



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Biochemistry

2627-3-H4102D128-H4102D12802

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#### Aims

To provide the concepts necessary for understanding biological phenomena and the energetic variation associated with them. The course will focus on the molecular basis for understanding the processes underlying the bone and muscle metabolism.

#### Contents

Biochemistry of the bone remodelling. Biochemical markers of bone deposition and reabsorption. Growth factors and hormones involved in bone remodelling. Biochemistry of the skeletal muscle. Metabolic changes in physical exercise. Nutritional aspects and oxidative stress of the locomotor system.

#### Detailed program

1. Biochemistry of Bone Tissue
  - Molecular composition of bone.
  - Collagen and non-collagenous proteins.
  - Mineralization and calcium-phosphate homeostasis.
  - Energy metabolism of bone cells.
2. Molecular Regulation of Bone Remodeling
  - Osteoblasts, osteoclasts, and osteocytes.
  - RANK/RANKL/OPG, Wnt/ $\beta$ -catenin, BMP, and TGF- $\beta$  signaling pathways.
  - Role of hormones (PTH, vitamin D, estrogens, and calcitonin).
  - Osteoimmunology.
3. Bone as an Endocrine Organ and Systemic Interactions

- Osteocalcin, FGF23, and other bone-derived mediators.
- Interactions among bone, kidney, intestine, and muscle.
- Calcium-phosphate metabolism.
- Aging and skeletal fragility.
- 4. Molecular Basis of Bone Diseases
  - Osteoporosis.
  - Osteomalacia and rickets.
  - Osteogenesis imperfecta.
  - Genetic and metabolic bone disorders.
  - Biomarkers and laboratory diagnostics.
- 5. Innovative Therapies and Regenerative Medicine
  - Antiresorptive and anabolic therapies.
  - Biological and molecular therapies.
  - Biomaterials and nanomedicine for bone tissue applications.
  - Regenerative medicine and future perspectives.

## **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 and slides used during lessons. All materials will be loaded on e-learning platform.

## **Semester**

First 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

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