UNIVERSITÀ DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Fisiologia 1 A

2425-2-H4101D253-H4101D020M

Aims

The objective of teaching human physiology is to provide students with a solid foundation to understand the normal functioning of the human body, which is essential for recognizing, diagnosing, and treating diseases in their future roles as physicians. During the course, students will learn to interpret physiological data and correlate these data with pathological conditions, developing analytical and critical thinking skills. This will provide the necessary basis for further studies in pharmacology, pathology, pathophysiology, and clinical medicine and surgery. Acquiring measurement techniques and interpreting experimental data are crucial for practical understanding of physiological functions. Furthermore, it is important for students to acquire the ability to communicate clearly and present physiological data in an understandable manner, as well as the skill to solve clinical problems through the application of acquired knowledge.

Contents

The course is based on the systematic presentation of physiological concepts based on the functions of the human body. The mechanism leading to an imbalance of function cannot be appreciated without a deep understanding of the biophysical and physiological basics. Therefore, such mechanisms that ensure the functions at the cellular level, tissues, organs and apparatus and at the integrated level will be introduced. **In particular, this module of the course will address the cellular physiology and the physiology of the renal and digestive systems.**
During the course, the effects of the aging process and gender differences on human physiology will be emphasized.

Detailed program

Cellular physiology. Transport through the plasma membrane, diffusion, active and passive transports. Transport

mediated by carriers and ion channels

Basis of electrophysiology. Membrane potential; electrical characteristics of the cell membrane; membrane channels; ion exchanges, electrical model of the cell membrane; equilibrium potential of an ion (Nerst's law). Sodium-potassium pump. Electrical events in excitable cells. Action potential; propagation of the nervous impulse. Synapses in the central nervous system. Electrical synapses and chemical synapses. Neurotransmitters. Post-synaptic potentials; facilitation and inhibition mechanisms; spatial and temporal summation.

Neuromuscular junction. Physiology of the contraction in smooth and striated muscles. Describes the events of synaptic transmission leading to contraction of skeletal muscle. Excitation-contraction coupling in the skeletal and cardiac muscle. Compare and contrast the basic types of muscle tissue.

Renal System

The fluid compartments of the organism. Electrolyte homeostasis. Antidiuretic hormone. Natriuretic peptides. Role of aldosterone.

Functions of the renal system.. Nerve control of renal function. The nephron. The renal corpuscle. Ultrastructure of the glomerular capillaries. Glomerular filtration. Glomerular filtration coefficient. Starling forces in glomerular filtration. Glomerular Filtration Rate. Regulation of the glomerular filtration rate. Myogenic regulation, tubulo-glomerular feedback (adenosine, renin)

Resorption and tubular functions. Minimum urinary volume required. Maximum concentration of urine. Countercurrent multiplication mechanism. Generation and maintenance of the medullary hyperosmolar gradient. Clearance and renal function. Definition of clearance. Calculation of the clearance for a given compound. Clearance of inulin. The clearance to evaluate renal plasma flow (PAI). Osmolar clearance. Clearance of free water.

Acid-base balance. Henderson-Hasselbach equation. Renal mechanisms for regulating blood pH Chemical buffer systems, bicarbonate reabsorption, hydrogen excretion, urine buffer systems (phosphate and ammonia).

Digestive System

Functions and general characteristics. Structure of the gastro-intestinal tract. Secretion. Motility. Nervous control of the digestive function. Enteric nervous system. Electrophysiology of smooth muscle cells of the gastrointestinal tract. Hormonal control of motility of the gastrointestinal tract (gastrin, CCK, secretin). The oral cavity. The chemical senses of taste: physiology of taste and smell. Salivary secretion. Stomach and gastric secretion (composition and regulation). Intestinal secretions. Pancreatic secretion (composition and regulation). Liver secretion (composition and regulation). Digestion and absorption.

Prerequisites

It is required to have passed the Human Anatomy and Histology exam

Teaching form

All the 42 lessons of 2 hours each will be in person, except in emergencies. They will begin with an initial part where concepts will be presented (lecture-based mode), followed by interaction with students that defines the subsequent part of the lesson in interactive mode.

Teaching methods will include lectures, videos, and class discussions.

Textbook and teaching resource

KLINKE, Fisiologia EdiSES

CONTI, Fisiologia Medica, EDIERMES

GUYTON & J.E. HALL, Fisiologia medica, Piccin

D'ANGELO, PERES, Fisiologia, EDIERMES

GRASSI, NEGRINI, PORRO Fisiologia Medica, POLETTO EDITORE

MC ARDLE, KATCH, KATCH, Fisiologia applicata allo sport, CEA

KANDELL, SCHWARTZ, JESSEL, Principi di Neuroscienze, CEA

Reviews or scientific papers recommended by the Professor During Lectures

Semester

First Semester

Assessment method

For the assessment method, please refer to the general course syllabus.

Office hours

The professors receive by appointment upon agreement by e-mail
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Sustainable Development Goals

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