COMPARATIVE MEDICINE

Karolinska Institutet

CKF2996, Anaesthesia, Analgesia and Surgery (mice and rats), 1.5 credits (hec)

Anestesi, analgesi och kirurgi (mus och råtta), 1,5 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus was approved by the The Committee for Doctoral Education on 2023-11-13, and is valid from spring semester 2024.

Responsible department

Comparative Medicine, Faculty of Medicine

Prerequisite courses, or equivalent

Students need to complete the "Function A" laboratory animal science course ("to carry out scientific procedures on animals"), or must have completed an equivalent course.

Purpose & Intended learning outcomes

Purpose

The course is designed to meet the learning outcomes specified by the education and training recommendations supplied as an annex to EU Directive 2010/63/EU, which has been endorsed by the Swedish legislation L150 (SJVFS 2019:9). Modules included are EU 3.2, 5-7, and EU20-22. Education and training in anaesthesia, analgesia and surgery is both essential, and a legal requirement, for all those who need to undertake such procedures on laboratory animals. Applying appropriate anaesthetic, analgesic and surgical techniques to in vivo studies enhances outcomes from research studies, reduces experimental variability, and is perceived as ethically acceptable.

Intended learning outcomes

After completion of this course, the students should be able to meet the defined learning outcomes as set out in the EU Education and Training Framework, with emphasis on modules 20, 21 and 22. Each module requires both theoretical knowledge, and acquisition and

demonstration of practical skills. The list of suggested learning outcomes by such guidelines is comprehensive, but in summary, participants will acquire the knowledge and skills to anaesthetize animals safely and humanely, assess and alleviate post-surgical pain, and be able to conduct surgical procedures competently, using appropriate aseptic technique. Recognition of pain, suffering and distress, appropriate methods of euthanasia, and minor procedures in mice and rats (EU modules 3.2, 5-7) will also be included.

Course content

The course provides guidance and information to individuals who, during their research work with animals, will need to apply sedation or anaesthesia and who will undertake surgical or other painful procedures. It includes details of methods of assessing, preventing and alleviating animal pain. The use of appropriate killing methods of rodents will also be included. The course will include training in the most recently developed behavioural measures of pain, including use of grimace scales. Monitoring of animals during anaesthesia and coping with problems and emergencies are explained and demonstrated. Potential interactions between anaesthetic and analgesic agents and specific research protocols are also explained and discussed.

Training is given in the principles of pre-operative animal assessment and care, preparations for surgery, aseptic technique and the principles of successful surgery. The course provides information about possible complications, post-operative care and monitoring along with details of the healing process. It also covers more practical elements for example the demonstration of commonly used instruments and provides an opportunity for trainees to practice some of the practical aspects of basic surgical technique, such as methods of suturing, using appropriate non-animal models..

Forms of teaching and learning

The course will adopt a blended learning approach that combines e-learning, live sessions (in-person and digital), discussions, interactive sessions and practical components in the laboratory. Lecture notes and video materials to introduce practical skills will be provided as well.

Discussion and problem-solving sessions will be provided, which will encourage students to reflect on the application of the course content in their own research area, and discuss and explain their work to other participants.

Laboratory practical sessions (4-5 hours) on introductory anaesthesia and surgical skills will be provided.

Language of instruction

The course is given in English

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

All components must be completed and active student participation in the discussion and problem solving sessions is required if the student is to be provided with certification of the successful completion of the course. Missed parts of the course as a consequence of a well-justified absence will need to be compensated after agreement with the course director e.g. with a written assignment or in future course editions.

Forms of assessment

Practical skills are formatively assessed during the laboratory sessions using direct observation of practical skills. A short answer/multiple choice question final examination is held at the end of the course. A pass/fail criteria will be used as a global rate for this course.

Course literature

Detailed lecture notes are provided, that support all of the specified learning outcomes. Additional teaching materials will be available at Canvas via researchanimaltraining.com (anaesthesia for minor procedures, assessment of pain and distress, and euthanasia). Copies of all seminars and transcripts of interactive and discussion sessions are provided to the students. As the key reference material, the students are referred to:

Handbook
1. Flecknell, PA, (2015) Laboratory Animal Anaesthesia, Elsevier, 4th Edition, New York.

Articles
1. Bukhari, Qasim, et al. "Resting State fMRI in Mice Reveals Anesthesia Specific Signatures of Brain Functional Networks and Their Interactions." Frontiers in Neural Circuits 11 (2017).
2. Cooper, Dale M., Robroy Mciver, and Richard Bianco. "The thin blue line: a review and discussion of aseptic technique and postprocedural infections in rodents." Journal of the American Association for Laboratory Animal Science39.6 (2000): 27-32.
3. Descovich, Kris A., et al. "Facial expression: An under-utilised tool for the assessment of welfare in mammals." ALTEX (2017).
4. Faller, Kiterie ME, et al. "Refinement of analgesia following thoracotomy and experimental myocardial infarction using the Mouse Grimace Scale." Experimental physiology 100.2 (2015): 164-172.
5. National Research Council of the National Academies (2009). Recognition and Alleviation of Pain in Laboratory Animals, National Academies Press, Washington D.C.
6. Uhrig, L., S. Dehaene, and B. Jarraya. "Cerebral mechanisms of general anesthesia." Annales francaises d'anesthesie et de reanimation. Vol. 33. No. 2. Elsevier Masson, 2014.
7. Jeffrey S. Mogil, Daniel S.J. Pang, Gabrielle Guanaes Silva Dutra, Christine T. Chambers. "The development and use of facial grimace scales for pain measurement in animals", Neuroscience & Biobehavioral Reviews, Vol. 116, 2020.