Microbiology & Infection Control

Specialty Courses for Phlebotomists

National Center for Competency Testing

7007 College Boulevard, Suite 385 | Overland Park, Kansas 66211
www.ncctinc.com | t: 800.875.4404 | f: 913.498.1243

Microbiology and Infection Control for Phlebotomists

By Sheryl Whitlock, MA, MT(ASCP)BB
Laboratory Coordinator
Student Health Service
University of Delaware
Newark, Delaware 19716

NCCT is continually refining and creating professional development products for all certified allied health professionals. We are committed to your success. This mini course was designed to help health care professionals understand, empathize, and provide superior service to our aging population.

The course is divided into chapters. There is an open-book quiz at the end of every chapter to help you assess your understanding of that chapter's material. Upon completing all the chapters, you can access this mini-course's final examination online at NCCT's website, www.ncctinc.com. Proceed to the ***Testing*** section, and choose the ***CE Test Login*** option and log in. Choose the ***Microbiology and Infection Control for Phlebotomists Final Exam***.

Seventy percent or better is considered a passing grade for this course. Upon passing the course's final exam, you will receive a Specialty Certificate and a sticker from NCCT signifying that you have successfully completed this course. This sticker should be placed in your NCCT *Professional Development Log Book*. You will also receive five clock hours of continuing education credit and the course title will be placed on your *NCCT Continuing Education Transcript*.

Acquiring new skills and pursuing additional knowledge in your career field have always been the hallmark of a true professional. Read, learn, and most importantly, enjoy your profession more. Your new knowledge will not only increase your competence and importance to your team, but also will increase your own self-assurance in your abilities and work.

Course Objectives

Upon completion of the Competence Certificate Course, the professional will be able to:

1. Define Microbiology as a science.
2. Outline and describe classes of bacteria by shape and gram reaction.
3. Define the term spore and related to transmission of infections.
4. Define antiseptic and disinfectant.
5. Compare and contrast antiseptics and disinfectants.
6. Relate principles and antisepsis and disinfection to phlebotomy practices.
7. Define nosocomial infection.
8. Define and discuss transmission-based precautions.
9. List and describe the three main types of isolation.
10. Discuss the social and emotional effects of isolation.
11. Discuss and apply principles of hand hygiene to phlebotomy.
12. Discuss principles of glove use and related to the transmission of microorganisms.
13. Relate transmission of microorganisms to transmission of infectious agents.
14. Outline proper arm preparation for phlebotomy.
15. List and describe antibiotic resistant organisms that pose infection hazards in the healthcare setting.
16. Discuss the medicolegal impact of infections related to phlebotomy.

Chapter 1 Introduction to Microbiology

Microbiology is one of the four major technical areas found in the Clinical Laboratory. The basic testing performed in the Microbiology Department includes isolation and identification of microbes. Microbes or bacteria could be described with a "good cop" and "bad cop" type of scenarios. The main intent of Microbiology as a Clinical Science is to identify the bacteria in its "bad cop" modality. This would include scenarios where bacteria have a negative impact on the patient.

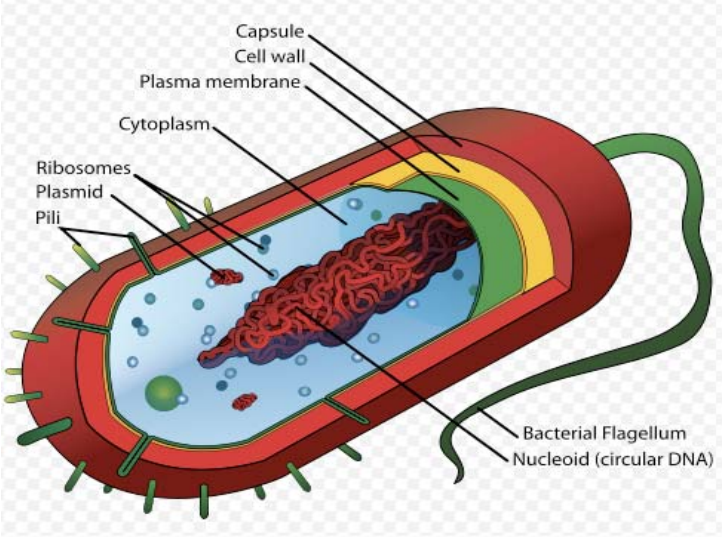
While identifying the "bad cop," the microbiologist must also be able to identify the "good cop" role of the bacteria. Human bacteria reside in the human body in a delicate balance. The "good cop" bacteria serve a protective role and actually work towards preventing infection. These "good cop" bacteria are known as "normal flora." When this delicate balance is upset, the "bad cop" bacteria take over and populate the area creating an infection or infectious process.

It is important for the phlebotomist to understand both bacterial roles. Performing an invasive procedure such as venipuncture or skin puncture breaks the integument allowing for a "portal of entry" for the "bad cops." Therefore, a basic understanding of bacteria, infectious processes, antisepsis and disinfection will aid the phlebotomist in performing the tasks associated with phlebotomy without causing harm to the patient.

Section A Cell Structure

Cytoplasmic Structures

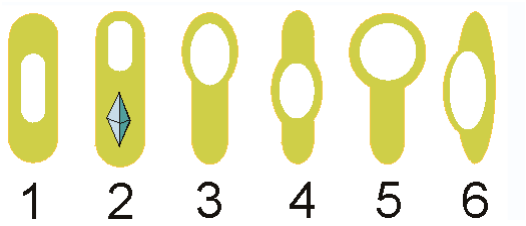
The bacterial cell contains structures unique to a prokaryotic cell. See the diagram below for a diagrammatic representation of cellular structures. Bacterial cells are not nucleate. This means that the bacterial cell contains no nucleus, but rather contains a single chromosome. The chromosome is circular in shape.



From: Wikipedia. Accessed 1/4/10.

Bacterial ribosomes may be attached to the cytoplasmic membrane and free in the cytoplasm. Granules are organelles present in the cytoplasm. The granules are storage deposits for substances such as glycogen.

Endospores are intracellular structures that are pertinent to the infectious process. These structures are small, dormant, asexual spores. These spores are a means of survival. Spores become vegetative when harsh conditions are removed. The thick protein coat of the spore is highly resistant to chemical agents, temperature change, starvation, dehydration, radiation and desiccation.[10] Spores appear as refractile bodies in the cell. Experienced microscopists may use the size, shape, and interior location of the spore as one of the identifying characteristics. See the diagram below for specifics on endospore placement.



Key:
1. Central endospore
2. Terminal endospore
3. Terminal endospore
4. Central endospore
5. Terminal endospore
6. Lateral endospore

From: Wikipedia. Accessed 1/4/10.

Section B Cell Wall

The prokaryotic cell wall is the structure that maintains the shape and osmotic pressure of the cell. The rigidity of the cell wall prevents rupture of the cell by a change in osmotic pressure. Absence of a cell wall is characteristic of some prokaryotes. These organisms will not be discussed in this unit. There are two major types of bacterial cell walls:

Gram-Positive - A very thick protective peptidoglycan layer composes the gram-positive cell wall. Teichoic acid is anchored to the peptidoglycan and penetrates to the exterior of the cell and lipoteichoic acid is anchored to the plasma membrane. These two components are unique to the gram-positive cell wall.

The composition of the gram-positive cell wall is integral to the effectiveness of specific antibiotics. Antibiotics that act effectively against gram-positive organisms are those that act by preventing the synthesis of peptidoglycan.

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