



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Biochemistry

2627-4-H4102D120-H4102D103M

Aims

To understand the biochemical pathways underlying the CNS metabolism under physiological conditions. To understand how derangement of metabolism can affect CNS functions. The course will focus on the biochemical and metabolic changes occurring in pathological conditions.

Contents

Metabolism of CNS (saccharides, proteins amino acids, lipids). Biochemistry of the blood-brain barrier. Metabolic changes in pathological conditions. Nutritional aspects. Neurotransmitters.

Detailed program

1. Brain Energy Metabolism and Neurochemistry
Metabolism of carbohydrates, lipids, proteins, and amino acids in the central nervous system.
Neuron-glia metabolic interactions.
Mitochondrial function and bioenergetics.
Metabolism of neurotransmitters and neuromodulators.
2. Blood-Brain Barrier and Blood-Cerebrospinal Fluid Barrier Metabolism
Structure and function of the BBB and BCSFB.
Molecular transport systems and nutrient trafficking.
Metabolic coupling between the CNS and peripheral organs.
Barrier dysfunction in neurological diseases.
3. Metabolic Alterations in Neurodegenerative Disorders
Alzheimer's disease, Parkinson's disease, ALS, and related disorders.

- Mitochondrial dysfunction, oxidative stress, and neuroinflammation.
Metabolic biomarkers and emerging therapeutic targets.
4. Cancer Metabolism in Brain Tumors
Metabolic reprogramming in gliomas and other brain tumors.
Aerobic glycolysis, glutamine metabolism, and lipid metabolism.
Oncometabolites and epigenetic regulation.
Tumor microenvironment and metabolic interactions with neural cells.
Metabolic imaging and therapeutic targeting of tumor metabolism.
 5. Nutrition, Precision Medicine, and Emerging Therapeutic Approaches
Diet, gut-brain axis, and brain metabolism.
Ketogenic and other metabolic interventions.
Metabolomics and systems biology approaches.
Personalized medicine and future therapeutic strategies.

Prerequisites

Basic knowledge of biochemistry, biology and chemistry.

Teaching form

8 h (4 lessons, 2 h each): Frontal Lesson (DE), face-to-face lessons

2 h (1 lesson of 2 h): Frontal Lesson (DE), online lessons

Frontal lectures that require the active participation of students who will be involved in the subject by proposing group work, and discussion of problems related to the change of body metabolism in different conditions.

Textbook and teaching resource

Biochemistry with clinical cases . T. Devlin; Biochemistry, Berg et al.

Scientific papers/reviews, slides and materials used during frontal lessons. All the materials will be loaded on e-learning platform.

Semester

second semester.

Assessment method

Individual written examination

10 multiple-choice questions (3 marks each) on frontal lesson, 1 clinical case question (1 mark) to be completed in 30 minutes.

The questions proposed in the written exam will be constructed in such a way as to induce the student to biochemical-clinical reasoning, to understand the units of measurement and to be able to evaluate the skills and competences acquired according to the objectives of the course.

There are no *itinerare* tests planned.

Office hours

on appointment to francesca.re1@unimib.it

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING
