UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physiology 1 A

2021-2-H4101D253-H4101D020M

Aims

It is essential that all medical students receive sufficient exposure to the physiological concepts underlying the functions of the human body that will provide the basis for further studies in pharmacology, pathology, pathophysiology and medical clinics and surgery. Curricular objectives are mainly focused on the normal function of the body, however, the material is presented in a context that prepares students for their role as doctors. Therefore, whenever possible, clinical examples will be used to illustrate physiological baseline principles.

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, the course will address the physiology of excitable and non-excitable cells, of the cardio-circulatory.

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.

Physiology of the Heart. Structural and functional characteristics of the myocardium. Cardiac automation. Adjustment of heart rate. Rhythmic excitation processes and excitation-contraction coupling. Nervous control of cardiac activity. Cardiac pump mechanics. Cardiac output. Self-regulation of cardiac output (Starling's law). Measurement of cardiac output. Relationship between oxygen consumption and cardiac output (Fick's principle).

The cardiac cycle. Energetics and work of the heart. Mechanisms of intrinsic and extrinsic regulation of the heart. Heart tones.

Circulatory System. Blood and its rheology, biophysics of circulation: Bernouilli's principle, Poiseuille's law. Mechanical properties of vessels: arteries, arterioles, capillaries, veins. Distensibility and 'compliance' of the vessels. Laplace's law. Blood speed. Arterial pressure and its control. Systemic and pulmonary circle. The venous system. Coronary circulation. Splanchnic circulation. Pulmonary circulation. Renal circulation

Prerequisites

Knowledge of the introductory courses indicated in the guidance of the degree course

Teaching form

Lectures. In the Covid-19 emergency period classes take place in

mixed mode: asynchronous / synchronous videotaped lessonswith some events, where possible, in presence. Whenever possible, clinical case analyses will be proposed for the evaluation of the specific physiological parameters.

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

Semester

First Semester

Assessment method

There will be no ongoing tests.

The exam consists in an oral test. Open questions will be posed to the student in order to evaluate the general knowledge of the topics. Moreover, the student will be asked to answer to questions that require the analysis of a complex phenomenon, its rationalization and the application of specific physiology principles and to solve simple exercises. Finally, a clinical case may be presented which will require the analysis of the interconnections between different physiological variables in the light of the theoretical paradigms.

In the Covid-19 emergency period, the exams will be carried out electronically through the platforms made available by the University

Office hours

The professors receive by appointment upon agreement by e-mail