UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Functions and Dynamics of Intracellular Proteins

2425-3-E1301Q078

Aims

The course describes the pathway followed by proteins from their synthesis to their secretion or degradation: folding, sorting and degradation. This approach highlights many events of primary importance in the life of the cells and the regulatory and adaptive mechanisms involved. Emphasis is given to pathological outcomes resulting from malfunctions in the above-mentioned cellular events.

1. Knowledge and understanding - the course will provide students with a knowledge of protein folding, sorting and degradation.
2. Applying knowledge and understanding - students will be able to apply the knowledge acquired to the understanding of pathological outcomes resulting from malfunctions of the processes described in the course; this knowledge will also be applied to subsequent courses, especially “Pathologies of metabolism” and “Cellular physiopathology”.
3. Making judgements – at the end of the course, students will be able to understand the different cell processes described in the course and evaluate the pathological consequences of their malfunctioning.
4. Communication skills – at the end of the course, students will acquire a proper scientific language and the ability to describe the topics discussed in the course.
5. Learning skills - this course will provide students with the ability to understand and critically evaluate the experimental methods described in the scientific literature.

Contents

The course is divided into two parts:
Part 1- Protein folding and protein degradation
Part 2 - Protein sorting

Detailed program

Part 1- In vivo protein folding and molecular chaperones (molecular machineries assisting protein folding in prokaryotes and eukaryotes). Cellular devices that implement and control protein intracellular degradation: the ubiquitin-proteasome system and the lysosomal system. Physiological and pathological signals committing proteins to degradation.
Part 2 - Intra- and extracellular protein trafficking. Protein sorting to the secretory and endocytic pathway and the related post-translational modifications. Sorting to the nucleus, to mitochondria, chloroplasts, peroxisomes.

Prerequisites

A basic knowledge of biochemistry and cell structure is required. Essential knowledge will be reviewed before each lesson.

Teaching form

Lessons will take place in person. They will be organized with a frontal part, in which the main concepts will be presented by the teachers, and an interactive part with the students for discussion and in-depth analysis. Some lessons will be fully interactive, in a journal club mode, with students discussing scientific articles, in the presence of both teachers.

Textbook and teaching resource

Molecular Cell Biology (Harvey Lodish & others). W. H. Freeman Editor (subjects related to protein sorting)
Alberts, L'essenziale della biologia molecolare della cellula, ed. Zanichelli
Scientific articles and review will be available on the MOODLE platform.

Semester

Second semester

Assessment method

A final oral examination consisting in 3-4 open questions, aimed at assessing knowledge and ability to understand and critically evaluate the scientific topics of the course. No in itinere evaluations are scheduled.

Office hours

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Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION