…of all the diseases to which man is heir, those known in etiology, possible of cure and capable of prevention – these diseases are mostly caused by infectious agents.

Instructor: Emmett Bond  M.S.  CLS

**Course Description:** This introductory laboratory course will present the basic fundamentals of diagnostic microbiology. Emphasis will be placed on bacteriology techniques commonly encountered in the clinical laboratory including staining methods, identification of normal flora and the isolation and identification of bacterial pathogens. Basic clinical scenarios will accompany discussion of each organism to best understand its role in pathogenicity. Current topics in infectious disease will be discussed so as to remain current on newer diagnostic methods. Fundamental concepts of lab safety, sample collection and culture set-up and the practice of standard (universal) precautions will be emphasized. Patient isolation protocols will be discussed to insure proper methods of patient/health – care worker interaction. Clinical science is a dynamic ever-evolving discipline. The instructor reserves the right to add or delete course materials to best optimize content and presentation.


**Medical Terminology text:** Brooks, Myrna Lafleur. *Exploring Medical Language, 6th edition* (5th is OK too). Copies are available for loan at the Allied Health Resource Center (S-82).

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**HTEC 83A – Clinical Microbiology Lecture: Cognitive Objectives**  
After attending the Clinical microbiology lectures, reading the assigned chapters and completing the homework, the student will:

**HTEC 83A – Clinical Microbiology – Course Introduction:**

1. State the number of exams given throughout this course and the required % score needed to pass this class
2. Locate in the course syllabus the “important dates to note” section

**Safety, Isolation Precautions, Microscopy, Specimen Collection and Gram Stain:**

1. List the issues that need to be addressed when forming a comprehensive safety program for the microbiology laboratory.
2. Identify the most common agents associated with laboratory-acquired infections and explain the disease they represent, the routes of infection and their source.
3. Differentiate the three types of biosafety cabinets
4. Given organisms seen in a microbiology laboratory, categorize them according to their biosafety level.
5. Given the type of isolation used for the patient and their diagnosis, choose the appropriate isolation procedure to be used in specimen collection.
6. Examine the microscope, locate each of the components and describe the function of each identified component.
7. Demonstrate knowledge of mechanisms for maintaining organism viability relating to storage, transport, and preservation of specimens by appropriate actions or answers when asked.
8. Discuss general precautions that must be observed during the collection, handling and transporting of clinical specimens.
9. Examine the gram stain procedure, explain the procedure and the reactions occurring at each step.
10. Suggest limitations and precautions when performing a gram stain and recommend viable solutions.

**Staphylococci:**
1. Describe the general characteristics of the genus *Staphylococcus*.
2. Compare the characteristics of the staphylococci to other gram-positive cocci.
3. Describe the virulence factors associated with staphylococci.
4. Differentiate between endotoxins and exotoxins.
5. Given clinical infections, correlate with possible staphylococci species.
6. Develop an algorithm of key tests to differentiate among the clinically relevant *Staphylococcus* species.
7. Explain why methicillin and Vancomycin resistance is a serious clinical problem.

**Normal Flora, Streptococci, Enterococci & Pneumococci:**
1. Discriminate between normal flora and pathogenic microorganisms.
2. Compare and contrast normal flora from these different sites:
   a. Mouth and oral cavity
   b. Nasopharynx
   c. Stomach and small intestine
   d. Colon
3. Identify which pathogens are of concern in the organs presented, i.e. (respiratory track, urinary tract, central nervous system, etc)
4.
5. Correlate a particular infectious disease with its major characteristics, causative agent, reservoir, mode of transmission and diagnostic laboratory procedures.
6. Compare the general characteristics of the streptococci and related organisms.
7. Explain the Lancefield classification of the streptococci.
8. Compare and contrast the virulence factors associated with staphylococci, enterococci and streptococci.
9. Given the microscopic and colonial morphology of an organism isolated from a clinical sample, describe the appropriate biochemical tests for presumptively identifying the organism.
10. Develop an algorithm of key tests to differentiate among the clinically relevant *Streptococci* and *Enterococci* species.

**Neisseria, Moraxella & Haemophilus:**
1. List the general characteristics of the genus *Neisseria*.
2. Discuss the function of pili as a virulence factor.
3. Compare and contrast gonorrhea in male and female patients.
4. Discuss specimen collection, transport and processing for \textit{N. gonorrhoeae} culture.
5. Compare and contrast the usefulness of the direct Gram stain in the diagnosis of gonorrhea in men and women.
6. Choose selective media used for \textit{N. gonorrhoeae} and \textit{N. meningitides} and describe their components.
7. Develop an identification flowchart for the identification of the pathogenic \textit{Neisseria}.
8. List risk groups for epidemic meningococcal meningitis and discuss the usefulness of the meningococcal vaccine.
9. Discuss the pathogenic significance of \textit{Moraxella catarrhalis} in children and adults.
10. Differentiate between the pathogenic and nonpathogenic \textit{Neisseria} spp.
11. Match the \textit{Haemophilus} species with their associated infection, clinical manifestations and mode of transmission.
12. Determine the appropriate culture media and growth factor requirements for isolation of \textit{Haemophilus}.

\textbf{Enterbacteriaceae & Pseudomonas:}

1. Describe the general characteristics of organisms that belong to the family \textit{Enterobacteriaceae}.
2. Illustrate the antigenic structures of this family of organisms and explain how these structures are used for identification.
3. Compare the pathogenesis of the \textit{Escherichia coli} strains pathogenic for the gastroenteritis tract.
4. Describe the pathogenesis of the clinically relevant \textit{Enterobacteriaceae}.
5. Develop an algorithm using biochemical tests to identify presumptively the clinically significant \textit{Enterobacteriaceae}.
6. Describe the general characteristics of nonfermentative gram-negative rods.
7. Identify the virulence factors associated with \textit{Pseudomonas} spp.

\textbf{Anaerobes, Antibiotics, Susceptibility Testing:}

1. Differentiate the various types of anaerobes with regard to atmospheric requirements.
2. Given a list of specimens for anaerobic processing, select those that are acceptable from those that are unacceptable.
3. Given the clues (signs and manifestations) to an anaerobic infection, recommend the most probable etiologic agent of the following:
   a. Wound botulism
   b. Tetanus
   c. Gas gangrene
   d. Actinomycosis
   e. Pseudomembranous colitis
   f. Bacterial vaginosis
4. Describe the mechanism of action of the different classes of antimicrobials
5. Compare and contrast the bacterial targets of the different antibiotic classes.
6. Explain the rationale behind the performance of antimicrobial susceptibility tests.
7. Describe the method for selection of specific drugs in testing and reporting
8. Define MIC and the methods that are used for determination of MIC’s
9. Explain how zone interpretive criteria used with the disk diffusion test are established.
10. List the variables that must be controlled when antimicrobial susceptibility tests are performed.
11. Explain the principles behind automated antimicrobial susceptibility test methods.
12. List the organisms for which B-lactamase testing is useful.
13. Explain the reliable methods for detection of methicillin-resistant *Staphylococcus aureus* (MRSA)

**Respiratory Infections, Gastrointestinal Infections & Bacteremia:**

1. Describe the basic anatomy of the respiratory tract and explain the mechanical defenses of each anatomic site and how alterations to these defenses may lead to infectious diseases.
2. Define the importance of normal flora in the respiratory tract and explain how alterations in the normal flora may lead to infectious diseases.
3. Discuss the basic pathogenic mechanisms of infectious diseases of the respiratory tract and the virulence factors of the organisms that cause disease.
4. Appraise the important aspects of diagnosis of infections of the respiratory tract through case studies.
5. Explain the normal host defenses at each level of the gastrointestinal tract in preventing infection.
6. Explain the major mechanisms by which bacteria can cause diarrhea.
7. For each of the bacterial agents described in lecture, discuss the predicted results of direct microscopy of the stool specimen and the selective media for the maximal recovery of the pathogen.
8. Define bacteremia and differentiate this condition from septicemia.
9. Classify each type of bacteremia and describe when each condition occurs.
10. Associate specific organisms with each type of bacteremia
11. Discuss the methods for the detection of bacteremia, including the following:
   a. Media
   b. Blood culture additives
   c. Methods of removing antimicrobials
   d. Advantages and disadvantages of each procedure described

**CNS Infections, Urinary Tract Infections & Sexually Transmitted Diseases:**

1. Describe the collection, transportation, and processing of CSF samples.
2. List the common bacterial pathogens in meningitis along with one host-related factor and one virulence-related factor for each pathogen.
3. Compare and contrast the physical, chemical, and cellular features of bacterial, mycobacterial, fungal, syphilitic, viral and parasitic central nervous system infections.
4. Discuss the variety of infections that occur in the urinary system.
5. Identify organisms associated with UTI’s.
6. Discuss the interpretation of urinalysis results based on bacterial colony count, pyuria, and symptoms and signs presented by the patient.
7. Instruct a patient on collecting a clean catch urine specimen.
8. Describe the clinical manifestations produced by the following, discuss the epidemiology and pathogenesis of each of the infections:
   a. *N. gonorrhoeae*
   b. *C. trachomatis*
   c. *G. vaginalis*
   d. *T. pallidum*
   e. *H. ducreyi*
   f. Herpes simplex virus
9. Differentiate the clinical characteristics between gonococcal and nongonococcal urethritis.
10. Interpret specific and nonspecific serologic test results used to diagnose syphilis.
Virology & Rapid ID tests:

1. Describe the characteristics of viruses and differentiate them from bacteria.
2. Describe the proper procedure for collection and transport of viral specimens.
3. Compare and contrast the different methods used in the diagnosis of viral infections.
4. Explain the advantages and limitations of:
   a. Conventional cell cultures for diagnosing viral infections
   b. Rapid viral antigen detection methods
   c. Serologic assays in the diagnosis of viral infections
5. Create an algorithm for the serologic diagnosis of human immunodeficiency virus (HIV) infection.

Mycology & Parasitology:

1. Identify the major causes of fungal infections.
2. List the common opportunistic saprobes associated with infections in immunocompromised hosts.
3. Describe the appropriate specimen collection procedures, staining methods, and culture techniques used in the mycology laboratory.
4. Cite the major considerations in the collection and handling of specimens for identification of intestinal and blood and tissue parasites.
5. Describe the general procedures for performing the direct wet mount, fecal concentration and permanent stained smears, preparation of blood films, concentration methods and staining methods for blood and tissue parasites.
6. For the major human pathogens, describe the mechanism of pathogenesis, clinical symptoms, treatment, and prevention.
7. For each parasite presented, correlate the morphology, the life cycle, including the infective stage and the diagnostic stage and the usual procedure for identification.
8. Differentiate between the following: ectoparasites versus endoparasites; definitive hosts versus intermediate hosts; facultative parasites versus obligate parasites; and mechanical vectors versus biologic vectors.
9. Classify a particular parasitic infection as a protozoal or helminth disease.

HTEC 83 – Clinical Microbiology Laboratory – Psychomotor Objectives

Safety in the Clinical laboratory
Upon completion of this laboratory, the student will demonstrate by performance:

1. Using Universal precautions when handling any laboratory specimen.
2. Proper hand washing technique.
3. Select proper disinfectant to decontaminate the work area when cleaning up a simulated hazardous spill or at the ending of each laboratory session.
4. Locate: fire extinguisher, first aid kit, eye wash station, phone, fire alarm, posted evacuation route.
5. Explain the basic steps to first-aid.
6. Choose appropriate personal protective equipment for working in the clinical laboratory.
7. Select the correct glove size to be used during laboratory sessions and removing soiled gloves using the correct procedure preventing contamination of the skin.
8. Separate biohazardous material correctly according to OSHA mandates.
9. Dilute bleach solution 1:10 to be used for decontaminating the work area.

Specimen Handling/Aseptic Technique
Upon completion of this laboratory, the student will demonstrate by performance:

1. Demonstrate proper procedure for maintaining organism viability relating to storage, transport and preservation of specimens by describing these procedures to a lab partner
2. Given a specific specimen collection request, instruct your laboratory partner in preparation for specimen collection.
3. Practice aseptic technique for handling clinical specimens.
4. Select primary media and inoculate successfully isolating colonies, using a 3 or 4 quadrant streaking method.
5. Create charts for the selection of media used to optimize pathogen recovery based on the specimen type, differentiate each as enriched, differential or selective

**Gram Stain:**
Upon completion of the laboratory, the student will demonstrate by performance:

1. Practice proper procedural skills in gram staining unknown organisms, recording and interpreting results with 90% accuracy
2. Evaluate your gram stains for correct color and clarity, recommend any corrective action needed.

**Gram Positive Cocci/Staph/Wounds:**
Upon completion of the laboratory, the student will demonstrate by performance:

1. Demonstrate technically, the skills needed to perform and interpret laboratory testing in the identification of Staphylococci from unknowns provided.
2. Record and interpret results with 90% accuracy.
3. Differentiate *Staphylococcus* from *Streptococcus* when given unknown cultures by using the following tests as aids:
   a. Catalase
   b. Coagulase (slide and tube)
   c. Oxidase
   d. Bacitracin
   e. Novobiocin
   f. DNAse
   g. Staphyloslide Latex

4. Using Staph API strips, inoculate the unknown, complete the chemical testing, interpret the results and identify possible organisms.
5. Given case study data, including laboratory testing results, predict the organism

**Haemophilus**
Upon completion of this laboratory, the student will demonstrate by performance:

1. Recognize microscopic characteristics of fastidious gram negative rods
2. Plant unknown Haemophilus specimens on blood and chocolate agar. Provide nutritional supplements with X and V strips. Evaluate growth, record and interpret results, identifying the species of Haemophilus.

**GNC/STD Screen:**
Upon completion of this lab, which is a field trip, the student will:
1. Choose media appropriate for the culture or transport of Neisseria spp.
2. Describe Neisseria colony morphology
3. List infectious diseases that are reportable to Public Health agencies
**Gram Negative Rods/UTI:**

1. Choose media appropriate for the culture of GNR
2. Demonstrate knowledge of GNR colony morphology by describing the physical appearance on different media.
3. Demonstrate the technical skills to perform and interpret laboratory testing to identify Enterobacteriaceae, Pseudomonas and organisms responsible for UTI’s based on biochemical tests.
4. Choose medial appropriate for the isolation of bacteria responsible for UTI’s.

**GNR/Campylobacter/Stool:**

1. Demonstrate technical skills to perform and interpret laboratory testing in the identification of Salmonella and Shigella using simulated unknowns.
2. Demonstrate the technical skills to perform and interpret laboratory testing in the identification of Campylobacter using simulated unknowns.
3. Choose media appropriate for the isolation of bacteria responsible for gastrointestinal infections.

**Blood Cultures:**

1. Choose media appropriate for the isolation of bacteria responsible for bacteremia
2. Demonstrate technical skills to perform and interpret laboratory testing in the identification of the bacteria responsible for bacteremia.

**Susceptibility Testing/Eme rog ment Technology**

1. Demonstrate knowledge of procedures to perform antibiotic disk (Kirby Bauer) testing
2. Demonstrate the technical skills to perform and interpret antibiotic (Kirby Bauer) disk testing.
3. Demonstrate knowledge of procedures to perform B-lactamase testing
4. Demonstrate the technical skills to perform and interpret B-lactamase testing.
5. Demonstrate knowledge of selected “kit tests” representative of advances in microbiology

**Mycology/Parasitology:**

1. Review the mycology and parasitology course on [www.medtraining.org](http://www.medtraining.org)
2. Successfully pass the quiz at the end of the online module

**Anaerobic Cultures:**

1. Set up unknowns for anaerobic culture, read and interpret results.
2. Observe the indicator strip and explain its function.

**Student Responsibilities:**

- Attend all lectures and labs; show up on time; have appropriate personal protective equipment available.
- Complete assignments.
- Successfully complete all assignments and tests
- Take part in group discussions; be prepared to give oral presentations.

Clinical science is interactive. Each student should be prepared to give and receive constructive criticism and offer assistance with his or her colleagues regarding issues of safety and proper technique. Participation in lab discussions is an integral part of the
curriculum. Each student may be asked to give a short presentation of a current topic in infectious disease. Clinical science involves communication. Each student will improve their skills in acquiring pertinent medical information and effectively processing and reporting clinical reports and data. Clinical science involves integrity. Interactions among students and the instructor will encompass the best of professional standards of behavior. Students will be treated as professionals which imposes a responsibility on each individual.

Exams:
Midterm #1:  30%
Midterm #2:  30%
Final Exam:  40%

Grading Scale:        Dates of Importance:
90-100%    A         - last day to drop for a refund: January 18, 2008
80-89%      B         - last day to drop with no grade: January 25, 2008
75-79%      C         - last day to drop with a “withdraw” February 29, 2008
65-74%      D
<65%        F

Student Accountability: “There is a zero tolerance policy for any cheating, plagiarism, or behavior that would lead a reasonable person to assume that these actions have taken place. Anyone observing such behavior should report it to a faculty member at once. Anyone found by a faculty member to have committed plagiarism or to have cheated (or given the appearance of having done either), will be dropped from the course and given an F by the faculty member.”

“BHS Division Student Handbook, De Anza College, p.6

You may access your final grades through the Star System (408-777-9394 or 650-917-0509) or via the Internet at: (http://www.deanza.fhda.edu/DA_grades.shtml).

Medical Terminology Course Work:
Reading: Chapter 6 & 7
This will be an independent study assignment. Tests are to be taken in the Allied Health Resource Center (S-82). Points will be included as part of the final exam.