

# Degree Course: FOOD SCIENCES AND TECHNOLOGIES

## Subject: GENERAL MICROBIOLOGY

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### AIMS

The module of *General microbiology* aims to give, also by training activities in laboratory, specific basic knowledge on microorganism world concerning cellular organization, metabolic and genetics. Moreover, the students will learn some practical aspects of the general microbiology, among which the microorganism recognition by microscopic observation, Gram staining, and their correct manipulation. Throughout the training in the laboratory, adequate emphasis on the strategies to use in order to operate under optimal safety conditions will be given.

### PROGRAM

Introductory lesson: presentation of the contents of the program, the suggested reference text and the evaluation methods adopted. The world of microorganisms: microorganisms; microbial genetics; microbial metabolism and ecology; general information on microorganisms and diseases. Bacteria: morphology of bacterial cells; the cytoplasm; the cellular envelope; the surface of the bacterial cell; general information on bacterial taxonomy. Eukaryotic microorganisms: the typical morphology of eukaryotic cells; the replication of eukaryotic microorganisms; the origin of eukaryotic cells. The Archaea: general information. Viruses: general information on viruses; virus cultivation, purification and quantification; virus-like particles. Cultivation of microorganisms: nutritional needs of microorganisms; factors affecting microbial growth; the cultivation of microorganisms in the laboratory; measuring the growth of the bacterial population; the elimination of bacteria or the prevention of growth. DNA replication and gene expression: the role of DNA; general information on replication, transcription and translation; the effects of mutations. Viral replication strategies: recognition of host cells; viral entry and dispossession; viral replication; assembly and viral output. Genetic analysis in bacteria: bacteria as subjects in genetic research; strains, mutants and mutations; general information on restriction enzymes, vectors and cloning; DNA recombination and transfer. Gene expression regulation: differential gene expression; the operon. Biogeochemical cycles: cycles driven by carbon metabolism; cycles driven by nitrogen metabolism. Microbial ecosystems: microorganisms in the environment; structure of microbial communities; terrestrial ecosystems. Microbial symbionts: the types of microorganism-host interaction; plant symbionts; lichens; vertebrate symbionts: rumen fermentation. Microscopy: principles of microscopy; optical microscopes; phase contrast microscopy; electron microscopy.

Laboratory training - Basic microbiological methodologies and techniques useful to guarantee asepsis and antisepsis throughout the work phases in the laboratory. Basic methodologies and techniques on optical microscopy useful to guarantee the best using the available equipment. Slide technique preparation for observing pure culture of bacteria and yeasts; recognition of the structural differences between prokaryotic and eukaryotic cells. Preparation of bacterial cultures for microscopic observation of their ability to move by Kock slide; recognition of the strains able to move. Gram staining; microscopic observation using the 100-x objective of the obtained slides; recognition of the Gram+ and Gram- bacteria; identification of the possible flaws of each slide. Preparation of Petri plates by pouring the sterilized media. Streaking technique on solid media by sterile loop to obtain microorganism in pure culture.

### TEXT ADOPTED

Wessner D.R., Dupont C., Charles T.C. - Microbiologia. Prima edizione. Casa Editrice Ambrosiana (MI), 2015.

### JUDGMENT

Oral examination in Italian or English language.