MICROBIOLOGY

MED 106-3

COURSE OUTLINE AND OBJECTIVES

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UNIT #1 - Introduction, Classification, History, Bacterial Preparation, Anatomy of Bacteria

PART "A" - 2 hrs.

Objectives:

1. To state the importance and scope of microbiology in our society.

2. To state the differences between plants and animals, and to place microorganisms in the classification system.

3. To state and describe the major groups of organisms encountered in microbiology.

4. To briefly describe the important historical events in the development of the science of microbiology.

Description; definition of microbiology, scope and importance in our society; plants and animals and Protista, bacteria vs. higher microorganisms; algae, bacteria, fungi, protozoans, rickettsiae and viruses and their characteristics; Van Leewenhoek in 1674, germ theory, Koch's postulates, Lister's pure cultures, Pasteur's immunization discovery.

PART "B" - 4 hrs.

Objectives:

1. To state the general techniques used in the culture, physical examination, metabological, chemical and genetic examination of microorganisms.

2. To use the binomial system of naming and classifying micro-organisms.

3. To state the various means and principles of preparing bacteria for light microscopic examination.

4. To prepare the reagents and perform the wet preparation and hanging drop mount, gram stain, acid-fast stain and negative stain for bacteria.

Description; culture, microscope examination, study of metabolism, chemical composition and genetics as means of differentiating bacteria; binomial nomenclative and taxonomy as applied to bacteria use of scientific names; wet mount, hanging drop mount and uses, simple, differential acid-fast and negative staining techniques, gram stain.

PART "C" - 2 hrs.

Objectives:

1. To describe, give an example, and identify the three shapes and several arrangements of bacterial cells.

2. To describe and state the purpose of various, bacterial structures including flagella, fimbriae, cytoplasm, nucleus or chromatin bodies, endospores, capsules, cell wall and cytoplasmic membrane.

Description; coccus, bacillus, spirillum, spirochaete, etc- patterns and examples, lab identification; flagella and patterns; fimbriae, cytoplasm, nucleus or chromatin bodies, endospores, capsules, cell wall, cell membrane, their appearance and purposes

UNIT #2 - Bacterial growth and multiplication, media preparation

PART "A" - 4 hrs.

Objectives:

1- To state the seven nutritional requirements of all organisms.

2. To describe the various means by which bacteria obtain their energy.

3. To state the important culturing requirements of heterotropic and autotrophic bacteria.

4. To state seven types of media for growing bacteria and their uses.

5. To state the steps in media preparation and perform same in the lab.

Description; energy, carbon, nitrogen, sulfur and phosphorus, metallic element, vitamin and water requirements of organisms; autotrophic and heterotrophic bacteria, and their requirements, culture media for each type; types of media - enriched, selective, differential, assay,enumeration, maintenance, preparation of simple media, blood agar plates, tubed slant media, pH adjustment.

PART "B" - 1 hr.

Objectives:

1. To list the principle ingredients and function of each of the following media:

   a) blood agar (including per cent of blood)
   b) MacConkey agar
   c) selenite broth
   d) S almonella - Shigella agar
   e) Lxa/enstein - fensen agar
   f) triple sugar iron agar
   g) G.C. agar with antibiotics
   h) "Chocolate agar"
   i) Mueller - Hintonsensitivity agar
   j) Thioglycollate medium
   k) Mannitol salt agar
   1) Phenylethanol agar

Description; the ingredients and functions of 12 universally used culture media for bacteria.

PART "C" - 2 hrs.

Objectives:

1. To state the physical conditions required for growth specifically temperature, oxygen and pH.

2. To describe the process and importance of binary fission in bacteria and protozoans.

3. To define bacterial growth, and describe mathematically the geometric growth curve.

4. To describe, with stages, the actual growth of bacteria inoculated into a new medium.

Description: physical requirements of bacteria, specifically temperature, oxygen and pH; binary fission, the events and importance; growth of bacteria, geometric growth curve, calculation of generation time, actual growth curve of cultured bacteria - lag phase, log or exponential phase, stationary phase, phase of decline.

PART "D" - 6 hrs.

Objectives:

1. To describe the techniques and purposes of performing six important methods of enumerating the numbers of bacteria.

2. To describe the techniques and purposes of performing five important methods of obtaining a pure culture from mixed bacteria,

3. To perform streak plate, transfer, serial dilution, phenyethyl alcohol, antibiotics and bile salts as methods of separating mixed types of bacteria.

Description: enumerating bacteria - direct microscopic count, plate count, turbidimetric determination, nitrogen content, drug weight of cells, chemical change in media, techniques, purposes and limitations; pure cultures - streak plate, pour plate, enrichment culture, serial dilution and single - cell isolation techniques - methods, uses, limitations, laboratory procedure.

PART "E" - 2 hrs.

Objectives:

1. To describe four methods of maintaining reference colonies of bacteria.

2. To describe the various physical characteristics of the growth of bacterial colonies.

3. To gain laboratory experience in describing colonies.

Description: maintenance cultures - periodic tansfer, mineral oil, freeze drying, storage at low temperature; physical characteristics of colonies including size, margin, elevation, pigmentation, optical features, distribution, odour, mobility; laboratory experience.

UNIT #3 - Control of Microorganisms

PART "A" - 2 hrs.

Objectives:

1. To define the main terms used for agents in the control of microorganisms.
2. To state the four modes of action by controlling agents against bacteria,
3. To describe various physical conditions used to control the growth of microorganisms.
4. To effectively use physical means to control the growth of bacteria.

Description: sterilization, disinfectant, antiseptic, sanitizer, gefmicide, bactericide, bacteriostasis, antimiccrobial agents, cell wall damage, cell permeability, alteration of protein and inhibition of enzyme action; temperature - wet and dry heat, including autoclaving and pasteurization, low temperature, radiation, filtration.

PART "B" - 2 hrs.

Objectives:

1. To name, describe the mode of action and uses of phenols, alcohols, halogens, heavy metals, detergents and guarter^ary ammonium compounds as microorganism control agents,

2. To describe the use of ethylene oxide and formaldehyde as a sterilizer.

3. To effectively use the above where necessary in the laboratory

Description; chemical disinfectants, mode of action, concentration, uses and limitations for phemIs, alcohols, halogens (iodine and chlorine), heavy metals, detergents and quartemary ammonium compounds; ethylene oxide gas as a sterilizing agent, formaldehyde.

PART "C" - 2 hrs.

Objectives:

1. To state the requirements of a useful chemotherapeutic agent.

2. To state the uses and modes of action of sulfonamides.

3. To state the characteristics and history of development of antibiotics.

4. To name, give mode of action and usefulness of penicillin, streptomycin, Chloromycetin, Kanamycin, tetracyclines, erythromycin and neomycin.

5. To state the dangers involved in using antibiotics to control microorganisms.

Description: chemotherapeutic agents and their characteristics, sulfonamides, uses,mode of action and limitations; antibiotics arid their characteristics, penicillin, streptomycin, Chloromycetin, kanamycin, tetracyclines, erythromycin, neomycin - uses, modes of action and limitations; dangers of using antibiotics to control microorganisms.