INSTITUTO POLITÉCNICO DE BRAGANÇA

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	Level	2-1	ECTS credits	3.5
Type	Semestral	Semester	1	Code	5055-669-1102-00-23		

Workload (hours)	94,5	Contact hours	T -	TP -	PL -	TC -	S -	E -	OT -	O 42

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 enzymatyc regulation.
4. To understand and relate metabolic integration.
5. To characterize the main analytical methodolgies 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 mechanims and chemical communication between cells Revision and integration of primary metabolism Secondary metabolism Enzymology of primary and secondary metabolism Plasticity of the reaction pathways Enzymatyc 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 mechanims 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 methabolic pathways and different locations.
8. Enzymatyc 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 throught 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 Geraldes 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