UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Medical Microbiology A

2021-2-H4101D256-H4101D174M

Aims

The acquisition of the fundamental notions on microrganisms of clinical interest (viruses, prokaryotic and eukaryotic microrganisms), microbiological characteristics and their mechanisms of pathogenicity.

The principles of microbiological diagnostics, the mechanisms of action of antimicrobial drugs and strategies for the prevention of infectious diseases will also have to be examined in depth.

Contents

General Microbiology: Structure, organization, metabolism and mechanisms of replication of bacteria, viruses, fungi and protozoa. Mechanisms of transferal of genetic material among bacteria. Pathogenicity and relationship host-microorganism. Mechanisms of action of the major antimicrobial agents. Resistance to antimicrobial drugs.

Strategies for infection control and vaccine development.

Systematic Microbiology: Bacteriology, Virology, Mycology and Parasitology. General criteria for the classification of microorganisms. Microbial agents responsible for human infection and their mechanisms of pathogenicity; laboratory diagnosis and treatment/prevention of associated infectious diseases.

Detailed program

GENERAL MICROBIOLOGY

Structural, biological characteristics and relations with the host of the main groups of pathogenic microorganisms. Principles of microbial taxonomy.

• Bacteria

-Differences between the structure and the existing organization in the cells of prokaryotes and eukaryotes;

- The structure and functions of the different components of the bacterial cell;

-Structure and function of the bacterial spore;

- Reproduction modality of bacteria;

- Fundamentals of bacterial metabolism and fermentation products used for the identification of bacteria;

- Methods for the isolation and identification of bacteria from pathological materials;

-Pathogenic pathogen of bacteria: infection modalities and methods of transmission of bacterial infections; bacterial virulence factors;

-Bacterial toxins: exotoxins and endotoxins (structure, biological activity, role in the pathogenesis of infectious diseases);

- Methods for the control of microorganisms (sterilization and disinfection);

- Action mechanism of antibacterial drugs;

- Methods of assessment of the in vitro sensitivity of microorganisms to antimicrobial drugs;

-Mechanisms of transfer of genetic material between bacteria (transformation, transduction, conjugation), with particular reference to the transfer of pathogenicity and antibiotic resistance factors;

-Introduction to the diagnosis and prophylaxis of microbial infections;

• Mushrooms

-Morphology, ultrastructure and function of the components of the fungal cell;

-The modalities of reproduction of mycetes and their implications for classification and identification;

- Mode of infection;

-Mechanism of action of antifungal drugs;

• Protozoa

-Structure and reproduction cycles of protozoa;

- Mode of infection and vectors;

• Virus

-Structure and function of virus components;

- Virus-cell reports and the mechanisms of multiplication of bacterial and animal viruses;

- Transmission modality of viral infections;

-The stages of viral infection and the consequences of cell damage;

-Concept of persistent, slow, latent infection

-Principles of virological diagnostics;

- Methods of cultivation and titration of bacterial and animal viruses;

- Methods of highlighting the antigen-antibody reaction and their application;

-The regulation of the synthesis, the mechanism of action and the protective role of interferon in viral infections;

- Action mechanism of antiviral drugs;

-Rational bases of immunotherapy and vaccine preparation.

SPECIAL MICROBIOLOGY

BACTERIOLOGY

The main microbial species responsible for infections in humans, with particular attention to biological characteristics in relation to their pathogenic action.

-Flora normal microbial of the human body: composition in the various apparatuses and its role.

- Principles of bacterial classification.

-Staphylococci: *Staphylococcus aureus*, S. epidermidis and other CoNS; virulence factors and main infections

-Streptococci: *Streptococcus pyogenes*, *S. agalactiae* and *S. pneumoniae*. Overview of other groups of streptococci responsible for infections in humans

-Enterococci

- Gram-negative cocci: *Neisseria meningitidis*, *Neisseria gonorrhoeae*, notes on other members of Neisseriaceae

-Genre Bacillus: *Bacillus anthracis*, notes on other bacilli

-Genre *Clostridium*: species responsible for infections in humans

-*Corynebacterium diphtheriae*: criteria of distinction from other corinebacteria, the production of diphtheria toxin and its role in the pathogenesis of diphtheria

-*Listeria monocytogenes*

-*Mycobacterium tuberculosis* morphological and cultural characteristics, pathogenesis, immunity, laboratory diagnosis, outline of treatment and prevention. Notes on M. leprae and MOTT group

-Enterobacteriaceae: general characteristics and criteria of distinction and identification of *Escherichia coli*, *Shigelle* spp., *Salmonella* spp, *Proteus* spp, *Yersinia* spp. Metabolic and antigenic characteristics and virulence factors

-*Vibrio cholerae*: strains responsible for cholera epidemics; the cholera toxin

- Non-fermenting Gram-negative bacilli; *Pseudomonas aeruginosa*, *Acinetobacter baumannii*

- Gram-negative aerobe bacilli: *Haemophilus*, *Bordetella pertussis*, *Brucella* spp

-*Legionella pneumophila*: pathogenicity and particular cultural characteristics

-*Treponema pallidum*: syphilis and serological diagnosis of syphilis

-Leptospires and important Borrelias in human pathology

-*Helicobacter pylori*: characteristics, pathogenesis, laboratory diagnosis

-General characteristics and main pathogenic species of *Rickettsiae* spp and *Chlamydiae* spp.

-Mycoplasmas and forms L: *M. pneumoniae* and primary atypical pneumonia

- Notes on pathogenic *Actinomycetes* for humans.

MYCOLOGY

- Agents of deep or systemic mycosis: description of the morphological, cultural and pathogenic characteristics of the main species

- Subcutaneous mycosis agents: description of the morphological, cultural and pathogenic characteristics of the main species

- Surface and cutaneous mycosis agents: description of the morphological, cultural and pathogenic characteristics of the main species

-Candida albicans and related yeasts

- Opportunist fungal infections: *Aspergillus* spp., Other fungi

PARASITOLOGY

- General protozoa classification criteria

-Amoebe: morphological characteristics and modalities of reproduction of the main pathogenic species

-Flagellates of the digestive and urogenital tract: characteristics of *Giardia* and *Trychomonas* and of the infections they sustain

-Flagellates of blood and tissues (*Trypanosoma* and *Leishmania*): description of the cycle and methods of infection of the main species

- Malaria levels: life cycle, pathogenesis, diagnosis, epidemiology, treatment and control.

-*Toxoplasma gondii*

- Notes on Helminths: Nematodes, Trematodes and Cestodes.

VIROLOGY

- General classification of viruses

- DNA virus: Poxvirus, Herpesvirus, Hepadnavirus (hepatitis B virus), Papillomavirus, Poliomavirus, Adenovirus, Parvovirus (virus B19)

-RNA virus: Picornavirus, Calicivirus, Coronavirus, Arenavirus, Flavivirus, Togavirus, Coranavirus, Human retroviruses,

-Paramixovirus, Ortomixovirus, Rabdovirus.

CLINICAL MICROBIOLOGY

Etiologic agents and diagnostic tests related to respiratory infections; of the central nervous system; of the gastrointestinal apparatus, of the genitourinary system. Infections in pregnancy, of the fetus, of the newborn and of the infancy; systemic infections; heart; skin; bones; of opportunistic and nosocomial joints and infections.

Direct and indirect diagnostic techniques in: Bacteriology, Virology, Mycology and Parasitology. Evaluation of the "in vitro" sensitivity of microorganisms to antimicrobial drugs.

Prerequisites

Basic knowledge in the field of anatomy, biology and genetics

Teaching form

Lectures and laboratory practice.

Textbook and teaching resource

1. Microbiologia Medica. Giorgio Poli, Giuseppe Cocuzza, Giuseppe Nicoletti. Ed. UTET

2. Microbiologia Medica. Sherris. Ed. EMSI

3. Microbiologia Medica. La Placa. Ed. Esculapio

4. Principi di Microbiologia Medica. Antonelli, Clementi, Pozzi e Rossolini Ed. Casa Editrice Ambrosiana

5. Manuale di Virologia Medica. Dianzani, Antonelli, Capobianchi, DoleiEd. McGraw-Hill

Semester

II year - IV semester

Assessment method

Written and oral exam:

The written exam will consist of 20 multiple choice quizzes (5 answers, one of which only exact) and two open questions. At the return of the elaborate the oral will focus mainly on the elaborated papers.

Office hours

Every week day by appointment