UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Molecular Medicine

2223-1-F0901D055

Aims

The course is intended to provide students with fundamental concepts on translational and molecular medicine and the biotechnological applications in this field. The following topics will be discussed: human physiopathology, molecular pathology, molecular mechanisms of the diseases, immunology within tissues, including brain, lung, liver, gut, and skin, the biological and clinical relevance of immune cells in tissues. The molecular mechanisms of inflammatory processes and pathologies of the immune system and advanced biotechnological applications in molecular medicine will also be discussed. A deeper learning of the experimental processes that led to the identification of the pathogenic mechanisms involved in the neoplastic transformation as well as the role of the microenvironment in tumor progression and drug resistance will be also provided..

Contents

Cellular and organelle pathology. Extra-cellular matrix pathology. Physiopathology and pathology: pathology of blood coagulation, of glicemic control, of the kidney. Molecular mechanisms of the diseases: molecular mechanisms and pathways (tumors and other relevant diseases). Advanced biotechnological techniques and in vitro and in vivo model to study pathogenetic processes at cellular and organism level. Immunity of Mucosal Districts. Cutaneous Immune System. Immunologically privileged tissues. Preclinical models for the study of immunopathological processes. Monogenic defects in primary immunodeficiencies. Models to study the pathogenetic mechanism involved in neoplastic transformation, the role of microenvironment in tumor progression and mechanisms of drug resistance.

Detailed program

CELLULAR AND MOLECULAR PATHOLOGY: Extracellular matrix pathology (amyloidosis, prion disease,

collagenopathies, elastopathies, fibrosis). Intracellular accumulations (metabolic disorders-thesaurismosis, steatosis). Organelles pathology (lysosomal disease, mitochondrial diseaes). Cystic fibrosis. Hemoglobin diseases (sickle cell anemia, thalassemia). Membrane receptors pathologies (familial hypercholesterolemia). Alpha 1-antitrypsin deficiency. DISEASES OF ORGAN SYSTEMS. Red blood cells and bleeding disorders. The kidney (glomerulopathies and tubulopathies, polycystic kidney disease). Diabetes. PHYSIOPATHOLOGY OF IMMUNE SYSTEM AND PATHOLOGY OF IMMUNE RESPONSE: General characteristics of the immune responses of epithelial barriers. Immune System in the Gastrointestinal Tract. Innate and adaptive immunity of the gastrointestinal tract. Control of immunity in the gastrointestinal tract by regulatory T cells and cytokines. Tolerance and oral vaccines. Role of the commensal microbiome in the regulation of the immune system. Diseases related to the immune responses of the intestine. Immune response in other mucosal districts. Immunity in the respiratory system. Immunity in the genitourinary system. Skin immune system. Innate and adaptive immune responses of the skin. Diseases related to immune responses in the skin. Immunologically privileged tissues. Molecular mechanisms in inflammatory processes and immune disorders. Molecular and cellular mechanisms of the main immunopathologies. Autoimmune diseases, animal models and genes involved. GENERAL AND TRANSLATIONAL ONCOLOGY: Models to study the pathogenetic mechanism involved in neoplastic transformation and their effects on the regulation of cellular populations. Models to study the role of microenvironment in tumor progression. Models to study the mechanisms of drug resistance. Models to study of programmed cell death: morphological features and molecular mechanisms (p53, Bcl2 family, IAPs, caspases, Death Receptors). Models of apoptotic dysregulation and molecular target therapy in cancer. Metronomic chemotherapy: a new approach in cancer therapy.

Prerequisites

Knowledge in the field of genetic and biology, biochemistry and cellular biology, human histology and anatomy.

Teaching form

Lesson in attendance, subject to any ministerial changes following the COVID pandemic situation

Textbook and teaching resource

1. Majno G., Joris I. CELLULE, TESSUTI E MALATTIA, 2009, 2 Edizione, Casa Editrice Ambrosiana.
2. Robbins e Cotran, LE BASI PATOLOGICHE DELLE MALATTIE, 8 edizione, Elsevier Masson
3. Moncharmont, PATOLOGIA GENERALE, Edizioni IDELSON-GNOCCHI
4. Stevens A., Lowe J., Scott I. PATOLOGIA 2010, 3 Edizione, Casa Editrice Ambrosiana
5. Abate-Shen C., Politi K., Chodosh L.A., Olive K.P. MOUSE MODELS OF CANCER. A LABORATORY MANUAL. 2014, Cold Spring Harbor Laboratory Press.
6. Abul K. Abbas. MOLECULAR AND CELLULAR IMMUNOLOGY IX Edizione Edra
7. Infection, Immune Homeostasis and Immune Privilege, Joan Stein-Streilein Editor Springer
8. Review and selected papers will be discussed and provided to the students during the course.

Semester

First Year, First Semester

Assessment method

No “in itinere” tests.
Oral discussion about different topics belonging to the classroom lessons (teachers’ choice) to evaluate scientific communication skills and the ability to establish scientific links among different topics.

Oral discussion in attendance, subject to any ministerial changes following the COVID pandemic situation

Office hours

Available on request by email:

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION