



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Immunologia Applicata

2627-1-F0602Q071

Aims

1. Knowledge and understanding

At the end of the course, students will have acquired an advanced understanding of the functioning of the immune system under both physiological and pathological conditions. In particular, they will understand the immunological mechanisms involved in autoimmune, autoinflammatory, infectious, and neoplastic diseases, as well as the principles of neuroimmunology, immunometabolism, immunosenescence, and the immunological changes occurring during pregnancy. Students will also gain knowledge of the biological principles underlying modern immunotherapies and targeted therapeutic approaches.

2. Applying knowledge and understanding

Students will be able to apply the knowledge acquired to interpret the immunopathological mechanisms underlying major diseases, understand the biological rationale of innovative therapeutic strategies, and critically analyze alterations of immune responses in different physiological and pathological settings. They will also be able to integrate immunological knowledge with concepts from other biomedical disciplines to better understand the complexity of immune-mediated diseases.

3. Making judgements

Students will develop the ability to critically evaluate scientific evidence concerning the role of the immune system in different diseases and throughout the various stages of life. They will be able to discuss the strengths and limitations of current immune-targeted therapeutic strategies and formulate independent judgments on the interpretation of experimental and clinical data reported in the scientific literature.

4. Communication skills

Students will be able to use appropriate scientific terminology to describe the immunological mechanisms covered during the course, critically discuss the biological basis of immune-mediated diseases, and communicate complex

scientific concepts clearly and effectively, both orally and in writing.

5. Learning skills

Students will acquire the skills necessary to independently expand their knowledge through the consultation of international scientific literature and will be able to critically keep up to date with recent advances in immunology, neuroimmunology, immunometabolism, and immunotherapy, developing a lifelong learning approach that is essential for biomedical research and professional practice.

Contents

Synthetic contents

- Current methodologies for the advanced study of immunology and rare populations of immune cells: scRNAseq, multiplexed imaging, spatial transcriptomics
- Rare populations of immune cells: subpopulations of DCs and neutrophils, unconventional T cells.
- New theories on inflammation and new concepts of inflammation.
- Alterations in the mechanisms of resolving the inflammatory process and chronic inflammation.
- Examples of chronic inflammations.
- Tumor immunology and immunotherapies.
- Neuroimmunology (AD, Parkinson's, MS).
- Immunity during pregnancy.
- Immunity during aging and aging of the immune system.
- Tissue resistance and tolerance.
- Theory of "trained immunity".
- Immunometabolism

Detailed program

Lectures program

Lesson 1: Introduction to the course

Lesson 2: scRNAseq, spatial transcriptomics

Lesson 3: Multiplexed imaging

Lesson 4: Subpopulations of neutrophils and DCs

Lesson 5: Unconventional T cells

Lesson 6: New theories on inflammation and new concepts of inflammation

Lesson 7: Alterations in the mechanisms of resolving the inflammatory process and chronic inflammation

Lesson 8: Examples of chronic inflammations

Lesson 9: Tumor immunology I

Lesson 10: Tumor immunology II

Lesson 11: Immunotherapies and new generations of vaccines

Lesson 12: Neuroinflammation and neuroimmunology

Lesson 13: Neuroinflammation in neurodegenerative diseases: AD, PD, MS

Lesson 14: Immunity and tolerance during pregnancy

Lesson 15: Immunity during aging and aging of the immune system

Lesson 16: Theory of "trained immunity"

Lesson 17: Concepts of tissue resistance and tolerance

Lesson 18: Immunometabolism

Lesson 19: Student presentations of scientific articles and class discussion

Lesson 20: Student presentations of scientific articles and class discussion

Lesson 21: Student presentations of scientific articles and class discussion

Prerequisites

The knowledge of the basic mechanisms of functioning of the immune system is required.

Teaching form

All lessons will be held in person in English.

A video recording will be provided for each lesson.

The following will be conducted:

18 lessons of 2 hours each in a didactic mode, where the concepts related to the topics will be explained.

6 lessons of 2 hours each in an integrative mode, where a group of students will present a scientific article related to one of the course topics and another group will ask questions and moderate a scientific discussion involving the entire class.

Textbook and teaching resource

Slides from the instructor, original articles provided by the instructor (in English), review articles for further study provided by the instructor (in English).

For those who need to review the basic concepts of immunology, the following reference texts are recommended: ImmunoBiology, The Immune System in Health and Disease by Janeway, Travers (latest English edition or the latest edition of the Italian translation, Piccin).

Semester

First semester

Assessment method

Students will be assessed through an oral exam, which will consist of a discussion on the topics covered in the lessons.

For students who choose to participate in the scientific seminars (discussion of the scientific article or moderation of the discussion on scientific articles), these seminars will count as their interim assessment.

Office hours

Reception hours ON APPOINTMENT to be requested by email:

VENERDI 9:30-11:30

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING
