ANIMAL MODELING IN TRANSLATIONAL RESEARCH

STUDY PLAN 2022-2023

Coordinated by Dr Joan Clària Senior Consultant at the Department of Biochemistry and Molecular Genetics, Biomedical Diagnostic Center, Hospital Clínic, – Tenure-track Professor, Department of Biomedical Sciences, Faculty of Medicine, University of Barcelona and **Dr Cristina Fillat** Group leader at the Gene Therapy and Cancer Research Group, IDIBAPS.

GENERAL INFORMATION

Subject Name	Animal Modeling in Translational Research
Code	566657
Type	Compulsory
Teaching	First semester
Coordinator	Dr. Joan Clària & Dr Cristina Fillat
Contact Details	jclaria@clinic.cat
ECTS credits	6

OBJECTIVES

Upon completion of this subject students will be able to:

1. Identify the most appropriate experimental model to investigate mechanisms of a specific disease.
2. Identify the most appropriate methodology of laboratory employed in animal research studies.
3. Describe the strengths and weaknesses of a particular model of experimental disease.
4. Define the value and limitations of in vivo, ex vivo, in situ and in vitro experiments.
5. Understand the technicalities of the cellular and molecular biology methods most frequently used in experimental research.
6. Translate the results obtained in basic research to the diagnosis, prevention and therapy of particular diseases.
7. Understand offspring basic techniques used in genetic engineering of animal laboratories.
8. Understand fundamental aspects of the generation and husbandry of knockouts and transgenic models
9. Appreciate the main advantages and disadvantages of the most common experimental models of prevalent diseases.
10. Know the basic technical aspects of proper handling in animal laboratories
11. Understand the ethical and legal provisions of the experimental research
12. Design organ functioning studies (kidney, heart, lung, etc.) and vascular and hemodynamics function
13. Correctly design pathophysiological studies ex vivo and in situ
14. Learn the basic principles of cell culture and manipulation
15. Design studies in isolated cells, in vitro cell lines and primary cells
16. Interpret pre-clinical studies and their use in the pharmaceutical industry
17. Get acquainted with non-mammalian model systems

COMPETENCES TO BE GAINED DURING THE STUDY

General

G1: Knowledge of the main tools for translational research
G2: Knowledge of the scientific biochemical, molecular and genetic basis used in translational research

Specific

S1: Acquire the necessary skills to proper interpret the results obtained with experimental models
S2: Develop the required skills to design a translational study in experimental models of a particular disease
S3: Complement the knowledge and skills acquired in the course of 'Animal Experimentation at the Laboratory'

THEMATIC BLOCKS

1. Introduction and basic principles of experimental models
2. Ethical and legal dispositions in experimental research
3. Genetically modified animals: transgenic and knockouts
4. Mice colony management: breeding, assisted reproduction techniques and cryopreservation
5. Research studies in large animals
6. Models for "non-mammalian" (zebra fish) model systems
7. Experimental models for respiratory diseases
8. Experimental models for neuroscience
9. Experimental models for gastrointestinal diseases
10. Experimental models for liver disease
11. Experimental models for transplantation
12. Experimental models for cancer
13. Experimental models in cardiovascular biology
14. Methods and Models for cell biology
15. Organoids and iPS for in vitro disease modeling
16. Methods and Models in microbiology
17. Methods and models in immunology
18. Mathematical models
19. Chromatographic methods for biomarker identification
20. Design of pre-clinical studies in biomedical research
21. Screening methods in the pharmaceutical industry
22. Translating experimental studies into the industry

METHODOLOGY

Total training hours: 6 credits ECTS x 25h/credit = 150h

All lessons will be face-to-face.

a) Face-to-face training (48h):
   - Lectures
   - Journal clubs
   - Seminars/Group discussion
   - Experimental project presentation
   - Seminars

b) Home training (102h):
   - Individual and group work
   - Preparation of journal clubs
   - Preparation of experimental project presentations

EVALUATION

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

• **Attendance:** 50% of the overall grade.
Attendance will be evaluated as: 95%-100% → 50 points / 80% - 95%→ 40 points / 30-80% →20 points / <30% → Subject Failure
• **Exam**: 40% of the overall grade. The exam is on site and consists of 25 questions with multiple choices (5, only 1 is correct; each mistake subtracts 0.2 points).

• **Experimental project oral presentation**: 10% of the overall grade.

To pass the subject, students will have to fulfill three requisites: Attendance-score ≥ 20/50, exam-score ≥20/50, and overall score (attendance + exam/project oral presentation) ≥ 50/100.

Reevaluation: In case of failing the ordinary evaluation, students will have to send the coordinator a written report dissecting two different experimental models appearing in the same scientific article. The re-evaluation final score will never get over 50 points.

REFERENCES

Bibliography:

- González de Buitrago. Técnicas y métodos de laboratorio clínico. Elsevier España, 2004
- González Hernández, A. Principios de bioquímica clínica y patología molecular, Elsevier España, 2007
- Zhan X, Wang F, Bi Y, Ji B. Animal models of gastrointestinal and liver diseases. Animal models of acute and chronic pancreatitis. Am J Physiol Gastrointest Liver Physiol. 2016: 311:G343-55.
- Gopinath C, Nathar TJ, Ghosh A, Hickstein DD, Remington Nelson EJ. Contemporary Animal Models For Human Gene Therapy Applications. Curr Gene Ther. 2015;15:531-4
- Jennings P. "The future of in vitro toxicology". Toxicol In Vitro. 201;29:1217-21.
- Alqahtani S, Mohamed LA, Kaddoumi A. Experimental models for predicting drug absorption and metabolism. Expert Opin Drug Metab Toxicol. 2013;9:1241-54.
- Liu W, Deng Y, Liu Y, Gong W, Deng W. Stem cell models for drug discovery and toxicology studies. J Biochem Mol Toxicol. 2013;27:17-27.
- Picher-Martel V, Valdmanis PN, Gould PV, Julien JP, Dupré N. From animal models to human disease: a genetic approach for personalized medicine in ALS. Acta Neuropathol Commun. 2016;4:70.

Webography

- www.jax.org/
- www.informatics.jax.org/
- www.phe-culturecollections.org.uk/collections/ecacc.aspx
- genetics.hms.harvard.edu/
- www.complextrait.org/
- www.ncbi.nlm.nih.gov/pubmed/
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