Textbook - Warren Levinson et al. Review of Medical Microbiology and Immunology. 15th edition

Faculty of Medicine

Module 13

Thematic Plan of Lectures and Practical Classes

Study Weeks	Lectures	Duration (hours)
1.	Introduction of study course. Bacteria Compared with other microorganisms. Structure of bacterial cells.	1h.
2.	Growth of Bacteria. Genetics of bacteria. Human normal microflora.	1h.
3.	Pathogenesis of bacterial infections. Types of bacterial infection. mechanisms of toxin production. Invasion and inflammation. Exotoxins and endotoxins, their comparative description and modes of action. Stages of Infectious infections.	1h.
4.	Laboratory Diagnosis of Infectious Diseases. Sterilization and disinfection. Bacterial Vaccines.	1h.
5.	Antimicrobial Drugs: Mechanism of Action and antibiotic resistance.	1h.
6.	Gram-positive and Gram-negative cocci - *Staphylococcus spp., Streptococcus spp., Neisseriaceae*.	1h.
7.	Medically important Gram-positive rods - spore-forming and non-spore-forming Gram-positive rods.	1h.

Study Weeks	Practical Classes	Study Materials
1.	• Classification of major groups of organisms causing infectious diseases in humans • Discussion about important features of microbes • Eukaryotes and prokaryotes • Bacteria according to their shape and size • The structure of Bacteria (cell wall, cytoplasmic membrane, cytoplasm, etc.) • Structures outside the cell wall (capsule, flagella, pili, glycocalyx, etc.) • Bacterial staining methods *Laboratory Session - staining techniques (Gram and other methods)*	**Levinson's** chapters 1,2
2.	• The **growth cycle** • The aerobic and anaerobic growth	**Levinson's**

	• Importance of sugar fermentation, and iron metabolism. • B**acterial genetics**: types of mutations and their importance. Transposons and transfer of DNA within Bacterial cells, Programmed rearrangements. • Transfer of DNA between Bacterial cells; conjugation, transduction and transformation • Explain recombination: homologous and nonhomologous • **Normal flora** – Concept of Normal flora. The human microbiome. *Laboratory Session - Types of nutrient media. Cultivation technique*	Chapters 3,4, 6
3.	• **Principles of pathogenesis** (opportunistic pathogens, virulence) • Types of bacterial infections, mechanisms of toxin production, invasion and inflammation, and intracellular survival. Explain endotoxins and exotoxins, their characteristics, and their mode of action. • Exotoxins of Gram-positive bacteria, • Exotoxins and endotoxins of Gram-negative bacteria (septic shock, hemolytic-uremic syndrome, fever, disseminated intravascular coagulation - DIC, systemic inflammatory response syndrome - SIRS) endothelium damage, cytokines - IL, TNF involvement). • Discussion of transmission, portals of entry of some common pathogens. • Stages of an infectious disease	**Levinson's** Chapter 7
4.	• **Antimicrobial drugs**, and their targets (cell wall, ribosomes, nucleic acids, cell membrane). • Additional mechanisms of action (isoniazid, metronidazole, ethambutol, pyrazinamide); • *Laboratory Session - defining antibiotic sensitivity: disc diffusion (Kirby-Bauer) method and its interpretation*	**Levinson's** Chapter 10
5.	• **Principles of antibiotic resistance** - four major mechanisms (enzyme production, synthesis of modified targets, reducing permeability, MDR and "efflux" pumps), high and low-level resistance. Principles of a combination of antibiotic therapy and clinical importance; • **Principles of sterilization and disinfection**, and their clinical importance. • **Bacterial vaccines**, active and passive immunity *Laboratory Session - defining antibiotic sensitivity: disc diffusion (Kirby-Bauer) method and its interpretation*	**Levinson's** Chapters - 11,12,13
6.	• **Gram-positive cocci:** • Discuss Staphylococcus, diseases related to staphylococci, important properties, transmission and pathogenesis, clinical findings related to *S. aureus*: pyogenic diseases, toxin-mediated diseases, Kawasaki disease, *S. epidermidis,* and *S. saprophyticus.* • Laboratory diagnosis of staphylococcal infections; • Discuss Streptococci, diseases related to this agent, • Important properties and classification of streptococci.	**Levinson's** Chapters 15,16

	• Important features of *S. pyogenes* and classification. laboratory diagnosis and treatment of *S. pyogenes* infections. • Other important streptococcal pathogens - transmission and pathogenesis; • *Streptococcus pneumoniae* - diseases, transmission, pathogenesis, treatment, and prevention;viridans Streptococci (*S. mutans, S. salivarius, etc.*) • Microbiological and immunological methods for diagnosis, treatment, and prevention of different groups of streptococci; • **Gram-negative cocci**: *Neisseria meningitidis, Neisseria gonorrhoeae* - diseases, diagnosis, treatment and prevention. *Discussion of clinical cases*	
7.	• Medically important Gram-positive rods: **Spore-forming Gram-positive rods:** • B. cereus, B. anthracis – diseases, transmission, pathogenesis, clinical signs, laboratory diagnosis, treatment, and prevention. • Clostridium - *C.tetani, C.botulinum, C.perfringens, C.difficile* diseases, transmission, pathogenesis, clinical signs, laboratory diagnosis, treatment, and prevention. **Non-spore-forming Gram-positive rods:** • *Corynebacterium diphtheriae* - diseases, transmission, pathogenesis, clinical signs, laboratory diagnosis, treatment and prevention. • *Listeria monocytogenes* - diseases, transmission, pathogenesis, clinical signs, laboratory diagnosis, treatment and prevention. • *Gardnerela vaginalis* - disease, transmission, pathogenesis, clinical signs, laboratory diagnosis, treatment and prevention. *Discussion of clinical cases*	**Levinson's** Chapter 17