

# STUDYGUIDE

## Basic course

### Introduction to Laboratory Animal Science



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**Universiteit Utrecht**

**Organisation:**

Department Animals in Science & Society  
Faculty of Veterinary Medicine Utrecht University

**Contact:**

Coordinator: T.P. Rooymans ([t.p.rooymans@uu.nl](mailto:t.p.rooymans@uu.nl); 030-2535264/06-20881459)

Office Dept AISS: +31-30-253 2033 ([las@uu.nl](mailto:las@uu.nl))

English pages: [www.uu.nl/lascourse](http://www.uu.nl/lascourse)

Dutch pages: [www.uu.nl/art9cursus](http://www.uu.nl/art9cursus)

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## **Objective of the course**

The objective of this basic course is to present basic facts and principles that are essential for the humane use and care of laboratory animals and for the quality of research.

The course may also be of interest for those who intend to set up a similar course at their own location. For this purpose, during the course, acquisition of teaching materials can be discussed with the course committee.

## **Competence**

For the function 'designing procedures and projects' the Dutch government requires competency.

On December 18, 2014 the new legislation regarding animal experimentation was implemented. Due to this implementation the course on Laboratory Science has been adapted. The course contains now two parts, a basic course (Introduction to laboratory animal science) and a species-specific module. The basic course certificate and, at least, one species specific certificate will give the required competence.

From August 1, 2015 the competence is limited. You are not allowed to perform any skill on animals, unless there is supplementary education. From now you are competent when you are skilled (competence profile, species and act(s) stated).

When you successfully complete the new basic course, you still need to follow a species-specific course. After this you will be competent to design procedures and projects and to execute simple procedures on these animals.

## **Workload**

The number of credits that can be obtained after successful completion of the course is 3 ECTS (European Credit Transfer and Accumulation System). The length of the course is two weeks (fulltime, 09.00-17.30 hrs). Participation in all parts of the course is mandatory.

## **Course material**

English spoken LAS course:

During the course the book *Principles of Laboratory Animal Science*, revised edition, 2001, L.F.M. van Zutphen, V. Baumans and F. Ohl (eds.) (ISBN 13: 978-0-444-50612-2) will be used. Further material will be provided on OneDrive and Teams.

Nederlandstalige cursus Proefdierkunde: *Handboek Proefdierkunde, Proefdieren, dierproeven, alternatieven en ethiek*, red. Van Zutphen, Baumans, Ohl.

Vijfde druk ISBN 978-90-352-2981-5

Het overige studiemateriaal zal uitgereikt worden OneDrive en Teams.

## Program

<b>Title</b>	<b>1. Introduction to Laboratory Animal Science</b>
<b>Content</b>	During this interactive lecture an overview of all topics to be presented during the entire course period will be given. After a short summary of the history of the discipline the current national legislation governing the use of animals in research will be introduced. Next to giving facts concerning laboratory animals the discussion regarding ethical aspects, to be continued during the entire course period, will be started. Basic principles on how to perform the optimum animal experiment and on the validity of animal models will be presented in the light of the 3Rs and of animal welfare considerations. This lecture forms the basis of the entire course.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>Principles of laboratory animal science (course book). Chapter 1 Laboratory animal science.</li> <li>European Science Foundation Policy Briefing ‘Use of animals in research’ (p.1-2) <a href="http://www.esf.org/fileadmin/Public_documents/Publications/ESPB15.pdf">www.esf.org/fileadmin/Public_documents/Publications/ESPB15.pdf</a></li> </ul>
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>Describe Jeremy Bentham’s view on the use of animals.</li> <li>Which principle did Russel &amp; Burch introduce?</li> <li>What was the relationship between the Victoria Street society and Cruelty to Animals Act in the UK?</li> <li>Which general parameters have to be integrated in order to perform the optimum animal experiment?</li> <li>How do you decide on a species to be used in your experiment?</li> </ol>

<b>Title</b>	<b>2. LAS assignment</b>
<b>Content</b>	This assignment is a group task in which you are asked to design a research protocol of an animal experiment. The aim is to further zoom in on all important Laboratory Animal Science aspects that you get familiarized with during the different lectures in the course. Firstly, you will critically analyse a scientific article describing an animal experiment. Secondly, you will deliver an oral presentation on the experiment you designed, followed by a discussion with your classmates.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>Van Zutphen, L.F.M., Baumans, V., Beynen A.C. (2001) "Principles of Laboratory Animal Science: A Contribution to the Humane Use and Care of Animals and to the Quality of Experimental Results"</li> <li>Additional literature (sought by the participants themselves)</li> </ul>
<b>Form</b>	Working group assignment

<b>Title</b>	<b>3. Some methodological and statistical issues in animal experimentation</b>
<b>Content</b>	The design and statistical analysis of (animal) experiments are an important part of the scientific process. Well designed and correctly analysed experiments can lead to a reduction in animal use whilst increasing the scientific validity of the results. In two lectures the basic

	principles of experimental design and some aspects of statistical analysis of animal experiments will be covered.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Chapters 5, 11 and 12 (2001) from <i>Principles of Laboratory Animal Science. A Contribution to the Humane Use and Care of Animals and to the Quality of Experimental Results</i>. Revised (2nd) Edition. Edited by Van Zutphen LFM, Baumans V &amp; Beynen AC, Elsevier Science Publishers, Amsterdam, The Netherlands</li> <li>• Chapters 5, 11 and 12 (2009) from <i>Handboek Proefdierkunde. Proefdieren, dierproeven, alternatieven en ethiek</i>. Vijfde druk. Onder redactie van: Van Zutphen LFM, Baumans V &amp; Ohl F, Reed Business, Amsterdam, The Netherlands.</li> <li>• Festing MFW, Overend P, Gaines Das R, Cortina Borja M &amp; Berdoy M (2002). The Design of Animal Experiments: Reducing the use of animals in research through better experimental design. <i>Laboratory Animal Handbooks</i> No. 14.</li> <li>• Experimental Design and Statistics in Biomedical Research (2002). <i>ILAR journal</i> 43(4): 191-258.</li> <li>• Experimental Design and Statistics (2014). <i>ILAR journal</i> 55(3): 379-492.</li> </ul>
<b>Form</b>	Two lectures
<b>Testing your competence</b>	We advise the animal researcher to go through the different modules (except module 8) from the interactive website <a href="http://www.3rs-reduction.co.uk/">http://www.3rs-reduction.co.uk/</a> developed and launched by Michael F.W. Festing. On the basis of this website a number of methodological and statistical aspects of animal experiments are explained. The modules are mostly self-explanatory, with a lot of feedback, and there are several ‘test yourself’-questions. For a (Dutch) review of this website see ‘Van Lith HA (2013). Voor u getest: de nieuwe interactieve website ‘www.3Rs-reduction.co.uk’. <i>Biotechniek</i> 52(4), 9-12’.

<b>Title</b>	<b>4. Genetic standardization</b>
<b>Content</b>	The extent to which genetic standardization of laboratory animals is needed depends on the goal of the animal experiment. Some experiments require a more uniform responsive laboratory animal population, while for other experiments a certain variation is preferred. Besides genetic standardization, the genetics and breeding of the major classes of laboratory animal populations are discussed as well as the way in which one can verify that the test animals still fulfil the necessary genetic standards.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Chapters 7 (2001) from <i>Principles of Laboratory Animal Science. A Contribution to the Humane Use and Care of Animals and to the Quality of Experimental Results</i>. Revised (2nd) Edition. Edited by Van Zutphen LFM, Baumans V &amp; Beynen AC, Elsevier Science Publishers, Amsterdam, The Netherlands.</li> <li>• Chapter 7 (2009) from <i>Handboek Proefdierkunde. Proefdieren, dierproeven, alternatieven en ethiek</i>. Vijfde druk. Onder redactie van: Van Zutphen LFM, Baumans V &amp; Ohl F, Reed Business, Amsterdam, The Netherlands.</li> </ul>
<b>Form</b>	One lecture

<b>Testing your competence</b>	We advise the animal researcher to go through module 8 (Strains of mice and rats) from the interactive website <a href="http://www.3rs-reduction.co.uk/">http://www.3rs-reduction.co.uk/</a> developed and launched by Michael F.W. Festing. Module 8 is (like all the modules of this website) mostly self-explanatory, with a lot of feedback, and there are a couple of ‘test yourself’-questions. For a (Dutch) review of this website see ‘Van Lith HA (2013). Voor u getest: de nieuwe interactieve website ‘www.3Rs-reduction.co.uk’. Biotechniek 52(4), 9-12’.
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<b>Title</b>	<b>5. General Anatomy for LAS</b>
<b>Content</b>	<p>‘One of the prerequisites for responsible use of animals in biomedical research is a thorough knowledge of the biological characteristics of the species to be used. The choice of animal species, sex, age and strain largely depend on whether their anatomical characteristics are suited to the research demands’.</p> <p>In this lecture the general anatomy of mammals, birds and, fish will be discussed in order to provide a basis for the creation of the decision tree for finding the optimal animal model.</p>
<b>Key Text</b>	Principles of laboratory animal science, chapter 3 ‘Biology and husbandry of laboratory animals’. Handboek Proefdierkunde, hoofdstuk 3; Biologie en Zoötechniek
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Do animal species without a gall bladder produce gall?</li> <li>2. What is the location of the adrenal glands in mammals in general?</li> <li>3. Explain why a bird with a broken wing can be dyspnoeic.</li> <li>4. Where do the embryos develop in viviparous fish?</li> </ol>

<b>Title</b>	<b>6. Diseases of laboratory animals (Gezondheidsbewaking bij proefdieren)</b>
<b>Content</b>	Diseases in animals can be a consequence of experimental setup or occur as an unintended effect during the study. This lecture will focus on how to handle when animals die or are diseased as an u. In particular, the risks of disease at different levels will be discussed as well as how to recognize disease and come to a diagnosis. Furthermore, the most common infectious diseases of laboratory animals are given, with a special focus on zoonosis. Measurements to reduce the infection risks as well as how to handle in case of infection the potential effects on the studies. ...re.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Natural Pathogens of Laboratory Mice, Rats, and Rabbits and Their Effects on Research; Baker, Clin. Microbiol. Rev. 1998</li> <li>• Confronting Zoonoses, Linking Human and Veterinary Medicine; Kahn, Emerging Infectious Diseases, 2006</li> <li>• Code of Practice: Welzijnsbewaking van proefdieren</li> <li>• Robbins &amp; Cotran Pathologic Basis of Disease, 9e (for reference only)</li> <li>• <a href="http://dora.missouri.edu/">http://dora.missouri.edu/</a></li> </ul>
<b>Form</b>	Interactive lecture

<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. How to handle when laboratory animals are ill or diseased?</li> <li>2. What are the different (levels of) risks when animals are diseased?</li> <li>3. What are actions with regard to pathology, clinical and microbiological diagnostics that can be considered?</li> <li>4. What can be consequences of diseases in laboratory animals?</li> <li>5. What is the importance of collection of samples and how can they be used to diagnose disease?</li> <li>6. Give an example of how a natural pathogen in lab animals can interfere with research.</li> <li>7. Give an example of how rodents might be used as model to study human disease.</li> <li>8. List the transmission routes of pathogens and indicate what measurements can be taken to reduce the risks of spreading.</li> </ol>
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<b>Title</b>	<b>7. Anesthesia</b>
<b>Content</b>	This lecture attempts to provide a basic level of knowledge in anesthesia for research workers with special emphasis on those areas that are of practical importance when anesthetising laboratory animals. The general principles of peri-operative care, anesthetic techniques and anesthetic management are discussed including injection- and inhalation anesthesia. The pathophysiology of pain and knowledge concerning different techniques providing analgesia are reviewed.
<b>Key Text</b>	Van Zutphen, L.F.M., Baumans, V., Beynen A.C. (2001) Principles of Laboratory Animal Science: chapter 15, Anesthesia, analgesia and euthanasia
<b>Form</b>	(Interactive) lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. What is pre-emptive analgesia</li> <li>2. Describe the pillars of anesthesia</li> <li>3. Name the advantages and disadvantages of inhalation anesthesia.</li> </ol>

<b>Title</b>	<b>8. Preventing avoidable discomfort in laboratory animals</b>
<b>Content</b>	In this interactive working group assignment students and lecturer will discuss housing and care of laboratory animals, assessment of discomfort, clinical signs indicating the humane endpoint and the best method to kill animals (least distress and not interfering with experimental results). On the basis of three hypothetical experiments the above-mentioned topics will be discussed: 1. Accommodation of the animals; 2. How to assess discomfort? and 3. Selection of the most appropriate method of euthanasia?
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• “Principles of Laboratory Animal Science; chapter 4 (Behaviour, stress and wellbeing)</li> <li>• Council of Europe Convention ETS 123 for the protection of vertebrate animals used for experimental and other scientific purposes. Appendix A: Guidelines for accommodation and care of animals.</li> <li>• EU Working Party Report: Recommendations for euthanasia of experimental animals Parts 1&amp;2</li> <li>• FELASA Working Group Report: Pain and distress in laboratory rodents and lagomorphs</li> </ul>

	<ul style="list-style-type: none"> <li>• Environmental enrichment for laboratory rodents and rabbits: requirements of rodents, rabbits, and research. V. Baumans, ILAR Journal Vol. 46.2 (2005)</li> <li>• EU Directive 2010/63/EU on the protection of animals used for scientific purposes; Annex IV: Methods of killing animals.</li> </ul>
<b>Form</b>	Interactive workinggroup assignment
<b>Testing your competence</b>	<p>For each of the three hypothetical experiments</p> <ol style="list-style-type: none"> <li>1. What is the most appropriate way to house the laboratory animals?</li> <li>2. How do you assess distress, pain in the laboratory animals?</li> <li>3. What is the most appropriate method to euthanize the laboratory animals?</li> <li>4. Which clinical symptoms should be used to define the (humane) endpoint of the animal experiments?</li> <li>5. In general: how do you prevent avoidable discomfort in laboratory animals?</li> </ol>

<b>Title</b>	<b>9. Quality assurance in animal experimentation: legal and practical demands</b>
<b>Content</b>	In this lecture the legislation with respect to animal experimentation in the Netherlands is discussed. The Dutch Experiments on Animals Act is implemented according to EU Directive 2010/63/EU. The principles of the Act are explained: protection of the animal, respect the intrinsic value of an animal, “no, unless...” 3 R’s, etc. Also, the procedure to acquire a license allowing the conduct of animal experiments is explained as well as the route: Animal Welfare Body- Animal Ethics Committee – Central Committee Animal Experiments. Also, the practical demands to conduct an animal experiment at the Utrecht University is explained. Special attention is given to how to monitor and supervise the wellbeing of laboratory animals, how to assure the quality of experimentation and how to minimize discomfort of laboratory animals during the experiment.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• EU Directive 2010/63/EU on the protection of animals used for scientific purposes.</li> <li>• Experiments on Animals Act, revised, 18 December 2018 (Wet op de dierproeven)</li> </ul>
<b>Form</b>	(Interactive) lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. What administrative processes are required in advance of the start of the conduct of an animal experiment.</li> <li>2. What are the legal and practical demands when conducting animal experiments?</li> <li>3. What methods are available and legally mandatory when conducting animal experiments?</li> </ol>



<b>Title</b>	<b>10. The 3Rs</b>
<b>Content</b>	The lecture starts with the philosophy of the 3Rs followed by examples of each of the 3Rs. Through active participation of the participants a new 3Rs model for an animal experiment will be developed, following a simple concept. Subsequently, the formal procedure of validation to replace existing animal models by new 3Rs models in national and international guidelines will be discussed. Examples of already validated models will be presented. Finally, a short overview of organizations and websites that facilitate the identification of appropriate 3Rs models will be presented.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Handbook “Principles of Laboratory Animal Science” (course book), chapter 17 “Reduction and replacement concepts in animal experimentation”.</li> </ul>
<b>Form</b>	(Interactive) lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. What are the drivers to develop 3Rs models?</li> <li>2. What is a crucial problem when validating a 3Rs model?</li> <li>3. How do the 3Rs contribute to good laboratory animal science?</li> <li>4. Why are integrated test methods more powerful than single methods?</li> </ol>

<b>Title</b>	<b>12. Nutrition</b>
<b>Content</b>	Diet composition and feed intake are potential factors that can influence the outcome of an experiment. Because an international, uniform standard diet does not exist, variation in diet composition potentially compromises the reproducibility of experimental work. In this lecture, illustrative examples will be discussed. Specific topics that will be addressed are: <ul style="list-style-type: none"> <li>- Types of laboratory animal diets</li> <li>- Nutrient composition in relation to the energy density of the diet</li> <li>- Variation in diet composition</li> <li>- Measures to prevent interference by variation in diet composition</li> <li>- Unrestricted versus restricted feeding</li> </ul>
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Handbook “Principles of Laboratory Animal Science” (course book), chapter 6 “Nutrition and experimental results”.</li> </ul>
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Do standard laboratory animal diets have a constant composition?</li> <li>2. What measure(s) have to be taken to avoid interference of variation of diet composition on the results of an experiment?</li> <li>3. How to avoid differences in feed intake between experimental treatments?</li> </ol>

<b>Title</b>	<b>13. Searching for 3R-methods and Synthesis of Evidence</b>
<b>Content</b>	<p>During this tutorial students receive information on how to search efficiently for methods to Replace, Reduce and Refine animal experiments. Attention is paid to the use of databases, formulating a search question and defining key words. During the assignment students can practice some search skills.</p> <p>The second part of the tutorial focusses on synthesis of evidence and systematic reviews. See also: <a href="http://www.syracle.nl">www.syracle.nl</a></p>
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• EURL ECVAM Search Guide, Joint Research Centre of European Commission, <a href="http://bookshop.europa.eu/en/the-eurl-ecvam-search-guide-pbLBN124391/">http://bookshop.europa.eu/en/the-eurl-ecvam-search-guide-pbLBN124391/</a></li> </ul>
<b>Form</b>	Tutorial
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Name some databases or websites for finding 3R-methods.</li> <li>2. Describe the seven steps to successful searching for 3Rs.</li> <li>3. What is a systematic review?</li> <li>4. List pros and cons of a systematic review.</li> </ol>

<b>Title</b>	<b>14. Gnotobiology and Microbiological standardization</b>
<b>Content</b>	<p>Gnotobiology is the study of organisms or conditions that are either free of microorganisms or associated only with known or specified microorganisms.</p> <p>Just as other aspects of environmental standardization, microbiological standardization is necessary to prevent unwanted and unknown interference with experimental results. Moreover, microbiological contamination can lead to disease and even death of the animals. Other risks are the contamination of humans, or biological products made with the use of animals.</p> <p>Procedures and techniques to obtain laboratory animals of the desired microbiological quality and to maintain this quality (e.g. by using barriers) will be discussed.</p>
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Handbook “Principles of Laboratory Animal Science” (course book), chapter 8 “Microbiological standardization”.</li> <li>• Hardy, P. “Gnotobiology and Breeding Techniques”. Chapter 4.6 in “The Laboratory Mouse” (Second Edition). Academic Press, 2012.</li> </ul>
<b>Form</b>	Lecture

<b>Title</b>	<b>15. Animal welfare: biology, ethics, society</b>
<b>Content</b>	<p>Animal welfare shall be discussed as an interdisciplinary biological, ethical and societal concept. However, we will focus on biological functioning and step by step the concept of the “five freedoms” will be extended until we understand welfare as concept taking the dynamics of an individuals’ adaptive capacity into account. The interplay between environmental factors, genetic background, positive as well as negative emotions and cognition, which leads to the animals’ perception of its own internal state, will be discussed. Methods within animal welfare research will be presented with emphasis on research performed at the</p>

	department of Animal in Science & Society. Finally, we will pay attention to possible readout parameters for animal welfare.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Ohl F, van der Staay FJ (2012). Animal welfare: at the interface between science and society. <i>Vet J.</i> Apr;192(1):13-9.</li> <li>• S.M. Korte, B. Olivier, J.M. Koolhaas (2007) A new animal welfare concept based on allostasis. <i>Physiology and Behaviour</i>, 92, pp. 422–428</li> </ul>
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Give a list of positive and negative welfare indicators</li> <li>2. What are the “The five freedoms”?</li> <li>3. Explain the slogan Happy Animals Make Good Science. Why do or don’t you agree with it?</li> <li>4. Mention three effects of enrichment in laboratory animals.</li> </ol>

<b>Title</b>	<b>16. Introduction to ethics: why are animals morally important?</b>
<b>Content</b>	Using animals for experimental research has raised many public concerns. The current 21 <sup>st</sup> century debate is no longer restricted to the Europe, but can be recognized in many countries including the US, Australia and Asian countries. The origin of these debates lies in the recognition of animals as beings that have a moral value next to their instrumental value for humans. This implies that animals have a moral status and should be taken into account in our moral reasoning for their own sake. In animal research we are familiar to the idea of taking the interests of animals into account, because otherwise it may frustrate the research or have adverse effects on the outcome. However, speaking about animals as moral subjects implies a further step. If animals are acknowledged to be considerable and significant for their own sake, we have direct moral reasons to take their interests into consideration. What this implies in practice is not always immediately clear. In this session, we aim to get more grip on the theoretical background and the practical implications of this discussion.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Grimm, H. (2014): Ethics in Laboratory Animal Science. In: Jensen-Jarolim, Erika (Hg.): Comparative medicine: anatomy and physiology. Springer</li> <li>• Ohl, F. &amp; Meijboom, F. (2015). Ethical Issues Associated with the Use of Animal Experimentation in Behavioral Neuroscience Research. In G. Lee (et al.) (Eds.), <i>Ethical Issues in Behavioral Neuroscience</i> (pp. 3-15). Berlin Heidelberg: Springer.</li> <li>• Nuffield Council on Bioethics, Chapter 14 ‘Discussion on ethical issues’. In: <i>The ethics of research involving animals</i>, London, 2005</li> </ul>
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Why is ethics more than an exchange of subjective views?</li> <li>2. Mention three theoretical approaches that are used to substantiate the claim that animals have moral status.</li> <li>3. Why is improving the welfare of a research animal not a sufficient argument to justify animal research according to the animal rights movement?</li> </ol>

<b>Title</b>	<b>17. The ethical assessment of animal experiments</b>
<b>Content</b>	During this lecture we analyse the elements of an ethical assessment of animal experiments. Different problems concerning this assessment will be identified. Against the background of the assumption that animal experiments are justified by the (human) benefits resulting from them, we will scrutinize the reasons why so many promising results of animal experiments do not lead to these benefits.
<b>Key Text</b>	Oswald Steward and Rita Balice-Gordon: Rigor or Mortis: Best Practices for Preclinical Research in Neuroscience., Neuron 84, November 5, 2014.
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. What are the three steps of the ethical assessment of animal experiments</li> <li>2. Which (5) problems are the with this assessment?</li> <li>3. What are the tree main reasons for the hampering translation of results of animal experiments to the human clinic?</li> </ol>

<b>Title</b>	<b>18. Dutch Society for Replacement of Animal Testing/Stichting Proefdiervrij</b>
<b>Content</b>	This interactive lecture is meant to help build the right attitude towards animal testing by paying attention to strategies that make animal testing unnecessary. In this lecture we work towards this goal by addressing 6 different steps; what are we talking about, why do we have to act right now, what is our dream, what are the obstacles on the way towards this dream, how can we overcome these obstacles and why do we do what we do. This lecture is focused on non-animal methods, to show how to do it in a different way, not using animals. The emphasis is on the scientific advantages of animal free methods.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.proefdiervrij.nl">www.proefdiervrij.nl</a></li> </ul>
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Why is now the time, according to Stichting Proefdiervrij, to make animal testing unnecessary?</li> <li>2. Why doesn't Stichting Proefdiervrij demonstrate and free animals?</li> <li>3. What are the main obstacles (according to Stichting Proefdiervrij) towards the complete replacement of all animal experiments?</li> </ol>

<b>Title</b>	<b>19. Practical Animal Handling</b>
<b>Content</b>	In this practical you will learn procedures for handling and restraining mice, rats, hamsters, Guinee pigs and rabbits. This practical prepares you for the practical on basic techniques. Important to understand that 95% of a procedure is restraining the animal in the right way. Working safely and humanely with laboratory animals requires a core competency in handling and restraint methods. Proper restraint and handling techniques are essential for clinical examination and injections while limiting the amount of stress and/or discomfort to the animal and to the handler.

<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Handbook “Principles of Laboratory Animal Science” (course book), chapter 3 “Biology and husbandry of laboratory animals”.</li> <li>• Videos on handling/restraining</li> <li>• <a href="http://film.oslovet.norecopa.no/">http://film.oslovet.norecopa.no/</a></li> </ul>
<b>Form</b>	Lecture and practical
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Every species and even different strains (can) have their own specific way of handling and restraining.</li> <li>2. Restraining is handling an animal in such a way that nor you neither the animal will be harmed when performing a technique.</li> <li>3. Name possible consequences (for the animal and for the handler) if animals are not handled and/or restraint properly.</li> <li>4. How would you train yourself in handling when using a certain species and/or strain for the first time in an experiment?</li> </ol>

<b>Title</b>	<b>20. Demonstration Basic Techniques</b>
<b>Content</b>	In this demonstration a brief description of some basic procedures concerning sampling of blood, feces and urine will be discussed.
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Handbook “Principles of Laboratory Animal Science” (course book), chapter 16 “Experimental procedures”.</li> <li>• Videos on handling/restraining</li> </ul>
<b>Form</b>	Lecture and demonstration
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. Which methods of blood sampling do you know?</li> <li>2. How do you decide on a certain sampling technique?</li> <li>3. When would you anesthetize your animals for sampling and when not?</li> <li>4. How would you sample urine and feces of mice?</li> <li>5. How would you do that when animals are kept in groups?</li> </ol>

<b>Title</b>	<b>23. Physiology (general)</b>
<b>Content</b>	<p>Stress, defined as any deviation from homeostasis, induces a behavioural and physiological response that may impact on a wide array of animal experiments. In this lecture, the basic principles of homeostasis and physiological response to stress will be discussed. Specific topics that will be addressed are:</p> <ul style="list-style-type: none"> <li>- Autonomic nervous system and sympathetic and parasympathetic response</li> <li>- Impact on cardiovascular system</li> <li>- Neuroendocrine response to stress</li> <li>- Impact on animal studies</li> </ul>
<b>Key Text</b>	<ul style="list-style-type: none"> <li>• Handbook “Principles of Laboratory Animal Science” (course book), chapter “Behaviour, stress and welfare”, Environment and Physiology.</li> </ul>
<b>Form</b>	Lecture
<b>Testing your competence</b>	<ol style="list-style-type: none"> <li>1. How is stress defined?</li> <li>2. Which physiological systems are affected in response to stress?</li> <li>3. What is the impact of a sympathetic and neuroendocrine response to stress?</li> <li>4. Why is it important to consider stress in animal experiments?</li> </ol>

## **Evaluation of student's progress and final exam**

The final mark of each student ranges from 0-10 points and is determined by the following factors:

### **1. Final Examination (60%)**

A final written examination is scheduled for the last day of the course. Each student gets a mark ranging from 0-10 points (0= unsatisfactory, 10=very good) depending on the quality, which contributes for 60% in the final mark. The exam consists of multiple-choice questions and open questions. The examination involves the handbook, the lectures, discussions, demonstrations and practicals.

### **2. LAS assignment (40%)**

As a group you practice to critically analyze the work of others and to design an animal experiment. Your group is assigned a disease. Firstly, you have to analyze an article of your choice with help of a questionnaire that is based on the ARRIVE guidelines: (Kilkenny C, Browne WJ, Cuthill IC, Emerson M, Altman DG (2010) Improving bioscience research reporting: the ARRIVE guidelines for reporting animal research). You will discuss your findings within your group.

Based on every aspect you learned about during the course you design an animal experiment for a treatment of the illness. You will report this in a small presentation (10-15 min) at the end of the course and discuss your choices with the critical audience- the other students.

## **Certificate**

When the participant has met all legal requirements and has successfully passed the exam at the end of the course, the participant will receive the certificate for the basic course.

If you do not meet all legal requirements, like not holding a Master degree (yet), you will receive a written confirmation stating that you followed the course and successfully passed the exam. With this confirmation, after obtaining your Master degree, you can request for the final certificate confirming that you meet all legal requirements of the basic course on Laboratory Animal Science.

To be registered as an art.9 researcher within the Dutch legislation, you also need a certificate of a species-specific course.

## **More information**

Learning outcomes in accordance with the EC Training and Education Document relating to Directive EU/2010/63,

[http://ec.europa.eu/environment/chemicals/lab\\_animals/pdf/Endorsed\\_E-T.pdf](http://ec.europa.eu/environment/chemicals/lab_animals/pdf/Endorsed_E-T.pdf)