

Spring 2006

Course Name: BIOTECHNOLOGY MODULE 2: BACTERIOLOGICAL METHODS

Prefix and Number: BIO 282

Credit and Contact Hours: 1 credit hour – 1½ contact hours

Course Description: A laboratory module introducing the student to techniques in media preparation, culturing and handling of microorganisms, and genetic exchange in bacteria.

Prerequisite: BIO 121.

II. COURSE OUTCOMES AND OBJECTIVES

1. Know safety procedures for handling pathogenic microorganisms.
2. Be able to prepare media which includes use of balances, a variety of glassware, and use of the autoclave.
3. Be able to demonstrate proficiency in using streak-plate, spread-plate, and pour-plate.
4. Be able to demonstrate an understanding for the uses of differential, selective, and all-purpose media.
5. Recognize different colony types on the variety of media used in lab.
6. Be able to properly handle viruses and understand the concept of a bacteriophage.
7. Understand bacterial conjugation and transformation.
8. Be able to identify the gram stain reaction of a microorganism with the aid of a microscope.

The following College Competencies covered in this class would include: writing, reading, computer literacy, professional competency and problem solving.

III. METHOD OF INSTRUCTION

The format of this class will be lecture with most of the time spent doing hands-on laboratory exercises.

Students will be graded on homework reading assignments, papers (2), quiz, and a cumulative final exam.

IV. COURSE OUTLINE

1. Introduction to Course
 - Laboratory Safety
 - Lecture on Bacteria
 - Environmental Culturing
2. Preparing Culture Media
 - Prepare broths, slants, and plates of media for use in the subsequent laboratories.
 - Describe two uses for each form of culture media; solid, semisolid, and liquid.
 - List five functional categories of media; describe the purpose of each and give

- an example of each.
 - Distinguish between a chemically defined medium and a chemically complex one.
 - List the basic nutritional requirements of all bacteria.
 - Summarize attributes of agar that make it an adequate solidifying agent for the microbiology laboratory.
 - Wash glassware correctly for culture media preparation.
 - Discuss the advantages of utilizing a hot plate stirrer for preparing culture media.
 - Explain why Petri plates of media are poured at a holding temperature of about 50°C instead of 100°C.
 - Demonstrate knowledge of proper media storage techniques.
3. Streak-plate, Spread-Plate, Pour-Plate and Differential and Selective Media
 - With the streak-plate technique, students separate bacterial cells and grow them into isolated colonies.
 - Prepare bacterial spread plates that completely cover the medium with even, confluent growth.
 - Student's will learn a basic technique called a pour-plate which is used in the culturing of and/or isolation of bacteria in which a melted, yet sufficiently cooled, medium is inoculated with a bacterial culture, introduced into a sterile Petri dish, and allowed to harden; the individual bacteria trapped within the medium grow and eventually form colonies.
 4. Bacterial Culture Characteristics
 - Distinguish basic features of bacterial colonies, broth cultures, and agar slant growths.
 - Recognize the advantages and limitations of culture characteristics in the identification of bacterial species.
 - Determine the influence of temperature of pigment production.
 5. Viruses and Plaque Assay
 - Use and manipulate pipettes and pipettors to safely transfer liquids and/or bacterial cultures.
 - Calculate and perform dilutions.
 - Use metric units of measurement for liquids.
 - Perform the standard plate count technique.
 - Determine the number of viable bacteria/millimeter (mL) by means of a spread-plate technique.
 - Define virus structure, lytic and lysogenic life cycles, and bacteriophage.
 - Discuss medically important viruses.
 - Perform plaque assay to detect areas where viruses have replicated and destroyed host cells.
 6. Bacterial Transformation and Conjugation
 - Discuss general theory of bacterial conjugation and transformation.
 - Discuss the importance of plasmids and their role in antibiotic resistance.
 - Review the work of Frederick Griffith and show how this relates to bacterial transformation.
 7. Gram Stain Reactions

- Students will view several slides to determine gram stain reaction and morphology.