UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Fisiologia Umana 2 A

2627-2-H4103D007-H4103D00704

Aims

The **Respiratory Physiology** module aims to provide students with fundamental knowledge of the physiological mechanisms regulating pulmonary ventilation, gas exchange, blood gas transport and the maintenance of acid-base balance. By the end of the module, students are expected to understand the principles determining lung volumes and capacities, respiratory mechanics, alveolar-capillary diffusion, the ventilation/perfusion ratio, and oxygen and carbon dioxide transport. Students should also be able to interpret, from a physiological perspective, the main alterations in respiratory function, with reference to conditions such as anaemia, exposure to high altitude, physical exercise, carbon monoxide poisoning, obstructive and restrictive respiratory disorders, pulmonary oedema and acid-base disturbances.

Contents

The module covers the principles of respiratory physiology by integrating the mechanical, haemodynamic, biophysical and metabolic aspects of pulmonary function. Lung volumes and their measurement methods, the composition of respiratory gases, the physical laws governing partial pressure, solubility and gas diffusion, pulmonary diffusing capacity, oxygen and carbon dioxide transport in blood and the role of haemoglobin will be discussed. The ventilation/perfusion ratio, shunt, dead space, respiratory mechanics of the lung-chest wall system, compliance, airway resistance, respiratory work, the role of pulmonary surfactant, mechanisms of acid-base balance and the main physiological and pathophysiological changes in respiratory function will also be analysed.

Detailed program

Lung volumes and partial pressure. Methods for the measurement of pulmonary volumes. Spirometry: static lung volumes. Fowler's method for calculating anatomical dead space. Dilution and plethysmographic method for

calculating the residual volume. Dalton's law. Composition of ambient, inspired and alveolar air. Solubility of plasma gases and oxygen binding with hemoglobin. Henry's law. Fick's law for the diffusion of alveolar gases. Concepts of diffusion and perfusion limitation. Diffusive capacity. Diffusion capacity measurement method (DLCO). Physiopathological alterations of DLCO and its subcomponents. Transit time in the pulmonary capillary. Transport of O2 into the blood. Hemoglobin dissociation curve. Fick's principle. Alterations of O2 transport capacity in anemic patient, at high altitude and in physical exercise. Affinity variation of the hemoglobin dissociation curve as a function of physical and physiological parameters. Carbon monoxide toxicity. CO2 transport in the plasma. Bohr effect. Haldane effect. Bicarbonate buffer. Buffer power of hemoglobin. Acid-base balance. Diagram of Davenport. Acidosis and alkalosis, metabolic and respiratory. Ventilation-perfusion ratio. Regional variations of the VA report

Prerequisites

The prerequisite requirements to be fulfilled in order to sit the Human Physiology exam are those indicated in the Teaching Regulations of the Medicine and Surgery degree programme for the 2026/2027 academic year.

Teaching form

All lessons of 2 hours each will be in person. 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

Please refer to the general course syllabus.

Semester

Second year, second semester

Assessment method

Please refer to the general course syllabus.

Office hours

The professor receives by appointment upon agreement by e-mail
egidio.beretta@unimib.it

Sustainable Development Goals

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