12.3C: Cultivation of Specimen

Following direct examination, clinical specimens are cultivated to generate more confirmatory data.

Learning Objectives

• Describe how direct microscope observation of a fresh or stained specimen is one of the most rapid methods of determining its characteristics

Key Points

• The success of pathogen identification and treatment depends on how the specimen is collected, handled, and stored.
• Diagnostic laboratory techniques include direct testing using a microscope, and immunological or genetic methods that provide immediate clues as to the identity of the microbe or microbes in the sample.
• Following direct testing, cultivation, isolation, and identification of pathogens using a wide variety of general and specific tests is required.

Key Terms

• mannitol: A polyhydroxy alcohol, an isomer of sorbitol, used as an artificial sweetener.
• MacConkey agar: A culture medium designed to grow Gram-negative bacteria and differentiate them from lactose fermentation.
Cultivation of Specimen

The success of pathogen identification and treatment depends on how the specimen is collected, handled, and stored. It is also critical that the pathogen is isolated in a pure culture first. Direct microscope observation of a fresh or stained specimen is one of the most rapid methods of determining characteristics. Stains most often employed for bacteria are the gram stain, though they do not work on some organisms.

The direct florescence antibody (DFA) test can highlight the presence of the microbe in patient specimens by means of labeled antibodies. This test is useful for bacteria such as syphilis spirochete, which are not readily cultivated in a laboratory, or if a rapid diagnosis is essential for the survival of a patient.

Figure: Blood culture: This blood is cultured in a bottle to detect bloodstream infections.

In most cases, specimens are also inoculated into differential media that define such characteristics as fermentation patterns (mannitol salt and MacConkey agar) and as reactions in blood (blood agar). A patient’s blood is usually cultured in a special bottle of broth that can be periodically sampled for growth. Work must be done from isolated colonies or pure cultures, as working with mixed or contaminated cultures gives misleading and inaccurate results. From such isolates, clinical microbiologists obtain information about a pathogen’s microscopic morphology and staining reactions, culture appearance, motility, oxygen requirements, and biochemical characteristics.

Serological testing uses in-vitro diagnostic testing of serum, has a high degree of specificity and sensitivity, and is based on the specificity an antibody has for its antigen. These techniques do not necessitate a cultivation step. Serum can be directly used in agglutination, precipitation, complement fixation, fluorescent microscopy, and enzyme-linked assays. Results of specimen analysis are entered in the patient’s summary chart.