

Course Unit	Biochemistry, Metabolism and Regulation	Field of study	Biotechnology
Master in	Applied Health Sciences - Biotechnology	School	School of Health
Academic Year	2023/2024	Year of study	1
Type	Semestral	Semester	1
Workload (hours)	94,5	Contact hours	T - , TP - , PL - , TC - , S - , E - , OT - , O - 42
		Level	2-1
		ECTS credits	3.5
		Code	5055-669-1102-00-23

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Sandrina Alves Heleno

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. To acquire fundamental knowledge in metabolic processes and regulation towards homeostasis maintenance.
2. To understand the basic biosynthetic pathways for the production of primary and secondary metabolites.
3. To identify the principles of metabolism enzymology and to know the mechanisms of enzymatic regulation.
4. To understand and relate metabolic integration.
5. To characterize the main analytical methodologies of metabolites, techniques to obtain data and main statistical analysis tools applied to their interpretation.

Prerequisites

Before the course unit the learner is expected to be able to:
No prerequisites are needed.

Course contents

Basic concepts of metabolism. Regulatory strategies (metabolic control). Different modes of metabolic regulation Biosignaling and signal transduction mechanisms and chemical communication between cells Revision and integration of primary metabolism Secondary metabolism Enzymology of primary and secondary metabolism Plasticity of the reaction pathways Enzymatic efficiency, recruitment, induction and regulation Metabolic integration and regulation Metabolic adaptations Techniques for metabolite analysis.

Course contents (extended version)

1. Basic concepts of metabolism. Anabolic, catabolic and amphibolic pathways.
2. Regulatory strategies (metabolic control). Different modes of metabolic regulation.
3. Biosignaling and signal transduction mechanisms and chemical communication between cells.
4. Revision and integration of primary metabolism.
 - Metabolic pathways of carbohydrates, lipids, proteins and nucleic acids metabolism.
5. Secondary metabolism.
 - Metabolic pathways of acetate (polyketone compounds), mevalonate and non-mevalonate (isoprenoids).
 - Xiquimate pathway (aminoacids and phenylalanine derivatives) and biosynthesis of alkaloids.
6. Enzymology of the primary and secondary metabolism. Regulatory enzymes and modes of regulation.
7. Plasticity of the reaction pathways. Alternative metabolic pathways and different locations.
8. Enzymatic efficiency, recruitment, induction and regulation.
9. Metabolic integration and regulation. Global perspective and points underlying metabolic pathways
10. Metabolic adaptations. Physiologic answer to different metabolic limitations
11. Techniques for metabolite analysis. Techniques, data gathering and acquisition. Reference values.

Recommended reading

1. Frayn, K. N. (2010) Metabolic Regulation: A Human Perspective, 3rd Edition. Wiley-Blackwell (384 pp).
2. A. Quintas, A. P. Freire, M. J. Halpern, 2008. Bioquímica – Organização Molecular da Vida, Ed. Lidel
3. Bioquímica. M. I. Halpern, Ed. Lidel; J. M. Berg, J. L. Tymoczko, L. Stryer, 2006. "Biochemistry". W. H. Freeman 6th edition
4. D. L. Nelson and M. M. Cox, 2008. "Lehninger, Principles of Biochemistry". W. H. Freeman, 5th edition

Teaching and learning methods

Analysis of syllabus concepts using audiovisual equipment and multimedia. Knowledge integration through the elaboration of scientific works and critical analysis of selected papers. Teaching activity in collaboration with the Polytechnic Institute of Guarda with live classes through videoconference.

Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 60%
 - Development Topics - 40%

Language of instruction

Portuguese

Electronic validation

Sandrina Alves Heleno	Ana Maria Geraledes Rodrigues Pereira	Ana Maria Nunes Português Galvão	Adília Maria Pires da Silva Fernandes
09-01-2024	10-01-2024	12-01-2024	14-01-2024