

Microbiology

Code: 100771
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OB	2	2

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

Although there is no official prerequisite, students are advised to review the concepts that refer to the microbial world, studied previously.

Objectives and Contextualisation

This is a compulsory subject of the degree of Biology, which introduces students to the microbial world, giving a general vision of microorganisms, in connection with other living beings and the different environments in which microorganisms live.

This subject, given its introductory approach, gives the most basic concepts and competences related to Microbiology, so that students can go into the following courses in the rest of subjects that are part of the subject called Microbiology.

Objectives of the subject:

To broadly recognize the microbial diversity and to know how to distinguish the characteristics that define the different microbial groups.

Identify the different structures, as well as the composition of the prokaryotic cell.

Understand the metabolic versatility of the prokaryotes.

To know the main mechanisms for the exchange of genetic information between prokaryotes.

Describe the microbial growth and the physical and chemical processes that are used for its control.

Understand and know how to apply basic laboratory techniques to work experimentally with microorganisms.

Understanding how microorganisms are related to humans.

Content

CONTENTS THEORETICAL CLASSES

Topic 1. The world of microorganisms.

Object of study of Microbiology. The microorganisms definition and type. Discovery of microorganisms. Pasteur and the defeat of spontaneous generation. The Koch postulates. Pure culture, clone, strain and bacterial species. Taxonomy and bacterial systematics. Nomenclature of species.

Topic 2. The prokaryotic cell.

Differences between prokaryotic and eukaryotic cells. Microscope observation. Morphology and cell size. Differential characteristics of the Bacteria and Archaea domains.

Topic 3. The prokaryotic cell envelope and motility.

The cell wall of gram-positive and gram-negative bacteria. The stain of gram. Structure of the peptidoglycan. Bacteria without peptidoglycan. The external membrane of gram-negative bacteria. The cell wall of the archaea (Archaea). The layers S. Capsules and mucous layers. Fimbria, pili and flagella. Motility. The flagella of the spirochetes, the movement by sliding.

Topic 4. Intracellular inclusions and forms of bacterial differentiation.

Functional and reservation inclusions. Endospores. Spores. Fruitful bodies.

Topic 5. The cell cycle of prokaryotes.

Binary fission. Generation time. Exponential growth. Discontinuous culture. Continuous culture. Factors that affect bacterial growth.

Topic 6. Cultivation of microorganisms, methods of identification and conservation systems.

Media culture for the isolation of bacteria, viruses and fungi. Identification methods: biochemical, immunological and genetic identification. Conservation systems. International collections of microorganisms.

Topic 7. Control of microbial growth.

Physical control, mechanical control and chemical control of growth. Antimicrobials for external use and antimicrobials for internal use. The antibiogram.

Topics 8. Fundamentals of bacterial genetics.

Spontaneous and induced mutations. Selection of mutants. The Ames test. Mechanisms of genetic transfer: Conjugation, transformation and transduction.

Topic 9. Global metabolic scheme.

Metabolic diversity. The phototrophic life system: anoxygenic photosynthesis, red sulfur bacteria and other photosynthetic bacteria. Chemolithotrophy: the oxidizing bacteria of reduced sulfur compounds; Iron oxide bacteria; Nitrifying bacteria. Autotrophy: the cycle of Calvin, the reverse cycle of citric acid and the hydroxypropionate pathway. Aerobic respiration and anaerobic respiration. Chemoheterotrophy. Fermentation: fermentation of lactic acid, bacteria of lactic acid; Acid-mixed and butanediolic fermentation, enterobacteria. Nutrient cycles and microorganisms.

Topic 10. Interactions of the microorganisms with the human species.

Beneficial interactions of microorganisms with humans. Interactions of pathogenic microorganisms with human beings: virulence factors. Host factor in the infection. Principles of epidemiology.

CONTENT SEMINARS

Preparation and presentation by students of current affairs in the field of microbiology.

LABORATORY PRACTICAL CONTENTS

Practice 1. Methods for determining microbial concentration.

Microorganism count: count of viable and direct or total count (Breed).

Design of dilution banks and culture on plates.

Practice 2. Observation of microorganisms.

Observation of microorganisms in vivo with optical microscopy. Motility: pending drop technique. Prokaryotic staining techniques: Simple and differential stains.

Practice 3. Isolation and identification of microorganisms.

Methods for the isolation of microorganisms. Selective and differential culture media. Obtention of isolated colonies on plate culture media. Biochemical tests to characterize and identify microorganisms.

Practice 4. Clinical Microbiology. Antibigram.

Sensitivity of microorganisms to antibiotics. Technique of diffusion in plate.

Practice 5. Ubiquity.

Observation of the presence of microorganisms in different environments.