UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Cellular Biotechnologies

2627-3-E0201Q075

Aims

The course will provide to the student basic concepts about mammalian cell culture. During the course students will learn classic and innovative techniques to handle mammalian cell lines both at molecular and biotechnological level.

During the course students will attain the following goals:

Knowledge and ability to understand
Students could gain basic and advanced knowledge on different types of mammalian cell colture and on the usage of mammalian cells in laboratory and in industry.

Ability to apply knowledge and comprehension
Interpret correctly experimental protocols in papers and specialist magazine that involved mammalian cells.
Critical and judgment skills
Through the analysis of materials and methods of some articles, students will understand how to analyze and understand the methods used by the authors based on the type of research carried out.
Autonomous assessment
Recognize the best protocols to gain the result

Comunication skills
Reprocess information and knowledge of the course, describe experimental procedures using scientific terms
Learning abilities: correctly interpret questions and connect topics

Contents

The course will provide the essential informations concerning mammalian cells manipulation, classification and main application in basal research. Furthermore the students will learn many techniques (co-culture, invasion

assay, cell kinetics, vitality assays..) commonly used in cell biology laboratories.

Detailed program

Animal cell: basic concepts: Typical structure of an animal cell.
Cell culture: Establishing a cell line: Primary cultures, sub-cultures, continuous cell lines. Immortalization and transformation. Medium. Plasmids for mammalian cells. Stable , transient and retroviral transfection.
Cell line development and culture strategies: Use of scaffold/matrix-attached regions to enhance recombinant protein expression. T-REX, Tet-ON/OFF, Flip-in T-Rex technologies. Sleeping Beauty.
Cell metabolism and its control in culture: Energy sources and metabolic byproducts. Bioreactors for animal cells: Typologies, monitoring and control of bioreactors, strategies to develop serum free medium.
Kinetic models: formulas for cell growth, Labeling Index, flow cytofluorimetry , Mitotic Index and kinetic analyses of a bioprocess.
Staminal cells: Classification: embryo stem-cells and adult stem cells cultures methods
Tissue engineering: Scaffold matrix, skin, cartilage and bone reconstruction. Spheroids and organoids.

Prerequisites

Background: Biochemistry and Molecular Biology.
Specific prerequisites: none.
General prerequisites: Students can take the exams of the third year after having passed all the exams of the first year of the course.

Teaching form

All lessons are held in delivery mode
21 lessons of 2 hours in delivery mode (delivery teaching, DE) focused on presentation-illustration of scientific contents, concepts, principles.
All activities are carried out in person.
Teaching is held in Italian.

Textbook and teaching resource

Learning material (slides of the lessons, scientific papers) is available at the e-learning web page of the course.
Recorded lessons are available on e-learning
Recommended textbooks:
-“Animal Cell Technology: From biopharmaceuticals to gene therapy”- Edited by Castilho LR., Moraes AM., Augusto EFP. and Butler M. –Taylor and Francis.
-“Cell culture and Upstream processing” Edited by Butler M.- Taylor and Francis

Semester

Second semester

Assessment method

Oral Examination. The exam will consist of three questions regarding different topics of the course. The exam will be evaluated considering the ability of the student to integrate the different aspects of the subject in a proper vocabulary. There are no tests in progress.

Office hours

Contact: on demand, upon request by mail to lecturer.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION