UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biotechnology in Diagnostics

2324-1-F0901D029

Aims

The course is aimed at acquiring specific competences in the field of basic and advanced biotechnology-based biochemical diagnostics. It will provide principles of classical and innovative diagnostic techniques for molecular investigation on biological fluids and human tissues, focusing on advanced diagnostic techniques for specific diseases and tumors.

The course will provide biomarker definition, discovery and clinical application, and usefulness of biomarkers in disease prevention, screening and diagnosis. Students will learn concepts about clinical laboratory organization, purposes, practice of analysis, interpretation and patient management.

Contents

The aim of the biotechnologies in the diagnostic field is to create and develop new, rapid and efficient diagnostic tools, using the immunochemistry and nucleic acid hybridization techniques. To reach this objective, it is necessary to have a good knowledge of the basics of Laboratory Medicine (clinical biochemistry and clinical molecular biology).

Detailed program

• General principles of laboratory medicine. Biotechnology in laboratory medicine.

• The laboratory diagnostic process: pre-analytical, analytical and post-analytical aspects.

• The medical laboratory management: quality control; automation and LIS; point of care testing.

• Methodological approaches to clinical biochemistry. Enzime-, immunometry-, and pcr-based assays; signal detection and amplification; different analytical formats; advantages and disadvantages; 1d and 2d electrophoresis; western blotting; protein arrays.

• Biomarkers definition and relative concepts: functional and lesion markers, biomarkers release, diagnostic windows, biomarkers specificity; innovative biomarker discovery, biomarkers in organ and tissue diseases and inborn errors of metabolism: cardiovascular disease risk, myocardial infarction, hepatic diseases and diabetes. Tumour markers.

• Clinical diagnosis of celiac disease; molecular diagnosis of solid tumors, as lung and colon cancer; molecular diagnosis of multiple myeloma.

• Practical laboratory training: 1D and 2D electrophoresis to separate and study biological samples. During this training, students are given the basics for the use of small instrumentation and for practical operations in the laboratory (preparation of aqueous solutions, solvent mixtures, and biological samples).

Prerequisites

Basic knowledge in the field of chemistry, biochemistry, molecular biology, human physiology and pathology

Teaching form

Lectures and laboratory training

Textbook and teaching resource

Material and bibliographic references supplied by the professor

Semester

Second semester

Assessment method

The evaluation is carried out through an oral examination. No in itinere tests are foreseen.

Examination topics include all the program covered in lectures, classroom and laboratory exercises.
Each student is interviewed individually, with a minimum of 4 questions, some of which are about subject knowledge and others about reasoning. Assessment takes into account how well the student focuses the theme of the question, without dispersive digressions, giving the right context to the topic, and the level of confidence in

exposition.

From the academic year 2011-2012 (when the course was included in the degree course) to date, the average score obtained is 28,9/30, considering the 30 cum laude equivalent to 31. Interestingly, the average has risen in the last 3 academic years, with an average of 29,48/30 for a.y. 2019-2020 and 29,54 per for a.y. 2020-2021, with a decrease to 28.4 in the last a.y. 2021-2022. The average percentage of overrun per exam is around 90%. Students who repeat the exam, in most cases refused the score obtained on the first attempt; on the next one, they often achieved excellent results. The average % of refusals per exam is less than 1%.

Office hours

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Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | GENDER EQUALITY