UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applied Immunology

2425-1-F0601Q071

Aims

1. Knowledge and understanding
   The aim of the course is to provide knowledge about the functioning of the immune system in various pathological contexts and at specific moments in an individual's life.
   In particular, attention will be given to immune system dysfunctions that lead to chronic pathological contexts, such as autoinflammatory diseases, tumors, autoimmune diseases, and some diseases associated with infection, such as COVID-19, where the immune system is dysfunctional.
   The course will provide the latest knowledge on neuroimmunology and immune system dysfunctions in neuropathological contexts.
   It will also discuss how dysfunctional immune responses can be manipulated through the development of targeted therapies.

2. Ability to apply knowledge and understanding
   The course will provide the foundation for understanding the changes that accompany the immune system during aging and will explain recent theories in this field, such as 'tissue tolerance'. The immunological changes that occur during a particular phase of life: pregnancy, will also be discussed.
   In the context of immunometabolism, it will be understood how certain cellular processes support immune functions and how their alteration can lead to diseases.
   The general objective is the acquisition of in-depth knowledge of the immune system in various pathological and non-pathological contexts.

3. Autonomy of judgment
   Through the discussion of scientific articles, critical thinking will be promoted, and autonomy of judgment will be assessed.

4. Communication skills
   Through oral exams and class discussions, communication skills will be promoted and evaluated.

5. Learning ability

Learning ability will be assessed through oral exams.

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.
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 decide to participate in scientific seminars (discussion of scientific articles or moderation of the discussion on scientific articles), these seminars will count as an in-progress assessment where the presenter's ability to present, understand, and critically evaluate a scientific work in immunology will be evaluated.

Office hours

Reception hours ON APPOINTMENT to be requested by email:

VENERDI 9:30-11:30

Sustainable Development Goals