Block Objectives: Basic Infectious Diseases Block

Course: Intro to Infectious Diseases

IID-BASID-01 Virtual Lab: Infectious Disease Laboratory Session

1. Identify etiologic bacterial organisms from clinical case studies based on the following: Discriminating between pathogenic and commensal organisms
2. Identify etiologic bacterial organisms from clinical case studies based on the following: Performing and microscopically examining a Gram stain
3. Identify etiologic bacterial organisms from clinical case studies based on the following: Interpreting metabolic and biochemical tests
4. Identify etiologic bacterial organisms from clinical case studies based on the following: Assessing antibiotic sensitivity

IID-BASID-02 Clicker Lecture: Bacterial Classification, Morphology and Cell

1. Recognize the shapes and arrangements of common bacteria
2. Explain the principle of the Gram stain and its purpose
3. Explain how the cell wall affects Gram staining characteristics
4. Compare and contrast the structure and chemistry of the Gram positive and Gram negative cell walls
5. Explain the significance of lipid A and the O antigen of LPS
6. Discuss the basic structure and biosynthesis of Peptidoglycan and LPS
7. Explain how the cell wall affects susceptibility to penicillin and lysozyme
8. Contrast the bacterial ultrastructure (internal structures, cell envelope) with that of eukaryotic cells
9. Distinguish the various bacterial external structures (capsule, appendages)

IID-BASID-03 Clicker Lecture: Bacterial Metabolism, Growth, and Genetics

1. Define the factors that regulate bacterial growth and metabolism
2. Explain how specific growth characteristics are relevant in identification of pathogenic organisms
3. Identify the phases of the typical bacterial growth pattern
4. Discuss bacterial spore formation and germination and the conditions under which each might occur
5. Describe the formation of biofilms and what role they play in bacterial pathogenesis
6. Examine bacterial gene expression and list therapeutic targets in transcription and translation
7. Explain bacterial replication
8. Briefly describe the mechanisms for transformation, transduction, transposition, and conjugation in bacteria.
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10. Discuss the consequences of horizontal gene transfer.
11. Discuss the development and transfer of antibiotic resistance in bacteria.
12. Define genetic recombination and describe the processes used by bacteria to transfer DNA from one organism to another.
13. Compare the mechanisms of genetic recombination in bacteria.
14. Describe the functions of plasmids and transposons.
15. Develop an understanding of bacterial genetic systems and how they relate to important bacterial processes.

IID-BASID-04 Clicker Lecture: Mechanisms of Microbial Pathogenesis

1. Define and discuss the terms normal flora, commensal, opportunist, and pathogen.
2. Explain the concept of carrier state.
3. Discuss the benefits derived from normal flora as well as the disadvantages.
4. Compare and contrast the levels of non-specific immunity. Specify how non-specific immunity defends against infection.
5. Review how bacteria gain entry into the body and attach to target cells.
6. Explain why and how biofilms form and their role in disease.
7. Analyze the pathogenic actions of bacteria, including the role of virulence factors.
8. Describe how bacteria are able to evade the immune system.
9. Illustrate how transmission of pathogens occurs between hosts.
10. Explain why there is a problem with antimicrobial resistance today.
11. Discuss strategies for preventing and controlling antibiotic resistance.

IID-BASID-05 Clicker Lecture: Gram-positive cocci of medical importance

1. Describe the virulence factors of *Staphylococcus aureus*
2. Explain the function of superantigens.
3. Contrast *Staphylococcus aureus* with *Staphylococcus epidermis* in terms of virulence factors.
4. Discuss the structural and enzymatic features and toxins of Staphylococcus that allow it to evade the body's defenses and be pathogenic.
5. Describe the prevention and symptoms of staphylococcal food poisoning.
6. List, describe and discuss the most important diseases caused by *Staphylococcus* and *Streptococcus*.
7. Describe how staphylococcal species are distinguished from one another during diagnosis.
8. Discuss briefly the history of staphylococcal resistance to antimicrobial drugs.
9. Explain the classification of streptococcal strains.
10. Describe those structures in *Streptococcus pyogenes* that allow this organism to survive the human defense mechanisms.

11. Identify the enzymes and toxins that facilitate the spread of *Streptococcus pyogenes* in the body.

12. Interpret the conditions under which Group A streptococci cause disease.

13. Contrast Group A with Group B streptococcus in terms of structure.

14. List and describe the most important Group B (*Streptococcus agalactiae*) infections.

15. Describe how the structure of *Streptococcus pneumoniae* affects its pathogenicity.

16. Follow a *Streptococcus pneumoniae* bacterium on an imaginary path through the body, describing the chemical and physical properties that allow the bacterium to cause pneumonia.

17. Discuss the lab identification/diagnosis of pneumococcal diseases.

18. Identify species of *Enterococcus* and describe their pathogenicity, diagnosis and prevention of their diseases.

**IID-BASID-06**

**Clicker Lecture: Gram positive Toxigenic Rods**

1. List the methods of transmission of anthrax

2. Describe the clinical manifestations and diagnosis of infections by *Bacillus anthracis* and *B. cereus*

3. Characterize the two major species of *Bacillus*.

4. Characterize the four major species of *Clostridium*.

5. Identify the mechanisms accounting for the pathogenicity of *Clostridium perfringens*.

6. Describe the clinical manifestations and diagnosis of infections by *Clostridium perfringens*.

7. Explain the role of antimicrobial drugs in the development of gastrointestinal diseases of *Clostridium difficile*.

8. Discuss the diagnosis, treatment, and prevention of infection by *Clostridium difficile*.

9. Compare and contrast the different manifestations of botulism poisoning.

10. Describe the diagnosis of botulism poisoning and explain how to prevent it.

11. Review the epidemiology of tetanus.

12. List preventative measures against infection by *Clostridium tetani*.

13. Characterize the morphology of *Corynebacterium*.

14. Describe the transmission of *Corynebacterium diphtheriae* and the effect of diphtheria toxin.

15. Discuss the diagnosis and prevention of diphtheria.
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IID-BASID-07  Clicker Lecture: Enterobacteriaceae
1. Describe how members of the family Enterobacteriaceae are distinguished from members of other Gram-negative bacteria.
2. Discuss how members of the family Enterobacteriaceae are distinguished in the laboratory.
3. List the virulence factors found in the family Enterobacteriaceae
4. Describe diagnostic methods and prevention of diseases of enteric bacteria.
5. Compare and contrast Escherichia, Klebsiella, Serratia, Enterobacter, Citrobacter, Salmonella, Shigella, Proteus and Yersinia.
6. Describe and contrast the pathogenesis and diseases of ETEC, EHEC, EIEC, EAEC, and EPEC.
7. Describe the diseases caused Salmonella and Shigella species
8. Describe the life cycle of Yersinia pestis and contrast bubonic and pneumonic plague.

IID-BASID-08  Clicker Lecture: Gram-negative Cocci and Coccobacilli
1. Discuss how members of the gram-negative cocci and coccobacilli are distinguished in the laboratory.
2. Describe diagnostic methods and prevention of diseases of gram-negative cocci and coccobacilli.
3. List the main features of Neisseria that contribute to its pathogenicity.
4. Discuss the difficulties researchers face in developing an effective vaccine against Neisseria gonorrhoeae.
5. Describe how meningococci survive and thrive in humans.
6. Discuss the epidemiology of meningococcal diseases.
7. Identify and describe the main diseases caused by species of Haemophilus.
8. Describe the main virulence factors of Bordetella pertussis.
9. Identify the different disease phases of pertussis.
10. Describe how Legionella cause disease in humans.
11. Describe the main symptoms of Legionnaires disease.

IID-BASID-09  Clicker Lecture: Gram-Negative, Oxidase-Positive Motile Rods
1. Identify the clinically-relevant Gram-negative, oxidase-positive species
2. List the defining properties of Pseudomonas aeruginosa, Campylobacter jejuni, Helicobacter pylori, and Vibrio cholera.
3. Describe how these bacteria are transmitted.
4. Recognize the major virulence factors of these organisms.
5. Identify the most common diseases associated with each organism.
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IID-BASID-10  Clicker Lecture: Mollicutes, filamentous bacteria, and Bacteroides
1. List the main characteristics of Mycoplasma.
2. Explain why Mycoplasma can’t be classified as Gram--positive or Gram- negative organisms.
3. Summarize the damage done to respiratory epithelial cells by Mycoplasma pneumoniae.
4. Recognize those Mycoplasma that are associated with urinary and genital tract infections.
5. Compare and contrast Nocardia and Actinomyces in terms of appearance, cell wall composition, and pathogenicity.
6 List the main characteristics of Bacteroides.

IID-BASID-11  Clicker Lecture: Mycobacteria
1 Characterize Mycobacteria in terms of cell wall composition, growth rate, and resistance to antimicrobial drugs.
2 Identify the distinguishing characteristics of the cell wall of Mycobacteria
3 Describe the transmission of Mycobacterium tuberculosis and its subsequent action within the human body.
4 Discuss diagnosis and prevention of tuberculosis.
5 Compare and contrast tuberculoid leprosy with lepromatous leprosy.
6 Discuss the diagnosis and prevention of leprosy.
7 Explain why the number of reported cases of infection with Mycobacterium avium-intracellulare complex (MAC) has been rising, even though this strain was long thought to be harmless to humans.

IID-BASID-12  Clicker Lecture: Spirochetes
1 Define the general features and physiology of spirochetes and how these influence pathogenesis and diagnosis
2 List and identify the diseases caused by Treponema pallidum
3 Define the different stages of untreated syphilis and their treatment.
4 Differentiate the treponemal and non-treponemal tests in the diagnosis of syphilis
5 List the diseases caused by non-venereal species of Treponema.
6 Review Lyme disease, its vector, and its causative agent.
7 Describe the stage-specific phases of Lyme disease and their relevance in the diagnosis and treatment of Borrelia infection
8 Compare and contrast the two types of relapsing fever, including their causes and vectors.
9 Describe Leptospira interrogans and zoonotic leptospirosis.
IID-BASID-13  **Clicker Lecture:  Chlamydiae and zoonotic intracellular bacteria**

1. Describe the life cycle of *Chlamydia*, including the two cellular forms.
2. Specify the diseases associated with the various *Chlamydia trachomatis* Serovars, with *Chlamydophila psittaci*, and with *Chlamydophila pneumoniale*.
3. Discuss the prevention of chlamydial infections.
4. List the species of *Rickettsia* that are responsible for human infections.
5. Identify the cause, vectors, and reservoirs of the various Rickettsial species.
6. Compare and contrast the rash and petechiae of Rocky Mountain spotted fever (RMSF) with rickettsial typhus, Rickettsialpox and Ehrlichiosis.
7. Compare and contrast the life style of *Rickettsia, Ehrlichia, Bartonella*, and *Coxiella burnetti*.
8. Describe the mode of transmission of Q fever.
9. Identify the features of *Listeria monocytogenes* that allow for its pathogenicity.
10. Discuss diagnosis and prevention of disease from *Listeria monocytogenes*.
11. Explain the difference between trench fever, cat-scratch disease, and bacillary angiomatosis.
12. Describe the cause and symptoms of Brucellosis and Tularemia.

IID-BASID-14  **Clicker Lecture:  Basic Biology of Fungi**

1. Compare and contrast fungi and bacteria.
2. Describe fungal morphology and understand dimorphism.
3. Discuss types of diseases caused by fungi.
4. Summarize the complexities of identifying, treating, and preventing fungal infections.
5. State the most significant mode of transmission for mycoses.
6. Explain why the actual prevalence of fungal infections is unknown.
7. Describe the basic biology, pathogenesis, virulence/transmission, and characteristics of infections caused by fungal pathogens.
8. Compare and contrast mycotoxicoses, mycoses, and fungal allergies.
9. Compare and contrast true fungal pathogens with opportunistic fungi.
10. Identify factors that predispose people to experiencing opportunistic fungal infections.
11. Discuss why the diagnosis of opportunistic infections in immunocompromised patients is difficult.
12. Describe the primary ways that mycoses manifest clinically.
13. Describe general approaches for treatment and diagnosis of these fungal infections.
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IID-BASID-19  
Clicker Lecture: Basic Biology of Parasites

1. Articulate several ways in which parasitic pathogens differ from less complex pathogens
2. List several factors which contribute to the pathogenicity of parasites
3. Discuss in general how these factors can affect the clinical presentation of infection with parasites
4. Recognize the major groups of parasites

IID-BASID-20  
Clicker Lecture: Induced Defenses of the Body (Adaptive Immunity)

1. Describe the different types of lymphoid tissue and what functions they each serve during an immune response
2. Describe the basic structure and function of antibody molecules
3. Define antibody isotype and differentiate between various isotype functions
4. Describe the different functions of helper (CD4) T cells versus cytotoxic (CD8) T cells
5. Explain the role of MHC in antigen presentation in the activation of each T cell type
6. Differentiate between type 1 (Th1) and type 2 (Th2) immune responses
7. Explain how T cell cytokines affect the outcome of an immune response

IID-BASID-21  
Clicker Lecture: Constitutive Defenses of the Body (Innate)

1. Describe the various innate physical resistances to infection and what functions they each perform
2. Describe the role of macrophages, neutrophils, and NK cells during infection
3. Describe the process by which leukocytes can enter inflamed tissue
4. Define the interactions between pattern recognition receptors and pathogen associated molecular patterns and what outcomes this leads to
5. Define what a cytokine is and what functions they serve during infection
6. Distinguish between different cytokines and what functions they each have during infection
7. Define the three pathways of the complement system and the basic components of each Pathway

IID-BASID-22  
Clicker Lecture: Microbial Diagnostics and Vaccines

1. Identify the common types of laboratory assays/tests used for diagnosis of infectious diseases
2. Describe the basis of immunological assays used in microbial diagnostics
3. Discuss the basis of nucleic acid detection methods for microbial diagnostics
4. Explain the use of vaccines in prevention of viral and bacterial diseases
5. Develop an understanding of issues related to immunization practices
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IID-BASID-23 : Adult Infectious Diseases Section

1. Differentiate between upper and lower respiratory tract infections

2. Describe the clinical characteristics of a “typical”, “atypical”, or “aspiration” type pneumonia

3. Explain the use of the terms “community-acquired”, “hospital-acquired”, “ventilator-associated”, and “healthcare-associated” pneumonia

4. Predict the likely pathogens causing the above types of pneumonia
Course: Pharmacology

MEDPHARM-BASID-01  Lecture: ABX I - Antibiotics Overview

1. Discuss the process of choosing the correct antibiotic.
2. Discuss the process of identifying the infecting organism.
3. Describe the time dependent and concentration dependent pharmacokinetic/pharmacodynamic of antibiotics
4. Describe how to determine the antimicrobial susceptibility of infecting organisms (the MIC).
5. Describe the host factors necessary to understand so that the correct antibiotic is chosen.
6. Describe the mechanisms of action for the antimicrobials listed in this lecture.
7. Describe the mechanisms of resistance for the antimicrobials listed in this lecture including understand the ‘D’ test.

MEDPHARM-BASID-07  Lecture: Antifungal Drugs

1. List the antifungal drugs useful in treatment of fungal infections.
2. Explain the mechanism of action of each of these drugs.
3. Compare the pharmacokinetic properties of various antifungals.
4. Describe the major therapeutic indications of each of these drugs.
5. List the adverse effects associated with the antifungal drugs.
6. Know the liposomal preparations of Amphotericin B.
7. Be aware of the antifungal drug interactions, e.g. with warfarin.