



UCAM
UNIVERSIDAD
CATÓLICA DE MURCIA

Course Guide 2018/2019

Biochemistry and Immunology

Bioquímica e Inmunología

Bachelor in Dentistry

Mode: On Campus

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Biochemistry and Immunology

Module: **Biomedical Sciences.**

Subject: **Biochemistry and Immunology.**

Level: **Basic.**

No. of Credits: **6 ECTS.**

Academic Session: **1st Course – 1st Semester.**

Course Professors: **José Antonio Pellicer Balsalobre.**

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Professor coordinating the Module: **Sonia Sánchez Bautista.**

Brief Description

The aim of Biochemistry and Immunology is to provide students with the necessary knowledge to understand the structure of biomolecules, metabolism and the molecular mechanisms involved in regulation and metabolic integration. Furthermore, it is necessary to know and understand the basic aspects of how the immune system works in health and in sickness; this implies studying its structure and organization, its functions, and the main dysfunctions that lead to disease.

A general objective will be to convey to the students the need to clearly understand the ever increasing influence that the remarkable growth of Biochemistry and Immunology exerts on the sciences in general. Nowadays, Biochemistry and Molecular Biology are considered the most powerful tool to interpret biological phenomena and to be able to advance within the knowledge of the molecular bases of diseases and their treatment. The dentist will deal directly with biochemical processes, albeit only scarcely, and must acquire a sufficient biochemical background to understand and rationally use the advancements within this area that continually modify the practice of their profession.

In relation to immunology, students will get a deep insight into: (I) the different organs and cellular and molecular elements responsible for the induction and maintenance of immune response, (II) the main physiological processes responsible for maintaining a balanced state of health, (III) the alterations related to diseases that arise as a result of excessive or deficient immune responses which are harmful to the body, either because of their aggressive nature, such as those derived from inflammatory or allergic states, or from autoimmune processes, or because of their tolerant or limited action against infectious diseases, tumors, or deficiencies of the immune system itself, and, (IV) the use of pharmacological agents or therapeutic methods aimed at controlling the dysfunction of the immune system or which are relevant to the prevention of human disease or to a degree in Dentistry.

Prerequisites

None.

Objectives

1. To know the structure and classification of the different types of biomolecules necessary for the functioning of living organisms.
2. To understand the functioning of enzymes, enzymatic kinetics, and enzymatic regulation processes.
3. To know the different metabolic pathways, their regulation, and integration to understand metabolism as a whole.
4. To know the main cells that cooperate in immune response and the molecules involved in that cooperation.
5. To know the physiopathological basis of the most frequent alterations in the immune system.
6. To know the importance of the physiological functioning of the immune system, as a system perfectly integrated by different components cooperating for the effective elimination of antigens.

Competencies and Learning Outcomes

Basic competencies

MECES1: Students have demonstrated that they possess and understand the knowledge in an area of study that starts from the basis of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the forefront of their field of study.

MECES2: Students know how to apply their knowledge to their work or vocation in a professional manner and they possess the skills that are usually demonstrated through the elaboration and defense of arguments and through problem-solving within their area of study.

MECES3: Students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant issues of a social, scientific, or ethical nature.

MECES4: Students can transmit information, ideas, problems, and solutions to a specialized and non-specialized public.

MECES5: Students have developed the learning skills necessary to undertake later studies with a high degree of autonomy.

General competencies

G11: To understand the basic biomedical sciences on which Dentistry is based to ensure correct oral and dental care.

G12: To understand and recognize the structure and normal function of the stomatognathic apparatus at the molecular, cellular, tissue, and organ levels in the different stages of life.

Biochemistry and Immunology

Interdisciplinary competencies

CT5: To be able to manage information and knowledge in their disciplinary field, including knowing how to use basic ICT tools as a user.

Specific competencies

CBM1: To understand the biomedical sciences on which Dentistry is based to ensure correct oral and dental care. Among these, appropriate subject matter should include:

- Embryology, anatomy, histology and physiology of the human body.
- Genetics, biochemistry, molecular and cellular biology.
- Microbiology and immunology.

CBM2: To know the morphology and function of the stomatognathic apparatus, including specific appropriate subject matters of embryology, anatomy, histology, and physiology.

Methodology

Methodology	Hours	Hours of Classroom Work	Hours of Non-Classroom Work
Classroom based Classes	30	60 hours (40 %)	
Academic Tutorials	6		
Practicums	15		
Seminars	6		
Classroom Evaluations	3		
Personal Study	63	90 hours (60 %)	
On-line Tutorials	9		
Resolution of Exercises and Practical Cases	9		
Project Completion and Oral Presentations	9		
TOTAL	150	60	90

Syllabus

Theoretical instructional program

BIOCHEMISTRY

Biochemistry and Immunology

1. Water and mineral salts. Molecular structure. Solutions. pH concepts.
2. Carbohydrates.
3. Lipids.
4. Amino acids, peptides, and proteins.
5. Enzymes. Catalysis. Kinetics: The Michaelis-Menten model. Enzyme inhibitors. Enzymatic regulation.
6. Obtaining metabolic energy.
7. Metabolism of carbohydrates. Glycolysis. Metabolism of glycogen. Regulation.
8. Biochemistry of cellular respiration I: Krebs cycle. Regulation.
9. Biochemistry of cellular respiration II: Electron transport chain and oxidative phosphorylation.
10. Metabolism of lipids. Regulation.
11. Nitrogenated metabolism. Regulation.

IMMUNOLOGY

1. Introduction to the study of the immune system. Organs of the immune system. Primary and secondary lymphoid organs.
2. Cells of the immune system. Hematopoiesis and bone marrow.
3. Defense mechanisms of the innate immune system and consequences of its activation.
4. The complement system.
5. Antigens and Antibodies: Immunoglobulins and antigen-antibody interaction.
6. The major histocompatibility complex. Antigenic presentation.
7. Maturation and activation of the B lymphocyte and the production of antibodies. Effector mechanisms in humoral immunity.
8. Maturation, tolerance, and antigenic receptors of the T lymphocyte. Effector mechanisms in cellular immunity.
9. NK cells and their receptors. Mechanisms of target cell destruction.
10. Infection and vaccination.
11. Hypersensitivity.
12. Autoimmunity.
13. The immune response in transplants
14. Immunity and cancer. Theory of immunological surveillance. Tumor antigens.
15. Immunodeficiencies.

Practical instructional program

BIOCHEMISTRY

1. Degradation of starch by salivary amylase. Determination of reducing sugars.
2. Enzymatic kinetics. Phosphatase. Beer-Lambert Law, K_m , the pH effect.
3. Gel chromatography.

IMMUNOLOGY

Biochemistry and Immunology

1. Separation and cell count through the Ficoll gradient. Cell viability study.
2. Determination of auto-antibodies through immunoblotting.
3. HLA typing. Polymerase chain reaction (PCR). Agarose gel electrophoresis. Interpreting results.

Relationship to Other Courses of the Study Plan

This subject, together with other basic courses, helps the dentist to understand how the organism works as a chemical system. It also provides the basis for diagnosing and solving disorders and understanding the action of new drugs.

Grading System

For the February/September Sessions:

1. **Theoretical exams and Academic tutorials (75%):** Exams (or evaluative tests) will be carried out with theoretical-practical questions and resolution of assumptions that include the contents of the material studied. The student's participation will be evaluated through different means such as forums, chats, videoconferences, self-evaluations, activities proposed by the professor, and/or debates.
2. **Practical exams (25%):** The practicums and/or seminars will be evaluated through different grading systems (practical exercises, completion and exhibition of projects, clinical cases, etc....) that include the practical content worked on.

The student shall pass the subject when the weighted average is equal to or greater than 5 points and all the parts that make up the grading system have been passed, with an overall weight equal to or greater than 20%.

If the student has less than 5 in any of the parts with a weight equal to or greater than 20%, the subject will be suspended, and the student must retake the part(s) in the next session within the same academic year. The suspended part(s) in official sessions (February/June) will be saved for successive sessions that are held in the same academic year.

In the event that the subject is not passed in the September session, the passed parts will not count for successive academic years.

The grading system (RD 1.125/2003. of September 5) shall be the following:

0-4.9 Suspended (SS)

5.0-6.9 Passed (AP)

7.0-8.9 Excellent (NT)

9.0-10 Outstanding (SB)

Honorable mention may be granted to students who have earned a grade equal to or greater than 9.0. This number may not exceed 5% of the total number of students enrolled in a subject in the corresponding academic year, unless the number of students enrolled is less than 20, in which case only a single honorable mention may be granted.

Bibliography and Reference Sources

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- Teijón JM, Blanco MD (2017). Fundamentos de Bioquímica Metabólica. 4ª Edición. [*Foundations in Metabolic Biochemistry. 4th Edition.*] Tébar Flores.
- Teijón JM, Blanco MD (2017). Fundamentos de Bioquímica Estructural. 4ª Edición. [*Foundations in Structural Biochemistry. 4th Edition.*] Tébar Flores.

Basic Bibliography for Immunology

Biochemistry and Immunology

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Additional Bibliography

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- International scientific journals of the field: Current Opinion in Immunology, Immunity, Human Immunology, Immunological Reviews, Nature Immunology, The Journal of Immunology o Trends in Immunology.

Related Websites

- Sociedad Española de Bioquímica y Biología Molecular. [*The Spanish Society of Biochemistry and Molecular Biology.*] <http://www.sebbm.es>
- Biomodel: Contains moving and interactive molecular models that, together with the explanatory text, illustrate the three-dimensional structure of proteins. <http://www.uah.es/otrosweb/biomodel>
- Molecular database (NCBI): <http://ncbi.nlm.nih.gov>
- Protein database (PDB): <http://www.rcsb.org>
- BioRom: Aids in the teaching and learning of Biochemistry and Molecular Biology. <http://www.uah.es/otrosweb/biomodel>
- Complementary website to the book Lehninger Principles of Biochemistry (3rd ed., in English) by Nelson and Cox. <http://worthpublishers.com/lehninger>
- <http://pathmicro.med.sc.edu/book/immunol-sta.htm>

Biochemistry and Immunology

- <http://www.whfreeman.com/catalog/static/whf/kuby>
- <http://www.roitt.com>
- <http://www.inmunologia.org>

Study Recommendations

Study of the subject is recommended on a daily, continuous and orderly basis, in order to keep up with the classes and seminars.

Teaching Materials

Classrooms equipped with Internet connection and audiovisual media, API or computer rooms and laboratories will be used.

Tutorials

Brief Description

In academic tutorials, the focus will be to work on Decree No. 359/2009, of October 30th, which establishes and regulates the educational response to the diversity of students in the Autonomous Community of the Region of Murcia.

The activities that are carried out in the Academic Tutorials on this subject are:

- Personal orientation on the contents of the subject and the grading systems.
- Consolidation of knowledge, abilities, skills and attitudes of group work, and oral and written communication.
- Planning and promoting student learning through the provision of bibliographic and documentary sources.
- Advice on how to approach the activities of the practical seminars.

The University also has a Special Body of Tutors that conducts personal tutoring with students enrolled in the degree. The personal tutor accompanies the students throughout the university phase. You can check the following link:

<http://www.ucam.edu/servicios/tutorias/preguntas-frecuentes/que-es-tutoria>