UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

In Vivo Molecular Imaging

2627-1-F0902D008

Aims

The course will provide knowledge on the physical principles and potential applications of in vivo imaging in clinical and preclinical research, as well as in clinical setting.
Knowledge and understanding: students will acquire interdisciplinary knowledge useful for understanding the functioning and potential applications of in vivo imaging, with a particular focus on in vivo molecular imaging (nuclear medicine and optical imaging).
Applying Knowledge and Understanding: the course will provide knowledge to understand the possible applications of in vivo imaging in various clinical or experimental contexts, as well as the development and validation process required for new diagnostic probes for in vivo imaging.
Making Judgements: the course will provide the basis for independent decision-ability in choosing the most appropriate diagnostic method for a given clinical or experimental context.
Communication Skills: students will acquire technically appropriate language adequate to be used in a multidisciplinary setting.
Learning Skills: during the course, students will develop the ability to critically read scientific articles, understanding the advantages and limitations of imaging methods compared to alternative techniques.

Contents

Basic knowledge on fundamental in vivo clinical and preclinical imaging techniques. Main topics: radiobiology, radiochemistry, fluorescent probes, physical principles of in vivo imaging instrumentation devices, fundamentals of image quantification in clinical practice and research and introduction to regulatory affair for radiopharmaceuticals, contrast media and in vivo Imaging medical device.

Detailed program

-General introduction to basic principles, instrumentation and techniques for in vivo imaging; sensitivity, spatial resolution, temporal resolution; translational and preclinical imaging
-Fundamental of digital images: matrix, pixel or voxel, color scale, image analysis.
-Basic principles and application of Radiography and CT and contrast media
-Basic principles and application of Ultrasound and microbubble
-Basic principles and application of Magnetic Resonance and contrast media
-Basic principles and application of Emission tomography (PET and SPECT) and radiopharmaceuticals; radioactive decay and radiochemistry, radiobiology and radioprotection; tracer definition and phase 0 study concept; application of radiopharmaceutocals in therapy and introduction to the concept of radiotheranostic
-Optical Imaging: Bioluminescence and fluorescence; fluorescent probe for clinical and preclinical use. Application of OI for animal model characterization and drug development with particular focus on advance therapy and biologicals, application of OI in surgery an endoscopy.
-Preclinical and clinical application of in vivo imaging in oncology, neurosciences, inflammation and drug development; introduction to theranostic: from target identification to theranostic agents development
-Develop the skill to critically read, present, and discuss scientific articles, fostering a deeper engagement with current research in the field.

- Gain proficiency in visualizing and recognizing diagnostic images, and learn how to apply this knowledge in various contexts of interest.for the biotechnologies

Prerequisites

Basic knowledge on biochemistry, pharmacology, chemistry, physic and physiology that will be introduced during the course if relevant

Teaching form

40 lectures: the teacher begins the first part of the lesson in lecture mode and concludes with interactive teaching organized as questions and answers on specific experimental situation that can potentially be solved using the methodologies presented. 12 hours of integrative teaching organized as follow: during 8 hours students are divided into groups of 3/4 peoples. Student should read and understand a paper and than present to the other students the study objectives, the imaging methodologies used and the potential experimental alternatives applicable to the same experimental situation as well as the advantages or limitations of in vivo imaging application including aderence to 3R principle. This method of 4 hours each (2 hour in separate group and 2 hours of presentations) will be performed twice. Two hours of interactive teaching where the teacher will present diagnostic images and the student should undestand the type of image and the information derived from image interpretation on the basis of the infomation received by the teacher. Finally two hours of questions and answers (multiple choice or open) on the entire course.

Textbook and teaching resource

Slides, Scientific papers, images and self evaluation tests to evaluate the correct understanding during the course of for the exam preparation

Semester

second semester

Assessment method

Evaluation with oral or written self-assessment test performed during the course; (closed questions or multiple choice); to test the ongoing learning skills, students will receive a list of question on the various lessons presented and images case study; in addition, to verify the exact understanding of the methods presented to answer a specific scientific question, papers will be to be provided and discussed in class; problem solving activities on specific diagnostic issue will be carried out in class. Final test: Oral examination.
• DISCUSSION ON TOPICS PRESETED DURING LESSONS
Evaluation criteria: theoretical knowledge, synthesis skills, ability in the application of diagnostic methods to a specific clinical or experimental contest.

Office hours

On appointment with the teacher by mail at rosa.moresco@unimib.it

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | GENDER EQUALITY