

Diagnostic Microbiology 22/2023

Lecture-(11), (12-13) and (14-15)

Lecture-11

Antibiotic susceptibility tests

Antimicrobial agents are nontoxic antimicrobial therapeutic agents, which include antiseptics, antibiotics, preservatives, sterilants, and disinfectants; all have the capacity to kill or suppress the growth of microorganisms. Antimicrobial agents are an essential components of the practice of medicine. They are used to **treat, prevent,** and control the distribution of bacterial pathogens. The term **antibiotic** has been traditionally reserved for compounds that are naturally produced by **living microorganisms**, such as bacteria and fungi. The term has come to be more widely applied to any natural, semisynthetic, or synthetic molecule used to treat or prevent disease.

Antibiotics Mode of Action:

Antibiotics target anabolic **cellular processes** such as:

1. **Cell wall synthesis.**

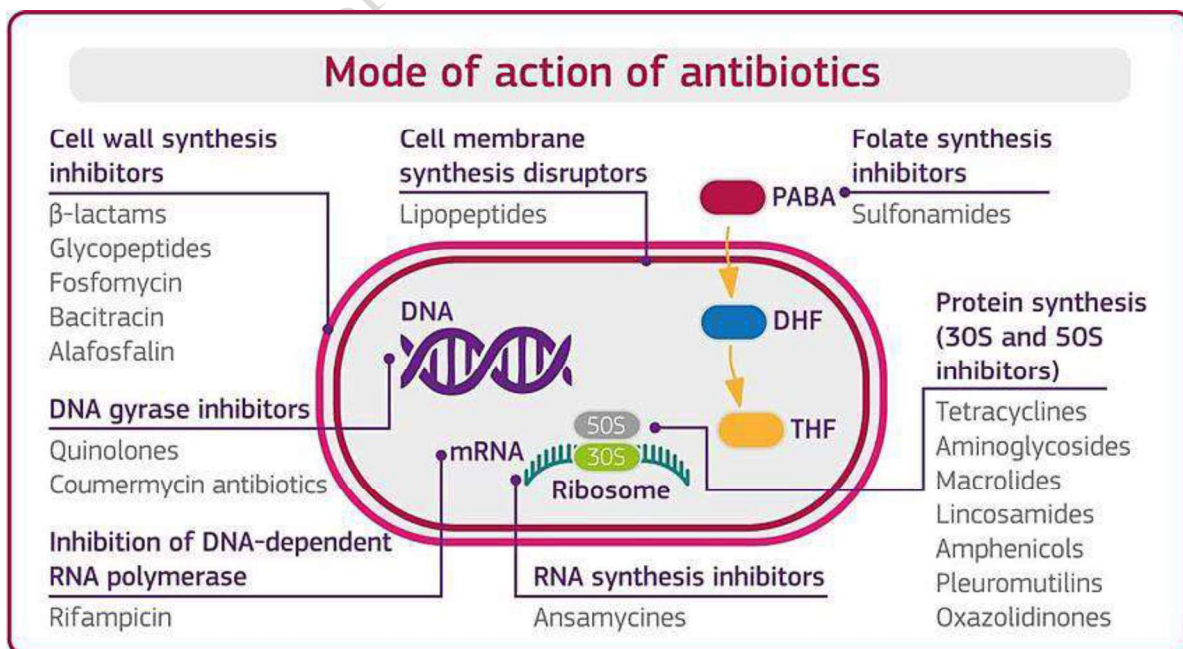
2-**Cell membrane synthesis**

2. **DNA replication.**

3. **RNA transcription.**

4. **Protein synthesis**

5-**cell metabolism**



Antibiotic susceptibility testing is performed on bacteria **isolated** from **clinical specimens** to determine which antimicrobial agents might be effective in treating infections caused by the bacteria. Only bacteria that are likely to be contributing to an infection should be tested. Testing bacteria that are not involved in the infection would be misleading to the physician and could lead to a **more serious infection** with development of **antimicrobial resistance**. One of the major challenges in clinical microbiology is the identification of the bacterium that caused infections.

Often, these bacteria **need** to be **distinguished** from **normal flora** that may be present in at the site of the infection normally, although in some situations the microbial flora that reside at the site of the infection may be **contributing to the infection**. Therefore, thought needs to go into determining which bacteria from a specimen will be tested for susceptibility to antimicrobials.

Most microbiology laboratories have guidelines for determining when and on which bacteria susceptibility testing will be done. When in doubt about the significance of a bacteria from a specimen, it is best to discuss the **situation** with the attending **physician**.

In clinical laboratories, susceptibility testing is usually performed by a disk diffusion or and minimal inhibitory concentration [MIC] methods. Standards that describe these methods are published and frequently updated by the **Clinical and Laboratory Standards Institute (CLSI)**, formerly the **National Committee for Clinical Laboratory Standards [NCCLS]**.

After a pathogen is cultured, its sensitivity to specific antibiotics serves as a guide in choosing antimicrobial therapy. Some pathogens, such as *Streptococcus pyogenes* and *N. meningitidis*, usually have predictable sensitivity patterns to certain antibiotics. In contrast, most gram-negative bacilli, enterococci, and staphylococcal species show unpredictable sensitivity patterns to various antibiotics and require susceptibility testing to determine appropriate antimicrobial therapy. There are many methods for detecting this bacterial susceptibility pattern like: