UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physiology

2122-4-H4102D024-H4102D080M

Aims

The course aims to provide a basic understanding of cardiovascular function and its homeostatic regulation; heart-lung interaction and the main consequences of cardiac and vascular dysfunction will also be addressed. The course should provide a background for the pathophysiological interpretation of cardiovascular disease.

Contents

Cardiac physiology and adaptations (in health and disease); physiology of the systemic and pulmonary circulations; regulation of cardiovascular function; methods of measurement of cardiovascular function

Detailed program

The heart

- Structural and functional aspects of cardiac excitation - the electrical cycle (with reference to ECG)

- Structural and functional aspects of cardiac excitation-contraction coupling and its modulation (inotropy, lusitropy)

- The cardiac mechanical cycle (on pressure/time and pressure/volume planes) – definition of “systolic” and

“diastolic” functions and their coupling.

- Cardiac “mechanical” and “chemical” work - relation to cardiac O_2 consumption (myocardial efficiency)

- Cardiac adaptation to preload and afterload changes in health and disease

- Principles of cardiac (systolic and diastolic) functional measurements (invasive and imaging)

The systemic circulation

- Large arteries dynamics: windkessel mechanism, pressure pulse and its propagation

- Small arteries: regulation of peripheral resistance (intrinsic, neural, paracrine)

- Systemic pressure/flow relationship – peculiarities of the coronary circulation

- Determinants of capillary pressure – mechanisms of “edema”

- Mechanisms of venous return (preload maintenance and regulation)

The pulmonary circulation

- Structure-function peculiarities

- Pulmonary vascular resistance : definition, regulation and measurement

- Outline of fetal circulation and characteristics of fetal hemoglobin

- Heart-lung interaction:

Pulmonary circulation impact on right ventricular function

CPAP hemodynamics in the setting of acute heart failure.

Regulation of cardiovascular function

- Pressure / volume homeostasis (neural and endocrine)

- Adaptation to physiologic demand (exercise, gravity, pregnancy etc)

Prerequisites

- Fundamentals of human physiology module (by Profs. Sancini and Rivolta)

- Fluency in English

Teaching form

- All course activities will be held in English

Textbook and teaching resource

- Guyton and Hall Textbook of Medical Physiology 14 edition. Elsevier 2020, Chapters III (The Heart), IV (The Circulation) and VII (Respiration)

- Mohrman DE, Heller LJ. Cardiovascular Physiology 9th edition. McGraw Hill 2018

Semester

- First semester

Assessment method

Oral exam: interview on the lesson topics in English

Office hours

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