

Course Title: General Microbiology

Department #: BIO 203W

Credits: 4

Lecture - Lab: 45-45

Course Description: Prerequisites: Bio 130 or Bio 140 or Bio 171 or Bio 152, each requiring a “C” (2.0) minimum grade or successful completion of the Bio 130 competency exam. Surveys the microorganisms associated with infectious diseases, including the bacteria, viruses, fungi, and protozoa’s. Emphasizes the health care aspects and the distribution and activities of microbes as related to the following: microbial nutrition and anatomy, growth, disease, epidemiology, infection and immunity. Uses labs that stress aseptic techniques and that develop skills necessary to handle microbes in health care settings, including the characterization of unknown microbes.

Outcomes and Objectives for: Bio 203W - General Microbiology.

Upon successful completion of this course, each student will be able to:

OUTCOME 1: Apply the Scientific Method and understand how data is collected and organized.

Objectives:

- A. Make and interpret observations.
- B. Formulate and test hypotheses.
- C. Conduct and evaluate experiments.
- D. Collect and analyze data.
- E. Interpret questions, statements, texts, theories, problems, points of view, symbols, and observations.
- F. Draw and assess conclusions.
- G. Report results.
- H. Apply microbiology concepts to real world applications.

OUTCOME 2: Access, analyze, and use information appropriate to the discipline.

Objectives:

- A. Use word processing skills to prepare designated assignments.
- B. Use the library for searching and accessing information pertinent to class assignments.
- C. Use the Internet to transmit and receive email and search topics pertinent to class assignments.
- D. Evaluate source and quality of information gathered through various search mechanisms for currency, appropriateness, and truthfulness.
- E. Use an appropriate style to cite and document sources.

OUTCOME 3: Communicate in the language of the discipline.

Objectives:

- A. Gather information from a text, organize and integrate the information into a format that illustrates patterns, clusters, and hierarchies of information.
- B. Write for a specific audience and purpose and use writing tasks to promote learning. Produce a formal written report in the language of the discipline.
- C. Interact productively with others and use effective listening skills.
- D. Conduct audience analysis, choose an appropriate topic, and deliver an informal presentation.

OUTCOME 4: Synthesize and engage in the critical thinking of the discipline.

Objectives:

- A. Interpret and integrate concepts and build on previously learned concepts.
- B. Reflect ethically and apply ethical decisions.
- C. Formulate solutions to problems.
- D. Draw logical conclusions based on data, evidence, theories, viewpoints, policies, and interpretations.
- E. Access, analyze, and use information to make predictions based on the evidence discovered.
- F. Identify, compare, and contrast trends and patterns.
- G. Distinguish between simple correlation and cause-and-effect.

OUTCOME 5: Work cooperatively and collaboratively with peers.

Objectives:

- A. Show respect for others and value and respect differences.
- B. Work in organized groups to accomplish tasks.
- C. Accept responsibility for work achieved.
- D. Meet deadlines determined by the group.

OUTCOME 6: Develop, demonstrate, and apply knowledge in a microbiology laboratory.

Objectives:

- A. List and describe safety precautions required in microbiology laboratories to protect workers.
- B. Demonstrate proper aseptic techniques.
- C. Demonstrate proper hand washing, disinfectant procedures, and spill cleanup.
- D. Perform the proper use of Personal Protection Equipment (PPE).
- E. Select the correct use of laboratory equipment used for working with microorganisms.
- F. Identify the correct staining methods and apply these methods used to identify microorganisms.
- G. Develop proficiency in the use of the microscope in the laboratory.
- H. Understand the use of different media in the laboratory.
- I. Perform and evaluate the use of different biochemical tests in the laboratory.
- J. Describe how microorganisms are collected, inoculated, cultured, incubated, and autoclaved.

- K. Perform the correct inoculation techniques.
- L. Perform and evaluate antibiotic sensitivity tests and identify antibiotic resistance on a Culture & Sensitivity (C & S) plate.
- M. Perform and evaluate the use of water and food analyses.
- N. Apply the use of urinalysis in the laboratory.
- O. Perform the Serial Dilution and the Standard Plate Count and explain their technique, advantages, and disadvantages.
- P. Perform a specimen collection and evaluate how you must take into account aseptic technique, quantity needed, timing of administration, and correct material needed.
- Q. Apply the scientific method and sequence of tests to identify an unknown bacterium.

OUTCOME 7: Identify the major categories of microorganisms and analyze their classification, diversity, and ubiquity.

Objectives:

- A. Explain how microorganisms are classified into major taxonomic categories.
- B. Explain the basis upon which the major types of microorganisms are classified.
- C. Identify the Genus and species of an organism using the binomial system of nomenclature.
- D. List the structural differences between eukaryotic and prokaryotic cells.
- E. Explain the structure and function of viruses, viroids, prions, archae, bacteria, protozoa, algae, and fungi.
- F. Demonstrate that microorganisms are everywhere in the environment, including in and on your body.
- G. Describe the beneficial activities of microorganisms and the application of this understanding to benefit mankind.
- H. Describe the roles and importance of microbiology in food production, agriculture, industry, and the environment.

OUTCOME 8: Identify and demonstrate the structural, physiological, and genetic similarities and differences of the major categories of microorganisms.

Objectives:

- A. Identify the five common shapes of bacterial cells as: coccus, bacillus, coccobacillus, spirillum, and pleomorphic.
- B. Identify the structure and function of bacteria components: cell wall, capsule, slime layer, fimbriae, pili, flagella, plasmid, chromosome, and ribosome.
- C. Describe and illustrate the difference between gram positive and gram negative bacteria.
- D. Describe the structure of the endospore and identify spore-forming bacteria.
- E. Diagram the cycle of the sporulation and germination.
- F. Describe the structure of the acid fast bacteria.
- G. Explain the impact of endospores and acid fast bacilli on microbial control and disease formation in health care field.
- H. Explain genetic exchange processes and genetic recombination.
- I. Explain the role of cellular respiration in microbial metabolism.
- J. Explain the major metabolic pathways for microorganisms.

- K. Describe the environmental conditions of growth.
- L. Identify examples of microorganisms that utilize different energy sources used to grow.
- M. Predict how different growth factors contribute to microbial metabolism and growth.
- N. Explain generation time and diagram the phases of the bacterial growth curve.
- O. Describe the relationship between the bacterial growth curve and the stages of disease.
- P. Evaluate differential media to determine nutritional, biochemical, behavior differences between different microorganisms.

OUTCOME 9: Identify and demonstrate how to control microbial growth.

Objectives:

- A. Define sterilization, disinfection, and antisepsis and list examples of each.
- B. Identify and evaluate various physical control methods.
- C. Identify and evaluate various chemical control methods.
- D. Discuss relative effectiveness of various disinfectants used against several common bacteria.
- E. Evaluate the characteristics of common antiseptic ingredients.
- F. Describe the procedures for autoclaving, dry heat sterilization, and chemical sterilization.
- G. Explain how environmental conditions influence the actions of antimicrobial agents: temperature, exposure time, concentration of microorganisms, nature of surface, nature of the microorganisms, and nature of inhibiting agent.
- H. Identify the factors which promote or inhibit microbial growth in foods.
- I. Explain the difference between food infection and food poisoning and how control methods are employed.
- J. List and describe the mechanisms of action of major chemotherapeutic agents that control microorganisms.
- K. Describe and evaluate the various factors that are involved in the development of antibiotic resistance.

OUTCOME 10: Demonstrate and evaluate the interactions between microbes and humans and factors that may contribute to disease.

Objectives:

- A. Explain the role of normal flora in maintaining health of the human body.
- B. Explain how areas of the human body normally contain microbes as transient and resident flora.
- C. List areas of the healthy human body which should be sterile.
- D. Explain the Germ Theory of Disease and gives examples of diseases that meet these criteria.
- E. List examples of physiological and physical factors of microorganisms that would lead to infection.
- F. Analyze the factors in healthy normal flora and how changes in these factors may result in opportunistic infections.
- G. Explain how different factors may contribute to the virulence of different pathogenic microorganisms.

- H. List and explain the sequence of events that cause infection in the host.
- I. List and explain the sequence of events that occur during the stages of disease, including clinical symptoms.
- J. Describe the five typical stages of the viral life cycle and the various cytopathic effects of viral infections.
- K. Explain the difference between an exotoxin and an endotoxin produced by bacteria and how they affect a patient.
- L. Evaluate the concept of a compromised host with respect to infectious diseases.
- M. Describe the process of opportunistic pathogenicity.
- N. Describe the epidemiological role between the host and microbe interaction.
- O. Relate the principles involved in antimicrobial therapy to reducing the incidence of infectious diseases.

OUTCOME 11: Demonstrate and evaluate defense mechanisms of the human body and abnormalities that may contribute to infection.

Objectives:

- A. Describe how the immune system enables us to control the transmission of infectious disease-causing microorganisms.
- B. List and describe the sequence of events in the inflammatory response.
- C. Identify and illustrate the Innate (non-specific) and Adaptive (specific) mechanisms of host immunity.
- D. Describe the link between chemical mediators, the cells that produce them, and their action in controlling infection.
- E. Explain the role of antigen presenting cells in immunity.
- F. Describe the role of complement.
- G. Describe the roles of passive immunity, active immunity, naturally acquired immunity, artificially acquired immunity.
- H. Compare and contrast primary and secondary responses.
- I. Illustrate and explain the operation of antibody-mediated and cell-mediated immunity.
- J. List the various forms of vaccines and outline the standard immunization schedule.
- K. Describe the various serological tests performed in the microbiology laboratory.
- L. Describe what happens on a cellular level during the four types of hypersensitivity responses.

OUTCOME 12: Identify and evaluate microbial diseases: their causative agent, source (or vector), reservoir, epidemiology, mode of transmission, pathogenesis, symptoms, diagnosis, prevention, control, treatment, and applicable clinical isolation precautions.

Objectives:

- A. Identify and evaluate common skin and eye infections.
- B. Identify and evaluate common wound infections.
- C. Identify and evaluate common respiratory system infections.
- D. Identify and evaluate common digestive system infections.
- E. Identify and evaluate common genito-urinary system infections.
- F. Identify and evaluate common nervous system infections.

- G. Identify and evaluate common blood and lymphatic systems infections.
- H. Discuss emerging diseases.
- I. Discuss agents of bioterrorism.

OUTCOME 13: Demonstrate the currently accepted microbiological safety and infection control practices and apply principles of safety and infection control practices to occupational settings.

Objectives:

- A. Describe the major methods used to control communicable diseases and the role of public health agencies.
- B. Apply the current blood-borne pathogen standards.
- C. Explain the current vaccinations and post-exposure recommendations for occupational settings.
- D. Evaluate the most commonly found bacterial contaminants in an occupational setting.
- E. List and explain the steps in the chain of infection and analyze how growth of microorganisms occurs in a susceptible host.
- F. Identify and describe the main types of hand hygiene used in occupational settings.
- G. Identify and explain the proper Personal Protective Equipment in an occupational setting.
- H. Evaluate procedures needed to aseptically dispose of biohazard materials.
- I. Describe proper aseptic techniques in disinfecting contaminated surfaces, instruments, and equipment.
- J. Apply the current isolation precaution guidelines.
- K. Identify and evaluate the common health-care-associated and community-associated infections.
- L. Identify and understand the importance of the current Exposure Control manual for Category-A students.