UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Nanomedicine

2122-1-F0901D042

Aims

Teach the student to know the techniques, tools and strategies used in the design, characterization and validation of nanotechnological products in the medical field, for the therapy and diagnosis of human diseases. Bring the student to the knowledge of the development of a (nano) drug, from the laboratory to the clinic. Teach the students to understand how some medical problems can be approached with nanotechnologies.

Contents

Concept of nanotechnology and nanomedicine. Knowledge of the main nanoparticles used in medicine and of the techniques for their synthesis, characterization and use in the biomedical field. Description of the multi-functionalization modalities of nanoparticles. Biomedical application of nanoparticles for the therapy and diagnosis of cancer and neurological and neurodegenerative diseases. How to study the pharmacokinetics and biodistribution of nanoparticles. Intracellular trafficking of nanoparticles. Biomimicry and regenerative medicine.

Detailed program

Lectures:

Description of the most relevant tools used on nanoscale in medicine for drug delivery (drug delivery) and diagnostics (imaging). Nanoparticles and nano-devices. Liposomes, Solid-lipid nanoparticles, polymeric nanoparticles. Techniques for manufacturing, characterization and their applications. Targeting nanostructured materials to tissues and cells. Biomimicry. Biocompatibility. Nano-systems and strategies for the therapy and diagnosis of tumors and diseases of the Central Nervous System. Procedures for the development of classical and alternative drugs. Biosensors, nanorobots. Tissue engineering with nanodevices. Innovative applications of

nanoparticles (eg hyperthermia, Cerenkov radiation).

Practical lessons in lab:

Preparation, functionalization, drug-loading and characterization of lipid-based nanoparticles. Critical discussion of the results from the preclinical point of view. Overview of the instrumentation useful for scientific research in the field of nanotechnology and nanomedicine.

Prerequisites

Basic knowledge of chemistry, biochemistry and biology.

Teaching form

Frontal lessons and individual study. laboratory exercises.

Textbook and teaching resource

M.Masserini. Come ci cureremo domani. Ed. Il Mulino

Review and articles published in international journals will be indicated during the course.

Semester

1st semester

Assessment method

Written and oral examination: 13 multiple-choice questions (2 marks each) + 1 open question (4 marks) to be completed in 45 minutes. The exam is positively evaluate with a score of 18/30 or higher. The questions proposed in the written exam will be constructed in such a way as to induce the student to biochemical-biotechnological reasoning, to understand the units of measurement and to be able to evaluate the skills and competences acquired according to the objectives of the course. The oral examination will include a discussion on the written test, including questions about topics included in the program of the course.

Office hours

On appointment to francesca.re1@unimib.it