



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biochemistry I

1920-1-H4102D001-H4102D002M

Aims

The Biochemistry I Module aims : i) to provide the concepts necessary to understand the biological phenomena and the energetic changes connected to them, illustrating the complex chemical reactions that give rise to life. Object of study is the structure and transformation of cell components, such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules. The description of the metabolism will take place both qualitatively and quantitatively. ii) to explain how organ functions can be regulated according to their particular biochemical processes, focusing on metabolic integration. iii) to explain how the regulation of metabolism occurs. iv) to illustrate the role of nutrients and balanced nutrition for maintaining the state of health.

Contents

The Biochemistry I module will illustrate the importance of life-sustaining chemical reactions. Object of study are the structure and the metabolic pathways involved in the transformations of cell components, such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules. Moreover the main hormones and their role in the regulation of metabolism will be described . Finally, the main components of the foods (macro and micronutrients, including vitamins and minerals) will be described in relation to a healthy diet.

Detailed program

General Biochemistry and Enzymology: Catalysis and enzyme kinetics. V_{max} and K_m . Factors influencing enzymatic activity. Inhibitors. Allosteric enzymes. Isozymes. Diagnostic use of enzymes and Bioenergetic isoenzymes: Respiratory chain and oxidative phosphorylation. Molecules with high energy content. The production of ATP. Inhibitors and decoupling of oxidative phosphorylation. Glucidic metabolism: Digestion, absorption and transport of carbohydrates. Glycolysis (aerobic and anaerobic). Regulation of glycolysis. Hormones Synthesis of glycogen and glycogenolysis. Metabolism of galactose. Lipid metabolism: Digestion and absorption of lipids.

Catabolism of lipids. beta-oxidation of fatty acids. Role of carnitine. Citric acid cycle. Lipogenesis: biosynthesis of fatty acids; biosynthesis of triglycerides. Regulation of lipolysis and lipogenesis. Metabolism of cholesterol and its derivatives. Cholesterol conversion into steroid hormones and bile salts. Metabolism of ketone bodies. Plasma lipoproteins Metabolism of lipoproteins. Lipoprotein receptors. Protein metabolism: Digestion of proteins, absorption, and transport of amino acids. General metabolism of amino acids. Gluconeogenesis. Regulation of gluconeogenesis. Metabolism of purine and pyrimidine nucleotides: Purine and pyrimidine pathways. Integration of metabolisms. The feeding-fasting cycle. Biochemistry of nutrition: Biochemical aspects of digestive processes and nutrient absorption. Basal metabolism. Water-soluble and fat-soluble vitamins. Homeostasis of the carbohydrates, lipids, and proteins. Diets

Prerequisites

Basic knowledge of biology and chemistry.

Teaching form

Frontal lectures . Students will also be involved in actively participating in lectures, bringing experiences to clinical cases to be discussed in the classroom. During the course, students will be divided in groups to discuss some biochemistry questions on the topics covered in class.

Textbook and teaching resource

Biochemistry with clinical aspects , Thomas Devlin

Biochemistry, Berg et al

Semester

II semester

Assessment method

The evaluation will be unique between biochemistry I and biochemistry II. Written and oral exam: 30 single-choice questions (1 mark each) to be completed in 1 h. The exam is positively evaluated with a mark 18/30 or higher. Oral discussion of the written with possible deepening of one or more topics. 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.

Office hours

on appointment.

