added to this mannikin. This will allow students to learn how to set and repair common K-9 fractures. This mannikin simulates a 60-70 lbs dog. Accessories included: Carrying case with kneeling pad, brush, 5 disposable lungs. This mannikin is a simplified version of [Critical Care Jerry](#).



Comments & References: Additional Disposable Lungs for Jerry: 24 disposable lungs: US\$128.00; 72 disposable lungs: US\$380.00. Suitable for training in the veterinary setting, search and rescue, veterinary schools, canine units and for pet owners. This item may be borrowed for up to 6 weeks through the Alternatives Loan System of the International Network for Humane Education (InterNICHE), free of charge, but return postage must be paid by the person who has borrowed the product. Please note that there are practical limitations on where some items can be sent. For more information, please contact loansystem@interniche.org. See also <http://www.interniche.org> for more information.

Item: 101

Price: US\$989.00. Loan Program: Free of charge

Free of charge: Loan Program: Free of charge

On loan: On loan

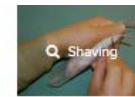
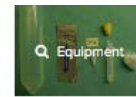
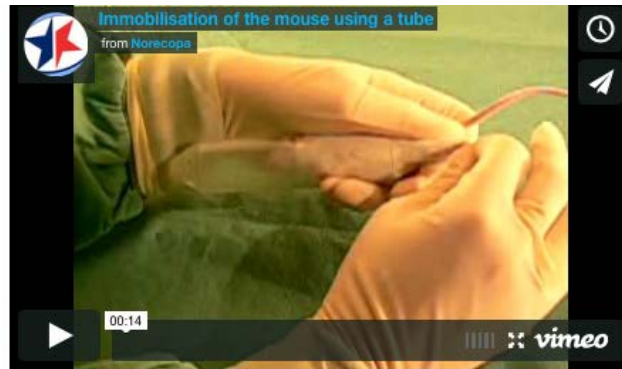
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The search engine

The screenshot shows a search engine interface. At the top, a search bar contains the text "Guidelines bleeding mice", which is circled in red. To the right of the search bar is a blue "Search" button. Below the search bar, there is a "Help" button, a checkbox labeled "Enable synonyms and stemming" which is checked, and a "Reset" button. Below the search bar, the text "Did you mean: guideline breeding mice(4)" is displayed. To the right of this text is a "Category" list with several items, each with a checkbox and a count in parentheses. The "Category" text is circled in red. Below the "Did you mean" text, there is an "Auto-complete function:" section with a list of suggestions: "blood", "blood", "blood collection", "blood from", and "blood sampling". Below the auto-complete section, there is a "Synonym list:" section with the text: "Bleeding, bloodsampling, blood sampling, venepuncture, blood collection, phlebotomy". To the right of the category list, there is a text block: "Categories, types, 3R relevance and many more".

Guidelines bleeding mice

Search

Help

Enable synonyms and stemming

Reset

Did you mean: [guideline breeding mice\(4\)](#)

Auto-complete function:

- blood
- blood
- blood collection
- blood from
- blood sampling

Synonym list:
Bleeding, bloodsampling, blood sampling, venepuncture,
blood collection, phlebotomy

Category

- Agricultural animals (5)
- Anaesthesia (3)
- Anaesthesia and analgesia (4)
- Anatomy (175)
- Aquatic animals (4)
- Behaviour (4)
- Behavioural research (3)
- Biochemistry (7)
- Biology (4)
- Birds (5)
- Blood sampling (12)
- Cancer research (3)
- Design (7)
- Disease research (3)
- Dissection (7)
- Education and training (3)

Categories, types, 3R
relevance and many more

- An index of all the words on all the approx. 6,300 pages
 - Fuzzy logic
 - Boolean logic
 - Wildcards
 - Proximity searches
 - Truncation
- A help file available



Collaboration with US Department of Agriculture

Search for 'bleeding mice' on Google and Norecopa.

bleeding mice

All Images Videos

About 4,760,000 results (0.1 seconds)

Search all Norecopa's databases and webpages simultaneously:

bleeding mice

76 results

Search filters

Order by: Relevance

Enable synonyms and stemming

Browse the databases

- eBooks (6)
- Free (5)
- Held at NMBU Oslo (contact kristine.hansen@nmbu.no) (5)
- Key products (6)
- On loan (2)
- Reviewed

Database

- 3R Guide (6)
- Classic AVs (6)
- Website (6)
- NORINA (35)
- TextBase (23)

Search in the databases

- All Text
- Title
- Author
- Publisher

Methods of Blood Collection from Mice

Collecting blood from mice: a number of efficient methods

Guidelines for Survival Bleeding of Mice and Rats

oacu.od.nih.gov/ARAC/docs/Guidelines for Survival Bleeding of Mice and Rats for investigators and National Institutes of Health

Blood sample collection

www.ncbi.nlm.nih.gov/pubmed/20100611

by S Parasuraman - 2010 - It is important that blood sampling techniques are standardized. This method is recommended.

How to obtain blood from mice

https://www.youtube.com/watch?v=...

Dec 11

See more

Lance

A rapid, simple method for obtaining blood from mice

ceua.ufsc.br/files/2010/06/...

Methods for obtaining blood from mice that allows investigators to collect blood from the saphenous vein.

Mouse : Decision tree for blood collection

https://www.nc3rs.org.uk/...

How much blood does a mouse weigh? A mouse weighs 20-30g.

Welcome to Norecopa's new website!

Search engine help file

More about Norecopa's databases: [3R Guide](#) - [NORINA](#) - [TextBase](#) - [Classic AVs](#)

NIH Animal Research Advisory Committee Guidelines for Survival Bleeding of Mice and Rats

3R Guide/10891

These guidelines have been developed to assist investigators and National Institutes of Health (NIH) Animal Care and Use Committees (ACUC) in their choice and application of survival rodent bleeding techniques.

Blood sampling

Blood sampling is one of the commonest procedures conducted on research animals, but it may cause pain, distress and lasting harm if the technique is poor, or if too much of the circulating blood volume is removed. Videos and slide series showing blood sampling techniques on several common laboratory animal species. Links NC3Rs Microsite on blood sampling. Films and slide shows on bleeding techniques...

Blood Collection in Mice Using the Saphenous Vein - An Alternative to Retro Orbital Collection

NORINA/8641

These web pages describe a method for blood collection from the saphenous vein of mice, rats, hamsters, gerbils, guinea-pigs, mink and ferrets. Type of record: Web pages. Category: Veterinary Medicine

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bleeding mice

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'Bleeding' not mentioned, but identified by the synonym list

Search filters

Order by:

Relevance

Enable synonyms and stemming

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Search in the databases

- All Text
- Title
- Author
- Publisher

Newsletter 8-9 times a year

- something for you?



Dette brevet inneholder følgende saker:

- Nå er det på tide å nominere til 3R-prisen!
- Nye nettsider for Norecopa
- Arbeidsseminar om design og statistikk
- Frist for sammendrag til FELASA
- Nettbasert kurs om sebrafisk
- Ny modul om dyrevelferd fra Newcastle
- Forbedring av fiskeforsøk
- Rådet for dyreetikk har fått nye medlemmer
- Nyheter fra 3R-sentre og komitéer
- UiB-nettside om 3R
- Glimt fra forskningen
- Merking av vilt
- Registrering av smerte hos sau
- 3R-fremskritt i tidsskriftet *Laboratory Animals*
- Nytenkning premieres
- Åpenhet rundt dyreforsøk
- Til ettertanke
- Fra mediene
- Møtekalenderen (oppdatert)



Norecopa's 3R prize
(30,000 kroner + diploma)

Deadline for nominations: 15 March

Newsletter 8-9 times a year

- something for you?



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