



Universidad
de Navarra

Animal models for biomedical research (MInvB)

Guía docente 2024-25

INTRODUCTION

Animal models for biomedical research

Let's talk about models to better understand disease and the basis of biomedical research

General description: The generation and characterization of animal models that reproduce human disease at the lab allow us to study the cellular and molecular pathogenesis of disease *in vivo*, and are particularly useful in the pre-clinical design and validation of new therapies. The main objective of this course is the **study of the rationale behind various state-of-the-art animal models** that are currently being used for basic and applied research of human disease.

Throughout the course we will explore and discuss the **scientific and methodological creativity**, as well as the **biomedical applicability** of multiple animal models typically used in the four key areas of our Master in Biomedical Research (i.e. cancer, translational research, neuroscience and cognition, and regenerative medicine and advanced therapies).

We believe this course is a great complement, more hypothesis-oriented and not overlapping, with the subject "Experimentación Animal" from Module I.

Cartoon by Mike Twohy for the New Yorker

Professor: Dr. Sergio Roa Gómez (sroa@unav.es, responsible)

Credits (ECTS): 2 ECTS

Type: Optional

Module: Module II. Specialist Programs

Area: Translational Research Speciality - Especialidad en Investigación Traslacional

Calendar: [Calendario del Máster](#)

Classroom: Room 30, Edificio Biblioteca Ciencias

Language: 100% english (all materials and activities will be in english)

COMPETENCES

Basic competences



- **CB6:** Possess and understand knowledgeable facts that serve as a basis or opportunity for being original in the development and/or application of ideas, frequently within the context of research.
- **CB7:** The students will be able to apply acquired knowledge and problem solving abilities to fields outside this program, including that which is new and scarcely known, within a more ample or multidisciplinary context related to the research, development and innovation of drugs.
- **CB8:** The students will be able to integrate concepts and manage the complex task of drawing valid conclusions from information which, in spite of being incomplete or limited, includes reflections regarding social and ethical responsibilities linked to the application of general knowledge, specific concepts and common sense to the research, development and innovation of drugs.
- **CB9:** The students will learn to relay their conclusions -and the most recent facts and reasoning supporting said conclusions- to specialized personnel and to the general public in a clear and precise manner.
- **CB10:** The students will have acquired learning abilities that will permit them to continue studying in a self-directed and autonomous manner.

General competences

- **CG1:** Ability to deal with biomedical challenges in depth, from different viewpoints, identifying the state of present-day science.
- **CG2:** Identification of significant questions or hypotheses regarding biomedical issues or problems and definition of the steps necessary to resolve such questions.
- **CG3:** Possession of creative ability and originality in order to be able to respond to the questions raised in biomedical research.
- **CG4:** Ability to select and use appropriate techniques in order to efficiently and accurately carry out biomedical research work.
- **CG6:** Possession of critical ability, both when reading scientific biomedical literature and when interpreting the results of experiments.
- **CG7:** Ability to orally communicate biomedical research matters or data in a fluent way, in both Spanish and English, taking into account the audience for which the presentation is intended.
- **CG8:** Ability to write correct, precise and well-structured texts about different types of biomedical research work.

Specific and complementary competences

- **CE3:** Acquisition of an overall view of the general methodology used in biomedical research, as well as the regulations and procedures which allow work to be carried out safely in research laboratories.



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- **CE4:** Knowledge of the legal framework that regulates the experimental use of the most widely-used animal species and the acquisition of key skills for handling them, as well as for designing and preparing in vivo experimental procedures.
- **CC1:** Understand the connection that exists between different knowledge areas in order to open up horizons with a view to addressing a biomedical research project with creativity.
- **CC2:** Look into specific aspects that permit increasing the knowledge acquired in the speciality.
- **CC3:** Acquire specific technical bases to understand scientific literature and/or to execute the research project.

PROGRAM

-Session 1. Introduction

Introduction to biomedical research with animal models; and bases for design and elaboration of scientific projects that use animal models for biomedical research.

-Session 2-3-4. Rodents and small mammals as biomedical models

Examples and rationale of biomedical research using rodents and small mammals: *Mus musculus* (mouse) and *Rattus norvegicus* (rat).

-Session 5. Non-mammals as biomedical models

Examples and rationale of biomedical research using non-mammals as animal models: *Caenorhabditis elegans* (worm), *Danio rerio* (zebrafish) and *Drosophila melanogaster* (fruit fly).

-Session 6. Non-human primates as biomedical models

Examples and rationale of biomedical research using non-human primates as animal models: *macaques* and *marmosets*, and other New World and Old World primates.

-Session 7. Journal club

Exposition and discussion of recently published research in different biomedical fields (cancer, neuroscience, regenerative medicine based, immunology, ...) based on the generation and use of animal models.

-Session 8. Research proposals

Round of presentations (oral and written) and group discussion of the scientific projects designed by the students during the course.

EDUCATIONAL ACTIVITIES

60% of the time for **Personal work** (1.20 ECTS, 30 h)



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+

38% of the time for **Class activities** (0.76 ECTS, 19 h)

- **Lectures and teamwork exercises (0.56 ECTS, 14 h):** both professor and students will be immersed in dynamic discussions about **what, why** and **how** animal models are designed, generated and applied in biomedical research.

- **Individual presentations (0.20 ECTS, 5 h):** there will be two individual oral presentations for the students.

One paper-one student: let's dissect together the scientific rationale for using very specific examples of animal models in the most recent literature of high-impact journals. One student will lead the paper each time (**10 minutes presentation** + discussion).

One project-one student: let's be creative and present a breakthrough scientific hypothesis in a **1-page research proposal**, which must involve the design and use of animal models. Students will expose their ideas in front of the group (**10 minutes presentation** + discussion).

+

2% of the time for the **Exam** (0.04 ECTS, 1h): this evaluation will primarily consist on 20 **test-like questions** and 1 **open-question**.

ASSESSMENT

Cumulative evaluation (score 100%)

- **Continuous assessment: (score 15%)** assistance and active participation during classes.
- **Exam: (score 35%)** questionnaire with one more analytical brief question (1 h).
- **Oral paper assignment: (score 25%)** presentations and discussion of one representative high-impact biomedical publication (**~10 minutes + discussion**).
- **Written project assignment: (score 25%)** a 1-pages creative hypothesis and research proposal including animal models. This will also be accompanied by a brief 5-minutes oral defense and discussion with the rest of the class (**~5 minutes + discussion**).

Re-sit examination

If a student failed, a tutorial of 2 hours will be organized to review concepts, and an extraordinary call for the re-evaluation of the suspended section (i.e. new written and / or oral presentation will be proposed again).

Grades

10-9,0: sobresaliente (SB) [*eligible for Honors*]

8,9-7,0: notable (NT)

5,0-6,9: aprobado (AP)



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0-4,9: suspenso (SS)

OFFICE HOURS

Please make an **appointment by e-mail** with *Professor Sergio Roa Gómez* (sroa@unav.es)

Physical office	Virtual meeting
<i>Department of Biochemistry and Genetics</i> <i>Edificio de Investigación, 3rd floor</i> <i>Office 3321</i>	<i>Google Meet</i>

BIBLIOGRAPHY AND RESOURCES

- **General scientific literature** on the subject and studying resources will be recommended to the students at the beginning of the course.
- **Preparatory materials**, including exercises and scientific articles selected by professors, will be given to the students in order to be discussed and analyzed in detail in the theoretical and practical classes.