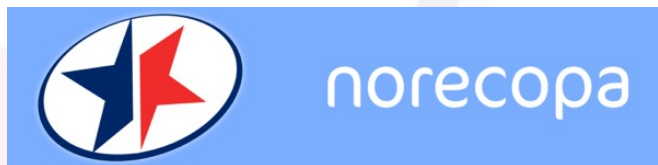


3R alternatives in the education and training of scientists and lab animal personnel

norecopa.no/WC13-education

Adrian Smith

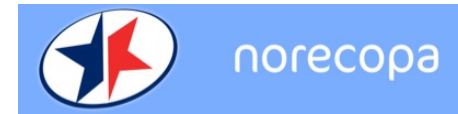
adrian.smith@norecopa.no



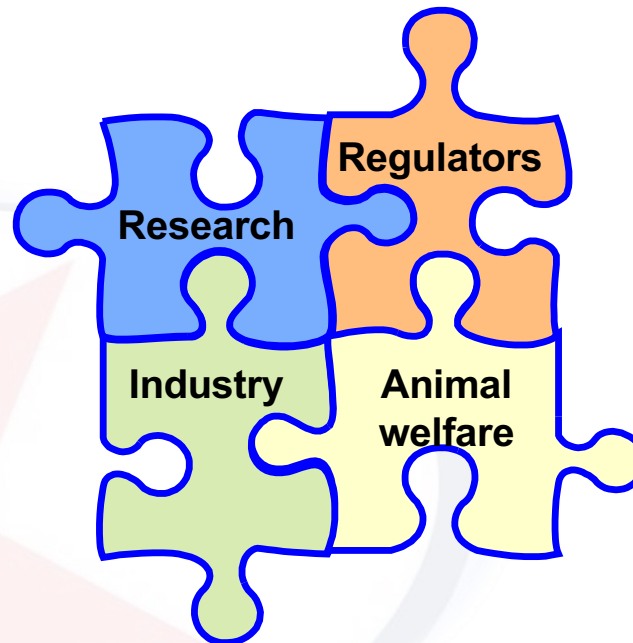
<https://norecopa.no>

Norecopa: PREPARE for better Science

Norecopa



Norway's National Consensus Platform for the 3Rs



norecopa.no

Norecopa: PREPARE for better Science

norecopa.no : "an up-to-date overview of global 3R resources"

The screenshot shows the norecopa.no website. The header is blue with the norecopa logo (a stylized star) and the text "norecopa". Below the header is a navigation menu with links: About Norecopa, Alternatives, Databases & Guidelines, Education & training, Legislation, Meetings, More resources, News, and PREPARE. Below the navigation menu is a list of topics: Anaesthesia and analgesia, Animal facilities, Animal welfare organisations, Blood sampling, Culture, Email discussion lists, Environmental enrichment, Ethics, Experimental design and reporting, Harm, Health and safety, Health monitoring, Humane, Literature searches and systematic reviews, and Organisms. A search bar is located at the top right. Below the search bar is a section titled "Search filters" with two dropdown menus: "Order by:" (set to Relevance) and "Typo tolerance:" (set to Default). Below the search filters is a section titled "Database" with a list of databases and their record counts: 3R Guide database (403), Classic AVs database (118), European Commission Inventory of 3Rs Education & Training Resources (567), European Commission Inventory of 3Rs Knowledge Sources (807), European Commission Inventory of NAMs for Respiratory tract diseases (280), NAL records (1688), NORINA database (3141), TextBase database (1501), and Website (761). Below the database list is a section titled "Browse the databases" with a list of categories and their record counts: eBooks (286), Free (199), Held at NMBU Oslo (contact Kristine Hansen, 67 23 21 89) (431), Key products (68), On loan (6), and Reviewed (85). Below the browse section is a section titled "Search in the databases" with a list of search criteria: All Text, Title, Author, Publisher, Supplier, and Record Number.

10,600 webpages
approx. 1,000 hits daily

7-8 detailed newsletters per year

Design and reporting of animal experiments

This page supplements advice given in [Section 4 of the PREPARE guidelines](#). PREPARE covers all aspects of design (including animal and facility related issues).

Norecopa: PREPARE for better Science

Fish 2005 | Wildlife 2008 | Fish 2009 | Agricultural animals 2012 | Field research 2017 | Past meetings |
Meetings Calendar | An informal guide to arranging a scientific meeting | Presentations

norecopa.no / Meetings / Meetings Calendar

norecopa.no/meetings/meetings-calendar

Webinar and Meetings calendar

September 2025

- > [Necropsy skills](#), hybrid event, start 2 September 2025
- > [3Rs from the perspective of a commercial breeder](#), webinar (Ditte Olsen & Peter Gade), 2 September 2025
- > [Minimise the use of mice in preclinical research by choosing the right model](#), webinar (Ditte Olsen & Peter Gade), 2 September 2025
- > [The TEATIME journey - Shaping the future of laboratory animal science](#), webinar (Ditte Olsen & Peter Gade), 2 September 2025
- > [International Congress on Experimental Surgery in Rodents](#), Chicago, 3-5 September 2025
- > [The 12th Annual 3Rs Symposium: Building Lasting Foundations: Shaping the Future of 3Rs in Research](#), virtual event, 10-11 & 17-18 September 2025
- > [1st UK Zebrafish Meeting](#), Exmouth & Exeter, 10-12 September 2025

Norecopa: PREPARE for better Science

September 2025

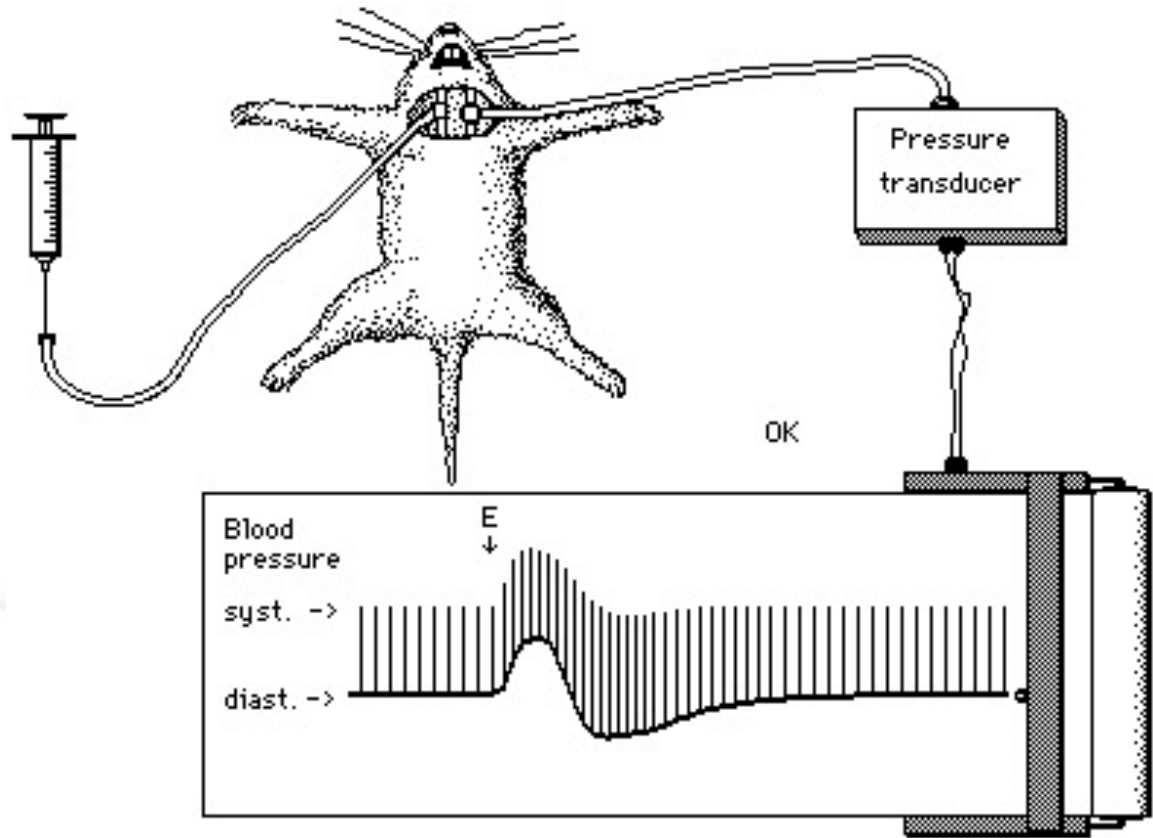
norecopa.no/meetings/meetings-calendar

- > [Necropsy skills](#), hybrid event, start 2 September 2025
- > [3Rs from the perspective of a commercial breeder](#), webinar (Ditte Olsen & Peter Gade), 2 September 2025
- > [Minimise the use of mice in preclinical research by choosing the right mouse model](#), webinar (Ditte Olsen & Peter Gade), 2 September 2025
- > [The TEATIME journey - Shaping the future of lab animal monitoring](#), Helsinki & online, 2-3 September 2025
- > [International Congress on Peer Review and Scientific Publication](#), Chicago, 3-5 September 2025
- > [The Replacement Checklist](#), webinar (Juliet Dukes), 4 September 2025
- > [The Art of Reproducible Experimental Surgery in Rodents](#), EALAS webinar (Thomas Svava Nielsen), 8 September 2025
- > [Advanced Laboratory Animal Science Course](#), Porto, 8-19 September 2025
- > [Zebrafish Health](#), webinar (Marcus Crim & J-P Mocho), 9 September 2025
- > [A team approach to reducing lab animal suffering: one procedure at a time](#), webinar (Penny Hawkins), 10 September 2025
- > [12th Annual 3Rs Symposium: Building Lasting Foundations: Shaping the Future of 3Rs in Research](#), virtual event, 10-11 & 17-18 September 2025
- > [1st UK Zebrafish Meeting](#), Exmouth & Exeter, 10-12 September 2025
- > [Minimising animal suffering with refined humane endpoints and early interventions](#), webinar (Penny Hawkins, Stuart Ainsworth, Mark Blee, Klas Abelson, Helen Murphy, Claire Gibson & Alice Nowak), 11 & 16 September 2025
- > [59th EUROTOX congress](#), Athens, 14-17 September 2025
- > [8th IC-3Rs Symposium: Tools in Action: Driving Better 3Rs Science](#), Brussels, 15 September 2025
- > [The Design of Animal Experiments](#), workshop, Helsinki, 15-16 September 2025
- > [Online rodent anaesthesia workshop](#), 15-16 September 2025
- > [Workshop on Cancer Research: Biological and Molecular Basis](#), Porto, 15-18 September 2025
- > [EUROoCS Organ-on-Chip Summer School](#), Tübingen, 15-19 September 2025
- > [Beyond tradition - Research and the shift towards responsible, animal-free innovations](#), Symposium, Leiden, 16 September 2025
- > [Introducing the Sex Inclusive Research Framework \(SIRF\)](#), webinar, 18 September 2025
- > [Next Gen3Ration Research \(Centro 3R meeting\)](#), Genova, 18-19 September 2025
- > [European Primate Veterinarians 23rd Scientific Seminar](#), Strasbourg, 18-19 September 2025
- > [The legal significance of surplus animals](#), webinar (Tobias Wagenknecht), 19 September 2025
- > [Responsible Research in Action - A multi-stakeholder unconference to improve research culture and practice](#), Berlin, 22-24 September 2025
- > [Patient Discovery Project](#), EARA webinar, 23 September 2025
- > [Dosing in Animal Models of Neuroscience](#), online event, 23 September 2025
- > [Animal Welfare from a Practical Perspective](#), Charles River/Statens Seruminstitut seminar, Copenhagen, 23 September 2025
- > [European Congress of Toxicologic Pathology \(2nd Joint ESTP/BSTP Congress\)](#), Manchester, 23-26 September 2025
- > [Introductory Statistics for Biomedical Sciences](#), Porto, 23 September - 1 October 2025
- > [Towards sustainable immunotoxicology: an animal-free culture medium model for TD and TI antibody response assay](#), webinar (Martina Iulini), 24 September 2025
- > [LASA Large Animal Research Network \(LARN\) meeting](#), 24-25 September 2025
- > [Talking in schools about animal research](#), UAR webinar, 25 September 2025
- > [Advanced animal husbandry, care and enrichment practices](#), hybrid event, start 26 September 2025
- > [UK Home Office Training Course for Wildlife Researchers](#), Edinburgh, 29 September 2025 (start)

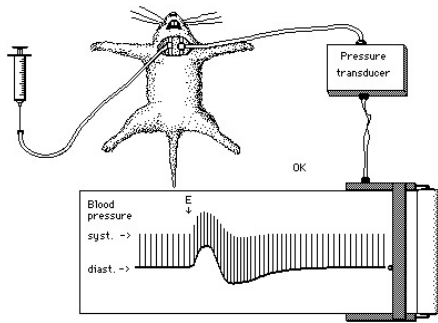
Norecopa: PREPARE for better Science

Summary of presentation

- Supplement the WC13 satellite meeting on 30 August, to demonstrate how Norecopa and its predecessors have disseminated information about 3R alternatives in education and training since 1991
- Present Norecopa's NORINA database, which contains 3,400 alternatives and supplements to animal use, and its complementary database, TextBase
- Discuss the use of homemade simulators
- Briefly discuss how to reduce opposition to animal alternatives



Pharmatutor
Daniel Keller, ETH Zurich
1987



1991-: NORINA
database

Richard Fosse
Karina Smith
Elisabeth Pagels

1996: *Laboratory Animals Ltd*

Norecopa: PREPARE for better Science



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



Frog Dissection

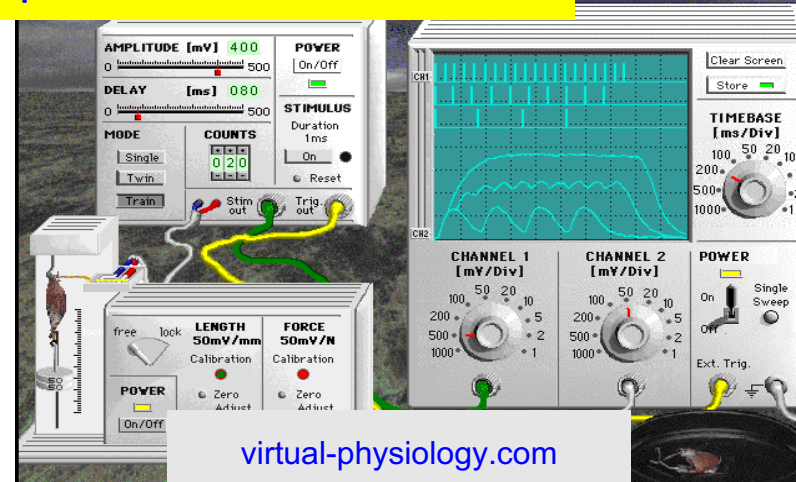
In-store Educational Discount Available

Virtual Frog Dissection Educational App

The Frog Dissection App is an ethical and educative alternative to live animal dissections. Help your students learn all about frogs and their biological functions, without the messy lab work or controversial questions

app screens
Click to view

frogvirtualdissection.com

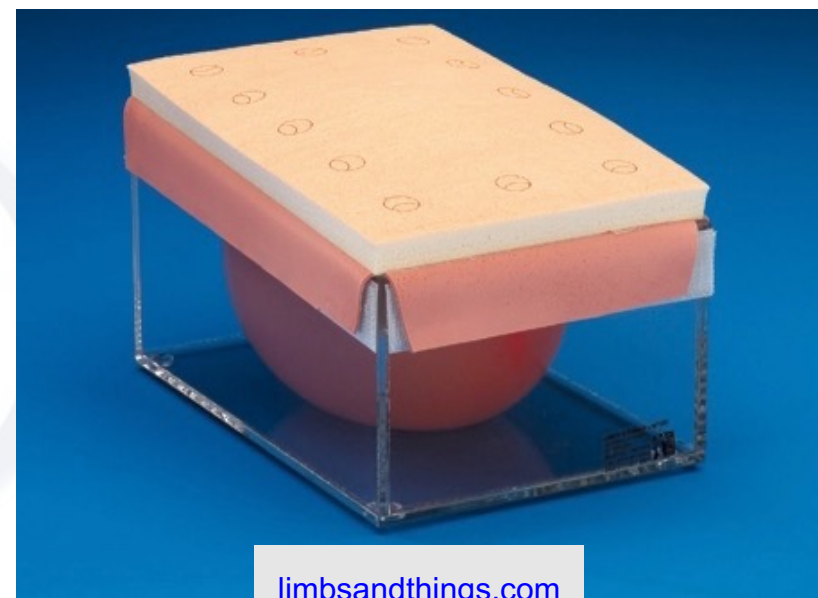


AMPLITUDE [mV] 400
0 500
DELAY [ms] 080
0 500
MODE Single
Twin
Train
COUNTS 0120
STIMULUS Duration 1ms
On
Reset
Stim out
Trig out

POWER On/Off
STIMULUS Duration 1ms
On
Reset
Stim out
Trig out

CHANNEL 1 [mV/Div] 100 50 20 10 5 2 1
200 500 1000
CHANNEL 2 [mV/Div] 100 50 20 10 5 2 1
200 500 1000
POWER On Single Sweep
Off
Ext. Trig.

virtual-physiology.com



TextBase:

2,100 books

norecopa.no/textbase

Home > Life Sciences > Biology > Dissection Guides > A Dissection Guide & Atlas to the Mink, 2e



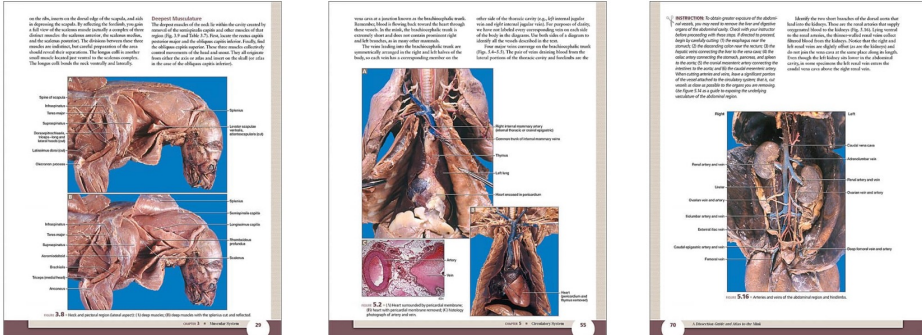
A Dissection Guide & Atlas to the Mink, 2e

By David G. Smith, Michael P. Schenk • © 2020 • 136 Pages
Loose-leaf Format • Print ISBN 9781640430525 • eBook ISBN 9781640430532



This full-color dissection manual is intended to provide an introduction to the anatomy of the mink for biology, zoology, nursing, or preprofessional students who are taking a laboratory course in anatomy and physiology or basic vertebrate anatomy.

Examples of interior pages:



Suggested Student Retail Price
\$36.00

Purchase

 Request Review Copy

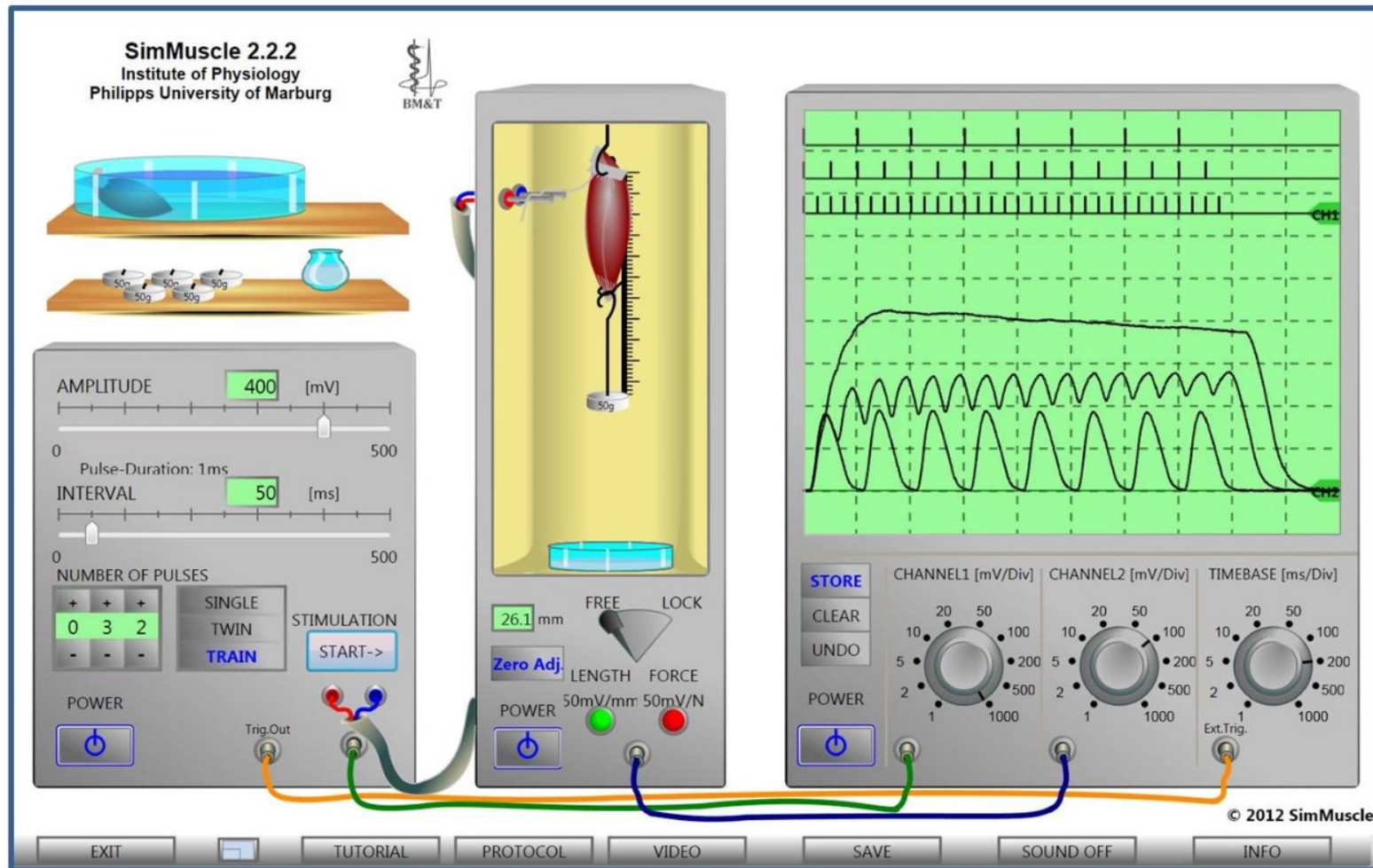
eBook Options
[Chegg](#)
[GooglePlay](#)
[VitalSource](#)
[RedShelf](#)

<https://www.morton-pub.com/product/a-dissection-guide-atlas-to-the-mink-2e>

Norecopa: PREPARE for better Science



Norecopa: PREPARE for better Science



SimMuscle

Hans Braun, Marberg virtual-physiology.com





Russell & Burch

'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.

Let students make their worst mistakes on non-sentient objects first

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



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



Testing anaesthetic depth in the chicken
Norecopa | 598 views



Blood sam
Norecopa



Blood sampling from the pig
Norecopa | 3,914 views



Subcutaneous injection in the rabbit
Norecopa | 1,479 views



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



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



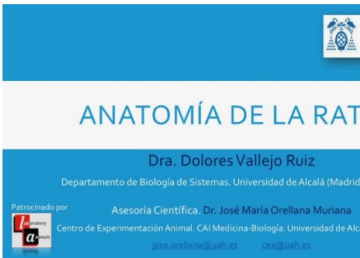
Blood sam
Norecopa



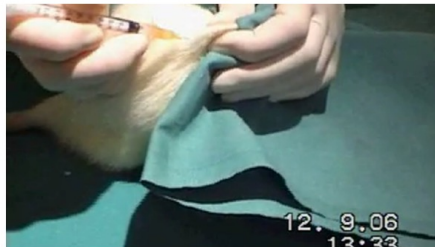
Intravenous injection in a rabbit
Norecopa | 2,025 views



Subcutaneous injection in the chicken
Norecopa | 1,806 views



Anatomía de la rata
Norecopa | 977 views



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



Blood sam
Norecopa



Lifting a rabbit
Norecopa | 2,420 views



Immobilisation of the rabbit
Norecopa | 2,072 views

Norecopa: PREPARE for better Science

Current number of pages : 10698



276 results

Rat Blood Pressure

NORINA database/af1a4 (legacy id: 4447)

An interactive computer simulation of experiments to study the effects of a number of pharmacological agents on rat blood pressure in vivo . Type: Computer Program. Category: Pharmacology (animal) & Physiology (animal).

Author: [Ian E. Hughes](#) [David Dewhurst](#) and [Alan Williams](#)

Supplier: [Sheffield BioScience Programs](#), [Dr. David Dewhurst](#)

A refined method of repeated blood sampling in mice

NAL records/b2d28 (legacy id: 3828971)

Journal: Animal technology : journal of the Institute of Animal Technicians,

Author: [Kitching, A.](#)

Films and slide shows of procedures on laboratory animals

This page contains links to older films and slide shows produced at the Norwegian School of Veterinary Science, and links to newer resources produced by international colleagues. They illustrate basic procedures (handling, injection techniques and blood sampling) on common laboratory animal species. Please note that refinements of these techniques are continuously

Search filters

Order by:

Relevance

Typo tolerance:

Default

Database

- ☐ [3R Guide database](#) (12)
- ☐ [Classic AVs database](#) (6)
- ☐ [European Commission Inventory of 3Rs Education & Training Resources](#) (19)
- ☐ [European Commission Inventory of 3Rs Knowledge Sources](#) (1)
- ☐ [European Commission Inventory of NAMs for Cardiovascular diseases](#)
- ☐ [European Commission Inventory of NAMs for Respiratory tract diseases](#)
- ☐ [NAL records](#) (49)
- ☐ [NORINA database](#) (62)
- ☐ [Refinement Wiki](#) (11)
- ☐ [TextBase database](#) (42)
- ☐ [Website](#) (74)

Browse the databases

Category

- ☐ 3R Center (1)
- ☐ Agricultural animals (3)
- ☐ Anaesthesia (1)
- ☐ Anaesthesia and analgesia (2)
- ☐ Anatomy (6)
- ☐ Aquatic animals (2)
- ☐ Behaviour
- ☐ Behavioural research (2)
- ☐ Biochemistry (3)
- ☐ Biology
- ☐ Birds (3)
- ☐ Blood sampling (6)
- ☐ Cancer research (2)
- ☐ Design (4)
- ☐ Disease research (3)
- ☐ Dissection
- ☐ Education and training (4)

Type

- ☐ App
- ☐ Audio Tape
- ☐ Book
- ☐ CD-ROM (5)
- ☐ Chart/Diagram (1)
- ☐ Computer Program (4)
- ☐ Contact Person
- ☐ Databases
- ☐ Discussion forums
- ☐ Display Mounts (1)
- ☐ DVD (8)
- ☐ Film
- ☐ Filmstrip
- ☐ Guidelines (11)
- ☐ Information centres (2)
- ☐ Journals
- ☐ Microslides (4)
- ☐ Miscellaneous
- ☐ Model



norecopa

Norecopa: PREPARE for better Science



2009: Multimedia room, Oslo veterinary school

2018: International Workshop: norecopa.no/education-training/homemade-educational-materials

Norecopa: PREPARE for better Science

Simulation and Clinical Skills at University of Copenhagen

Rikke Langebæk

Associate professor, DVM, PhD

Department of Veterinary Clinical Science

Faculty of Health Sciences

UNIVERSITY OF COPENHAGEN



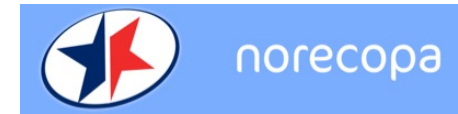
norecopa.no/media/8099/langebaek.pdf







Figure of Eight Ligature



Record number: bf05e
Category: [Surgery](#)
Type: [Simulator](#)

This model uses a stuffed toy dog with a "vaginal tunic" (condom), a "pampiniform plexus" (balloon with corn flour) and a "ductus deferens" (silicone tube) placed in the "prescrotal" area.

This model uses a stuffed toy dog with a "vaginal tunic" (condom), a "pampiniform plexus" (balloon with corn flour) and a "ductus deferens" (silicone tube) placed in the "prescrotal" area.



Assignment:

Using a needle and suture, a figure of eight ligature is placed through the *tunica vaginalis*, encircling the ductus and the plexus respectively.

Materials:

- > A stuffed toy dog. The dog is equipped with a metal clip in the prescrotal area. The clip is covered with a piece of "skin/fur" – a flap - that permits access to the clip from the cranial as well as the caudal side
- > Plexus pampiniformis: a long balloon (20cm) filled with corn starch
- > Ductus deferens: a rubber tube (diameter 3mm) from a bicycle shop
- > Tunica vaginalis: a plain condom, regular
- > Testicle: a wooden bead, 4 x 2.5 cm
- > Tape

norecopa.no/norina/figure-of-eight-ligature

The 3Rs in microsurgery training

PROFESSOR MICHAEL AXELSSON

Department of Biological and Environmental Sciences, Box 463, SE-405 30
Gothenburg, Sweden

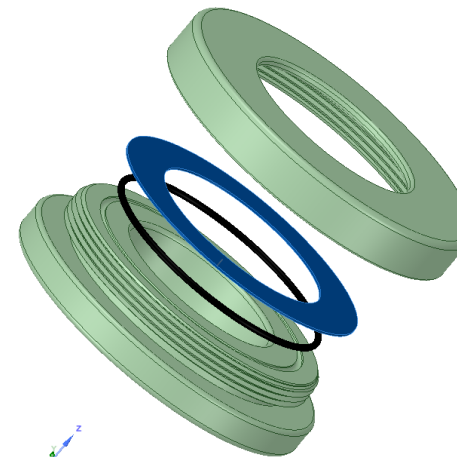
First instrument suturing
Banana peel is useful



<https://norecopa.no/media/8098/axelsson.pdf>


Sun-Lee disk in a modern 3D printed design

Suturing in latex membrane



SUN LEE, MD, and WARD J. COPPERSMITH, BS MICROSURGERY 4~67-69 1983

<https://norecopa.no/media/8098/axelsson.pdf>



Development of veterinary simulators as an interactive teaching method

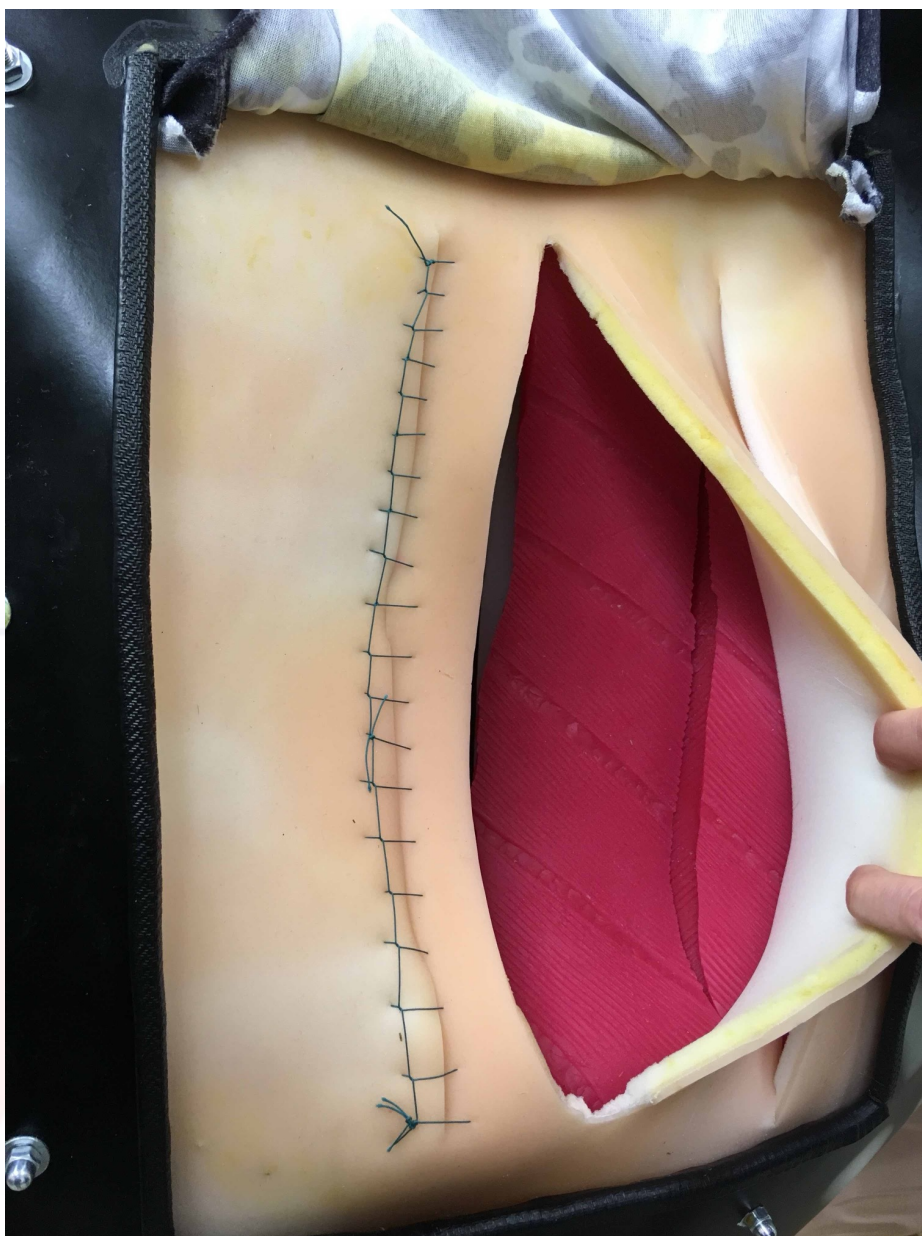
Laura Schüller

<https://norecopa.no/education-training/homemade-educational-materials>

Caesarian section simulator



<https://norecopa.no/media/8097/schueller.pdf>



C-section simulator



<https://vetiqo.com/en>



Suture skills



Injection skills



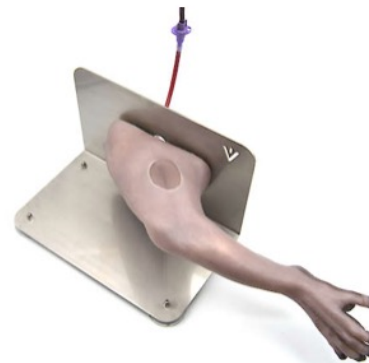
Bones



Gyndog



Castro & Weany



Rita Rhesus

Augmented Reality (AR)

A digital experience superimposed on the real world

Virtual Reality (VR)

A totally virtual digital world



3d4medical.com/student



healthysimulation.com

Norecopa: PREPARE for better Science

anatomage.com



Norecopa: PREPARE for better Science

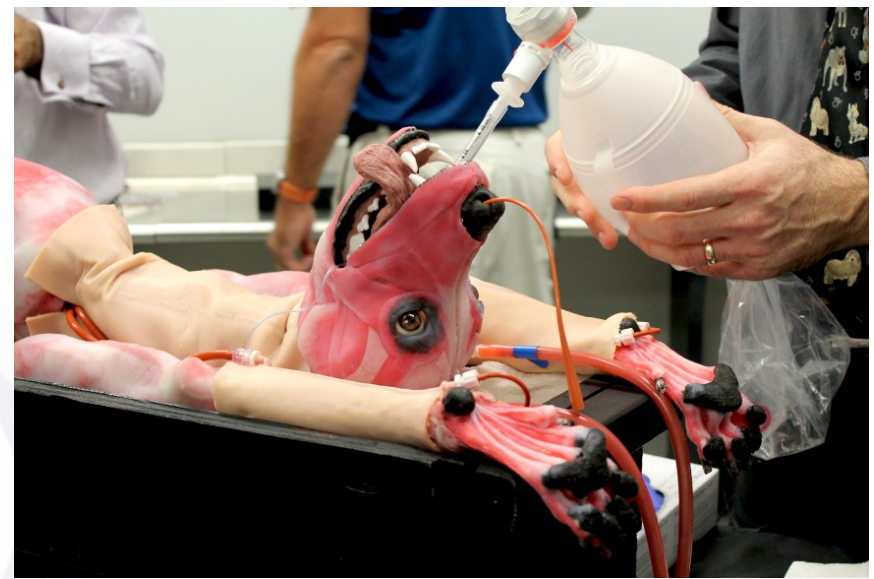
Criticism of animal alternatives

“They don’t even look like the animal model!”



Rikke Langebæk, University of Copenhagen

Low Fidelity, High Discrimination



<https://syndaver.com>

High Fidelity, Low Discrimination

Discrimination and fidelity

Russell & Burch warned against the '**high-fidelity fallacy**':

the false assumption that high-fidelity dictates which model is best.

High-fidelity '*ignores all the advantages of **correlation***', whereby

'the responses of two utterly different systems may be correlated with perfect regularity'

Russell & Burch (1959)

Replacement alternatives do not have to look like an animal!

The tutor loses control over the content...

Guinea Pig Ileum

By David Dewhurst; Philip Larkman and Stewart Cromar

Record number: 5830d (legacy id: 855)

Category: [Pharmacology](#)

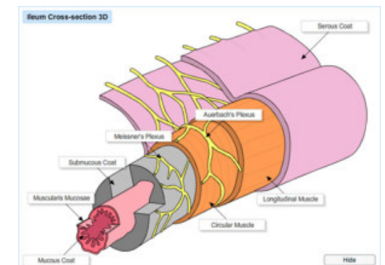
Type: [Computer Program](#)

A computer simulation program to teach the effects of drugs and electrical stimulation on the enteric nervous system. Type of record: Computer Program. Category: Pharmacology (animal).

A computer simulation program to teach the effects of drugs and electrical stimulation on the enteric nervous system.

This program simulates an isolated preparation of the guinea pig ileum, a smooth muscle preparation exhibiting little spontaneous contractile activity, which is extensively used for pharmacological studies. Its aim is to enable the exploration of the effects of drugs and electrical stimulation on the release of, and response to, neurotransmitters in the enteric nervous

system. Simulated responses are derived from a model which presents the contractile response of the ileum both to added drugs and to transmural electrical stimulation. Learning is through exploration and the program places at the disposal of the user a range of DRUGS (acetylcholine, histamine, clonidine, morphine, naloxone, phentolamine, atropine, mepyramine) which may be added alone or in combination to the organ bath in a range of DOSES, and an electrical STIMULATOR. A 'magic' WASH facility instantly removes all traces of added drugs and greatly speeds up the process of data collection compared to the real experiment. Simulated contractions of the gut are presented on a scrolling display comparable to that of a chart recorder. Students may take measurements directly from the monitor.



Council of Europe Convention (ETS123), 1986:

Article 25, point 3:

*Procedures shall be restricted to those absolutely **necessary** for the purpose of the education or training concerned and permitted only if their **objective** cannot be achieved by **comparably effective** audio-visual or other suitable methods.*

EU Directive 2010/63

Article 1:

This Directive establishes measures for the protection of animals used for scientific or educational purposes.

Article 5:

Procedures may be carried out for the following purposes only:

... **higher education**, or training for the acquisition, maintenance or improvement of vocational skills;

Recital 12:

The use of animals for scientific or educational purposes should therefore **only be considered where a non-animal alternative is unavailable.**

Choose your teaching objectives!

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



Teaching

- laboratory skills
- preparation-specific animal skills
- general animal handling skills
- imparting good ethical thinking
- data handling skills
- experimental design skills
- communication skills (oral, written)
- group work
- staff-student interaction

Simulation training – teaching benefits

- Skills can be taught to all students in a standardised way
- Learning outcomes can be mapped
- Standardized assessment using validated methods
e.g. OSCE (*Objective Structured Clinical Examination*)

Rikke Langebæk

Department of Veterinary Clinical Science

Copenhagen

Conclusions

Implementation of The Surgical Skills Lab in Copenhagen prior to live animal surgery has been a success:

- The models are considered useful educational tools prior to live animal surgery*
- Training on models in the Surgical Skills Lab reduces anxiety before live animal surgery**
- Training a skill on a simulator/model increases student self-confidence***
- For training basic skills, the low-fidelity models fulfill their purpose*
- A more ethical use of research animals

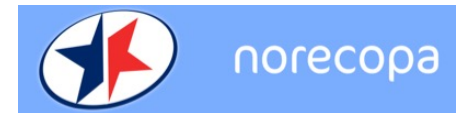
*Langebaek *et al.*, Vet. Rec. (2012)

** Langebaek *et al.*, JVME (2012)

*** Langebaek *et al.*, JVME (2015)

Rikke Langebæk

Department of Veterinary Clinical Science
Copenhagen



Thanks to Norecopa's sponsors

Standing Committee on Business Affairs, Norwegian Parliament
Norwegian Ministries of Agriculture and Fisheries
Research Council of Norway

Aivero
Architect Finn Rahn's Legacy
Laboratory Animals Ltd.
Nordic Society Against Painful Experiments (NSMSD)
Norwegian Society for Animal Protection (Dyrebeskyttelsen Norge)
Norwegian Animal Protection Alliance (Dyrevernalliansen)

Novo Nordisk
PHARMAQ
Royal Society for the Prevention of Cruelty to Animals (RSPCA)
Sanofi
Scand-LAS
Scottish Accreditation Board (SAB)
Stiansen Foundation
Universities Federation for Animal Welfare (UFAW)
US Department of Agriculture (USDA)



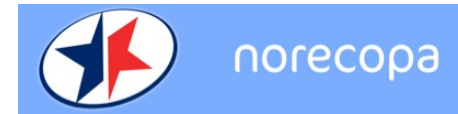
**Replacing
Animal
Research**



Dyrevernalliansen



At the bottom of Norecopa's webpages:



Feedback

English-language newsletters

Contact us

+47 41 22 09 49
post@norecopa.no



Facebook



LinkedIn

Postal address

% Norwegian Veterinary
Institute
P.O. Box 64
N-1431 Ås, Norway

Shortcuts

- Give us some feedback!
- > Sponsors
- > Cookies & Privacy Policy
- > Site map

Subscribe to our newsletter

your email address

> Browse our latest newsletters

norecopa.no/WC13-education

© Norecopa - Website developed by Netlab AS, Bitfarm AS and Thorgate

Norecopa: PREPARE for better Science