

Mouse Imaging

Code: 45024
ECTS Credits: 20

Degree	Type	Year	Semester
3500042 Erasmus Mundus Master in Human Disease Models Morphological Phenotyping	OB	0	1

Contact

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Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.
Please note that this information is provisional until 30 November 2023.

Teachers

Jesus Ruberte Paris

External teachers

Adelaide Greco

Antonella Zannetti

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Maria Elena Truppa

Maria Rosaria Panico

Paolo de Girolamo

Raffaele Liuzzi

Rosa Fonti

Sandra Albanese

Serena Monti

Prerequisites

There are no prerequisites.

Objectives and Contextualisation

- To know the basic principles of mouse handling, care and anaesthesia.
- To know the basic principles of mouse housing and husbandry
- To understand the basic principles of the most relevant preclinical imaging techniques and their application in biomedicine.
- To know differences between the various imaging methodologies to choose the most appropriate for specific morphological phenotyping.
- To apply knowledge of topography and physiology to accurately demonstrate by imaging the anatomy and structure of all mouse organs.
- To interpret data, image processing and post processing techniques for the different imaging modalities.
- To know animal and operator risks and radiation protection principles in preclinical imaging.

Learning Outcomes

- CM03 (Competence) Compare the various imaging methodologies and choose the most suitable one for a specific phenotype analysis of mice.
- KM07 (Knowledge) Know the anatomical grounding of mouse imaging.
- KM08 (Knowledge) Recognise the basic principles of radiological protection.
- KM09 (Knowledge) Know how to handle and anesthetize mice.
- KM10 (Knowledge) Understand the principles of the most significant preclinical imaging techniques and their applications in biomedicine.
- SM03 (Skill) Use terminology from the field of imaging correctly.
- SM04 (Skill) Interpret data from image processing and post-processing techniques using different methods to obtain preclinical images.
- SM05 (Skill) Apply knowledge of imaging to show the anatomy and structure of all organs in mice using imaging in a precise manner.

Content

- Mouse handling, care, and anaesthesia
- Imaging using ionizing radiation (X-ray, CT, SPECT, PET)
- Imaging using non-ionizing radiation (MRI, FMT, NIR, HFUS, PAI)
- Hybrid imaging (PET/CT, PET/MR, US/PAI)
- Applications: cell trafficking and cell tissue homing, angiogenesis, hypoxia, apoptosis and inflammation
- Anatomical bases of mouse imaging
- Optional: language courses (Italian)

Methodology

The methodology used in the teaching and learning process of this module is based on the student working on the information that is made available to them through lectures and practical classes.

- **Classroom lectures:** The student acquires the scientific knowledge of the discipline. The student must complete this knowledge with the personal and autonomous study of the topics explained.
- **Laboratory sessions:** Practical sessions approach the theoretical models to reality and reinforce, complete and allow to apply the knowledge acquired in lectures. In the practical sessions students will learn to recognize suffering and pain in the mouse, as well as the management and care protocols for this animal model. Minimally invasive procedures, such as blood sample collection, injections and dosage will also be performed. Acquisition and preprocessing of magnetic resonance images, microcomputed tomography images, ultrasound images, radiographs, PET images, molecular and optical imaging will be carried out. The attendance to the practical sessions will be controlled.

The materials used in the subject will be available on the Moodle platform.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom lectures	76	3.04	CM03, KM07, KM08, KM09, KM10, SM03, CM03
Laboratory sessions	38	1.52	KM09, SM04, SM05, KM09
Type: Autonomous			
Autonomous learning	382	15.28	CM03, KM07, KM08, KM09, KM10, SM03, SM04, SM05, CM03

Assessment

The evaluation will take place at the end of the module, which will allow monitoring of the teaching and learning process and verifying whether the assigned competencies are achieved.

A practical exam will be carried out on images obtained from the different imaging technologies used in the mouse. The practical exam will account for 40% of the final score for the module. A minimum score of 4.5 points out of 10 will be required in the practical exam in order to pass the module. There will be a final written multiple choice type theoretical exam, whose grade will account for 60% of the module. The module will be passed with a final score of 5 or higher, after averaging the two exams.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practical exam	40	2	0.08	KM07, KM09, KM10, SM05

Bibliography

Greco A, Coda AR, Albanese S, Ragucci M, Liuzzi R, Auletta L, Gargiulo S, Lamagna F, Salvatore M, Mancini M. High-Frequency Ultrasound for the Study of Early Mouse Embryonic Cardiovascular System. *Reprod Sci*. 2015; 22(12):1649-55.

Gargiulo S, Gramanzini M, Megna R, Greco A, Albanese S, Manfredi C, Brunetti A. Evaluation of growth patterns and body composition in C57BL/6J mice using Dual Energy X-Ray Absorptiometry. *Biomed Research International* 2014 10 July; <http://dx.doi.org/10.1155/2014/253067>.

Kagadis GC, Ford NL, Karnabatidis DN, Loudos GK. *Handbook of Small animal Imaging: Preclinical Imaging, Therapy, and Applications (Imaging in Medical Diagnosis and Therapy)*. CRC Press. 2016 (1st Ed.). ISBN-10 1466555688.

Mancini M, Greco A, Tedeschi E, Palma G, Ragucci M, Bruzzzone MG, Coda AR, Torino E, Scotti A, Zucca I, Salvatore M. Head and Neck Veins of the Mouse. A Magnetic Resonance, Micro Computed Tomography and High Frequency Color Doppler Ultrasound Study. *PLoS One*. 2015;10(6):e0129912.

Ruberte J, Carretero A, Cater H, Gràcia G, Lally C. *X-ray Annotation Mouse Atlas*. Doctor Herriot. 2021 (1st Ed.). ISBN 978-84-09-46874-0.

Software

Not applicable