UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physiology

2021-3-H4102D018-H4102D052M

Aims

The course will provide the knowledge to understand the physiological concepts underlying locomotor system functions in order to provide bases for pharmacology, pathology, pathophysiology and clinics of the locomotor system. Describe the mechanisms and regulation of muscle function, the neurophysiology of motor function, from spinal reflexes to cerebral cortical control.

Contents

The structure of skeletal muscle. Molecular mechanism of contraction. Excitation-contraction coupling. Cross-bridge cycle. Force output and motor unit. The control of skeletal muscle contraction. Neuro-muscolar synaptic transmission Muscle fiber types and properties. Spinal reflexes. The Cerebellum and Basal Ganglia: the functional organization of movements. The cortical control of movements. The postural control.

Detailed program

The motor unit and muscle action. The contractile machinery of muscle fibers is organized into sarcomeres and cross-bridges. Contractile force is produced by cross-bridges. Non-contractile components in muscle fibers provide stability for the contractile elements. Contractile force depends on the level of activation of each muscle fiber and its length and velocity. Repeated activation of muscle causes fatigue. The electrical properties of motor neurons determine their responses to synaptic input. Movements are produced by the coordinated work of many muscles acting on skeletal joints. Neurogenic and myopathic diseases. Reflexes are highly adaptable and control movements in a purposeful manner. The stretch reflex acts to resist the lengthening of a muscle. The neuromuscolar spindle: the stretch reflexes reinforce central commands for movements. Golgi tendon organs. Neural networks within the spinal cord generate rhythmic alternating activity in flexor and extensor muscle. Activity

in individual neurons of the primary motor cortex is related to muscle force. Voluntary movement is organized in the cortex. The basal ganglia play a major role in normal voluntary movement. The cerebellum influences the motor systems by evaluating disparities between intention and action. The posture control: when we move we are usually unaware of the complex of our neuromuscular processes but postural control is obvious enough when we accidentally fall or when disease damages parts of the postural system

Prerequisites

Basic knowledge of anatomy and biochemistry

Teaching form

Lectures. Whenever possible, clinical case analyzes will be proposed for the evaluation of the specific physiological parameters. The teaching methods will include lectures, videos, and class discussions.

In the first semester the courses will be delivered in mixed mode from asynchronous remote with synchronous videoconferencing events (WEBEX)

Textbook and teaching resource

- E. R. Kandel, J. H. Schwartz, T. M. Jessel, S. A. Siegelbaum, A. J. Hudspeth, Principles of neural science, Mc Graw Hill Medical

- Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, Richard D. Mooney, Michael L. Platt, Neuroscience (6th Edition) – eBook - Sinauer Associates (Oxford University Press); 6th edition

- Susan E. Mulroney, Adam Myers, Netter's Essential Physiology, Elsevier

Semester

First semester

Assessment method

There will not be on going tests. The exam consists in a written test. Open and closed 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 evidenced theoretical paradigms.

Exams written remotely, unless otherwise indicated by the teacher, will be provided by the platform https://esamionline.elearning.unimib.it, access to which will be activated for the date and time of the exam.

Office hours

By appointment, subject to notification to be sent to giulio.sancini@unimib.it