

MLT-2482: CLINICAL MICROBIOLOGY

Cuyahoga Community College

Viewing: MLT-2482 : Clinical Microbiology

Board of Trustees:

2015-06-25

Academic Term:

2015-08-24

Subject Code

MLT - Medical Laboratory Technology

Course Number:

2482

Title:

Clinical Microbiology

Catalog Description:

Application of the principles and procedures utilized in clinical microbiology, mycology, parasitology and virology in the collection, identification and serological detection of organisms. Pathogenesis and prevention of disease. Media, methods of culture and isolation, biochemical and susceptibility testing, aseptic and staining techniques, sterilization and safety protocols are studied. Analysis of case studies, problem solving and clinical significance of results in diagnosis.

Credit Hour(s):

5

Lecture Hour(s):

3

Lab Hour(s):

6

Requisites

Prerequisite and Corequisite

BIO-2500 Microbiology and MLT-1000 Introduction to Medical Laboratory Technology.

Outcomes

Course Outcome(s):

A. Define microbiology and describe four major fields in which its principles are applied.

Objective(s):

1. Describe the field of bacteriology
2. Describe the field of mycology
3. Describe the field of parasitology
4. Describe the field of virology

Course Outcome(s):

D. Describe and identify criteria used to classify cells, bacteria, algae, fungi, protozoa and viruses.

Objective(s):

1. 1. Recognize characteristics and taxonomic levels.
 2. 2. Identify on preparation and/or draw structural and morphological differences.
 3. 3. Discuss metabolic and physiology properties that aid in identification.
 4. 4. Discuss form of reproduction.
 5. 5. Discuss genetics changes affecting criteria.
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Course Outcome(s):

B. Discuss infection control practices.

Objective(s):

1. Relate the study of Epidemiology to infection control.
2. Define terms commonly associated with infection control.
3. Describe the various ways in which diseases are transmitted.
4. Analyze then discuss the effectiveness of mechanisms to prevent disease.

Course Outcome(s):

E. Select and perform procedures to collect, identify and determine sensitivity of bacteria.

Objective(s):

1. Describe the procedure and properly collect specimen(s).
2. Determine the acceptability of a sample for testing.
3. Notify and explain rationale for sample rejection to requisite personnel.
4. Prepare and correctly interpret stained slides using Gram and Acid Fast stains.
5. Select and explain why media is appropriate for identification.
6. Inoculate media using aseptic technique.
7. Incubate according to protocol.
8. Observe growth on media, evaluating morphology and biochemical reactions to determine if additional testing is needed.
9. Accurately identify organism by confirming results with instructor.
10. Perform antimicrobial susceptibility tests on appropriate organisms.
11. Explain and employ quality control measures related to testing in the microbiology laboratory.
12. Correlate results, select and confirm clinically significant data.
13. Discuss the clinical significance of result regarding the treatment and prognosis of the patient.
14. Explain how automated procedures and kits are used in identification and susceptibility testing of bacteria including accuracy, efficiency and cost.
15. Discuss data transmission via Laboratory Information System(LIS) and/or other methods as applicable.
16. Discuss the process for reporting Class A, B, and C organisms.
17. Store or dispose of specimens according to biological hazards protocol.
18. Properly clean work area following laboratory safety procedures.

Course Outcome(s):

F. Describe and perform procedures used in the collection and identification of fungal specimens.

Objective(s):

1. Describe the taxonomy and characteristics of fungi.
2. Describe the proper collection procedure for fungal specimens including vesicle, collection time, transportation, preservation and storage.
3. Select and discuss media used for fungal isolation.
4. Describe or perform the procedure for microscopic examination of fungi.
5. Perform or explain and interpret staining procedures used to identify fungi.
6. Differentiate common yeasts and molds from bacteria on routine mycological media.
7. Identify an organism from permanently stained slides, pictures/drawings and case histories of parasitic fungi.
8. After identifying the organism describe the disease, treatment and prognosis.

Course Outcome(s):

G. Perform and or describe procedures used in the collection and identification of parasites.

Objective(s):

1. Discuss the taxonomy and characteristics of parasites.
2. Describe the proper collection procedure for parasitic specimens including vesicle, collection time, transportation, preservation and storage.
3. Perform or describe the procedure for macroscopic examination for parasites.
4. Explain procedures and interpretations of stains used to identify parasites.
5. Identify organism(s) from preserved specimens, Wright stain smear and permanently stained slides, pictures/drawings and case histories.
6. Describe the disease, clinical significance and prognosis for various organisms.

Course Outcome(s):

H. Perform and or describe procedures used in the collection and identification of viruses.

Essential Learning Outcome Mapping:

Information Literacy: Acquire, evaluate, and use information from credible sources in order to meet information needs for a specific research purpose.

Objective(s):

1. 1. Describe the collection, transport and storage of specimens for viral testing.
2. 2. Explain procedures used to detect viruses
3. 3. Discuss the role the Reference Laboratory.

Course Outcome(s):

- I. Discuss quality assurance and quality control in the laboratory.

Objective(s):

1. 2. List regulatory and accrediting bodies.
2. 3. Describe and employ all practices mandated by regulatory and accrediting agencies.
3. 4. Perform standard quality control procedures.
4. 5. Discuss methods of inventory control.
5. 6. Explain the purpose and methods of monitoring staff performance.
6. 7. Discuss the technicians' responsibility regarding confidentiality.

Course Outcome(s):

- C. Use equipment and follow procedures correctly in the laboratory.

Objective(s):

1. 6. Explain the advantages and disadvantages of commercial kits.
2. 7. Discuss circumstances requiring the use and purpose of controls in the laboratory.
3. 8. Explain the purpose and maintenance of lab equipment.
4. 1. Describe and apply correct microscopic technique in specimen examination.
5. 3. Prepare reagents and stains and explain their function.
6. 4. Differentiate between simple stains and differential stains.
7. 5. Demonstrate correct micropipette techniques.

Methods of Evaluation:

1. Discussion Boards
2. Homework assignments
3. Case studies
4. Exams
5. Quizzes
6. Lab practical exams
7. Individual projects
8. Class participation

Course Content Outline:

1. Definition and fields of microbiology
 - a. Environmental
 - b. Industrial
 - c. Agricultural
 - d. Medical
 - i. Community acquired infections
 - ii. Nosocomial infections
 - iii. Bioterrorism
 - iv. Antibiotic resistance
2. Review infection control
 - a. Epidemiological Terms
 - i. Epidemic
 - ii. Pandemic
 - iii. Sporadic
 - iv. Morbidity rate

- v. Endemic
- vi. Mortality rate
- vii. Incidence rate
- viii. Prevalence rate
- b. Infectious Disease
 - i. Transmission
 - ii. Stages
- c. Prevention
 - i. Immunization
 - ii. Public Hygiene
 - iii. Chemotherapy
 - 1. Antibiotics
 - 2. Antiseptics
 - iv. Sterilization and disinfection
 - v. Patient Isolation Techniques
 - vi. Laboratory Protocol
- 3. Equipment and procedures
 - a. Microscopy
 - i. Prepare and interpret wet mounts
 - ii. Prepare stained slides and identify organism(s)
 - iii. Locate and identify organism from commercially prepared specimens
 - b. Culture Media and plating
 - c. Reagents and stains
 - d. Simple stains and differential stains
 - e. Micropipette techniques
 - f. Commercial kits
 - g. Controls
 - h. Cytocentrifuge
 - i. Incubator
 - j. Autoclave
 - k. Refrigerator
 - l. Hood
 - m. Biological safety cabinet
 - n. Microscope
 - o. Steriscope
 - p. Decontamination
- 4. Classification of microorganisms
 - a. Cells
 - b. Bacteria
 - c. Algae
 - d. Fungi
 - e. Protozoa
 - f. Viruses
- 5. Collection, identification and susceptibility of microorganisms
 - a. Specimen collection
 - b. Criteria for specimen rejection
 - c. Gram and Acid Fast stains
 - d. Growth media
 - e. Aseptic transfer
 - f. Inoculation and Incubation protocol
 - g. Morphological and physiological tests
 - h. Identification of organism and documentation of results
 - i. Staphylococcus
 - j. Streptococcaceae
 - k. Cornebacterium and other non-spore forming gram-positive rods
 - l. Aerobic gram-positive bacilli
 - m. Haemophilus and other fastidious gram negative rods
 - n. Mycobacterium tuberculosis and other nontuberculous myobacteria

- o. Enterobacteriaceae
 - p. Vibrio, aeromonas, plesiomonas, and campylobacter
 - q. Nonfermenting gram-negative bacilli and miscellaneous gram-negative rods
 - r. Neisseria
 - s. Spirochetes
 - t. Chlamidia, myoplasma and ureaplasma
 - u. Zoonotic and rickettsial infections
 - v. Miscellaneous groups of bacteria
 - w. Susceptibility testing
 - x. Quality control
 - y. Clinical significance, treatment and prognosis
 - z. Automated methods and kits
 - aa. Transmission of results
 - bb. Biosafety procedures
6. Fungal specimens - Mycology
- a. Taxonomy and characteristics
 - b. Specimen collection
 - c. Media used for fungal isolation
 - d. Examination of fungi
 - i. Dermatophytes
 - ii. Subcutaneous fungi
 - iii. Systemic mycoses
 - iv. Opportunistic mycosis
 - e. Staining and identification
 - i. Lacto-Phenol Cotton Blue (LPCB)
 - ii. India Ink
 - iii. Wet prep
 - iv. Germ tube
 - f. Yeast versus mold
 - g. Treatment and prognosis
7. Human parasites, protozoans, helminths, arthropods
- a. Taxonomy and classification of parasites
 - b. Collection techniques
 - c. Macroscopic examination by direct smear
 - d. Staining procedures used in identification
 - e. Identification from preserved specimens, slides, illustrations and case histories
 - i. Protozoa
 - ii. Nematodes
 - iii. Cestodes
 - iv. Trematodes
 - v. Anthropoda
 - f. Disease, clinical significance and prognosis
 - i. Protozoa
 - ii. Nematodes
 - iii. Cestodes
 - iv. Trematodes
 - v. Anthropoda
8. Virology
- a. Collection
 - i. Direct methods
 - ii. Cell culture
 - iii. Serological methods
 - iv. Detection
9. Reference laboratory
10. Quality assurance and quality control

Resources

Mahon, Connie and Lehman, Donald and Manuselis, George. *Textbook of Diagnostic Microbiology*. 5th ed. Maryland Hts., MO: Elsevier/Saunders, 2015.

Essridge, Barbara and Reynolds, Anna. *Basic Clinical Laboratory Techniques*. 6th ed. Clifton Park, NY : Delmar Cengage Learning, 2012.

Hart, Tony and Shears, Paul. *Color Atlas of Medical Microbiology*. 2nd. Edinburg: Mosby, 2004.

Engelkirk, Paul. *Laboratory Diagnosis of Infectious Diseases : Essentials of Diagnostic Microbiology*. 1st ed. Baltimore: Wolters Kluwer Health/Lippincott Williams Wilkins, 2008.

Turgeon, Mary Louise. *Linné Ringsrud's Clinical Laboratory Science : The Basics and Routine Techniques*. 6th ed.,. Maryland Heights, MO:Elsevier/Mosby, 2012.

Heelan, Judith and Ingersoll, Frances. *Essentials of Human Parasitology*. 1st ed. Albany, N.Y. : Delmar, 2002.

Engelkirk, Paul and Duben-Engelkirk, Janet. *Burton's Microbiology for the Health Sciences*. 10th ed. Philadelphia: Wolters Kluwer/Lippincott Williams Williams, 2015.

Luis M. de la Maza ... [et al.]. *Color Atlas of Medical Bacteriology*. 2nd ed. Washington, DC : ASM Press, 2013.

"MLO Articles" various.

"Advance Articles" various.

ASCLS. "Clinical Laboratory Science" various.

ASCP. "Laboratory Medicine" various.

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