UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biology and Genetics - 5

2526-1-I0102D001-I0102D002M-T5

Aims

The student must acquire the knowledge of the basics of cellular and molecular biology, essential for the study and understanding of human physiology and pathology. The student will learn the structure and function of cellular components and related molecular mechanisms; the basic concepts of hereditary traits transmission; the basis for qualitative and quantitative knowledge of biological phenomena.

Contents

The course aims to provide information for understanding the organization of cells. It also aims to convey knowledge of the structure and function of the various components of eukaryotic cells, the molecular mechanisms involved in cell replication, the molecular mechanisms involved in gene expression; the concepts and mechanisms of cell division and sexual reproduction, as well as the basis for understanding genetic variability and the evolution of living organisms.

Detailed program

BIOLOGY AND GENETICS: General Biology - Key features of living matter; the four major classes of biological macromolecules: carbohydrates, lipids, proteins, and nucleic acids; the cell as a structural and functional unit; classification of prokaryotic and eukaryotic cells. Characteristics of the various components of the cell: cell membrane, its formation and characteristics; transmembrane transport and endocytosis; structure and function of the endoplasmic reticulum and the Golgi apparatus; structure and function of mitochondria and lysosomes; cytoskeleton, intermediate filaments microfilaments, microtubules; structure of nuclear membrane. DNA replication: the various protein components that are involved in DNA replication; the processes that take place at the level of the filament and filament delayed of replicative senescence fork. The genome organization in prokaryotes and

eukaryotes: in the eukaryotic organisms, the genetic information is divided among multiple DNA molecules (chromosomes); the problem of compaction of DNA in the nucleus of eukaryotic cells; the information contained in DNA is divided into discrete units (genes) that specify the individual macromolecules structure RNA or proteins). Regulation of gene expression in prokaryotic and eukaryotic cells. The main types of RNA present in cells; differences compared to DNA: the mechanism of synthesis of RNA (transcription); the problem of deciphering the genetic code: general characteristics and biological implications. The mechanism of protein synthesis: the strategy of polymerization of amino acids: amino acid recognition by the messenger RNA and the source of the energy necessary for the formation of eptide bonds; the biological role and structure of ribosomes; the different stages of the translation process. The cell cycle and metabolic events that characterize its phases: control the progression along the cell cycle; consequences of mutations affecting genes for different proteins involved. Cell reproduction and agencies: mitosis as maintenance of genetic information. Meiosis and the crossing-over in the process of genetic variability. The gene mutation at the cellular level: the effects of mutations on the gene product. Communication between cells in the multicellular organisms: notes on exchanging chemical signals with autocrine and paracrine action: overview of general mechanisms of signal transduction within cells.

Prerequisites

Teaching form

Lectures.
Live at Monza campus. Via web-conference (live streaming) for Bergamo, Lecco, Sondrio.

Textbook and teaching resource

P. Bonaldo, C. Crisafulli, R. D'Angelo, M. Francolini, S. Grimaudo, C. Rinaldi, P. Riva, M.G. Romanelli. Elementi di Biologia e Genetica (2019) Edises

Chieffi G., Dolfini S., Malcovati M., Pierantoni R., Poli M., Tenchini M.L. Biologia e Genetica (2013) Edises - IV ed.
Donati C., Stefani M., Taddei N. Biologia e Genetica (2019) Zanichelli

Semester

1 Year - 1 Semester

Assessment method

Written examination: multiple choice

Office hours

On appointment

Sustainable Development Goals

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