



➤ Principles of Antimicrobial Therapy

- Administer to an infected person a drug that destroys the infective agent without harming the host's cells.
- Antimicrobial drugs are produced naturally or synthetically.

Characteristics of the Ideal Antimicrobial Drug

- Selectively toxic to the microbe but nontoxic to host cells
- Microbicidal rather than microbistatic
- Relatively soluble; functions even when highly diluted in body fluids
- Remains potent long enough to act and is not broken down or excreted prematurely
- Doesn't lead to the development of antimicrobial resistance
- Complements or assists the activities of the host's defenses
- Remains active in tissues and body fluids
- Readily delivered to the site of infection
- Reasonably priced
- Does not disrupt the host's health by causing allergies or predisposing the host to other infections

➤ Terminology of Chemotherapy .

- **Chemotherapeutic drug** : Any chemical used in the treatment, relief, or prophylaxis of a disease.
- **Antimicrobials** : All - inclusive term for any antimicrobial drug - regardless of its origin .
- **Antibiotics** : Substances produced by the natural metabolic processes of some microorganisms that can inhibit or destroy other microorganisms .

➤ Origins of Antibiotic Drugs .

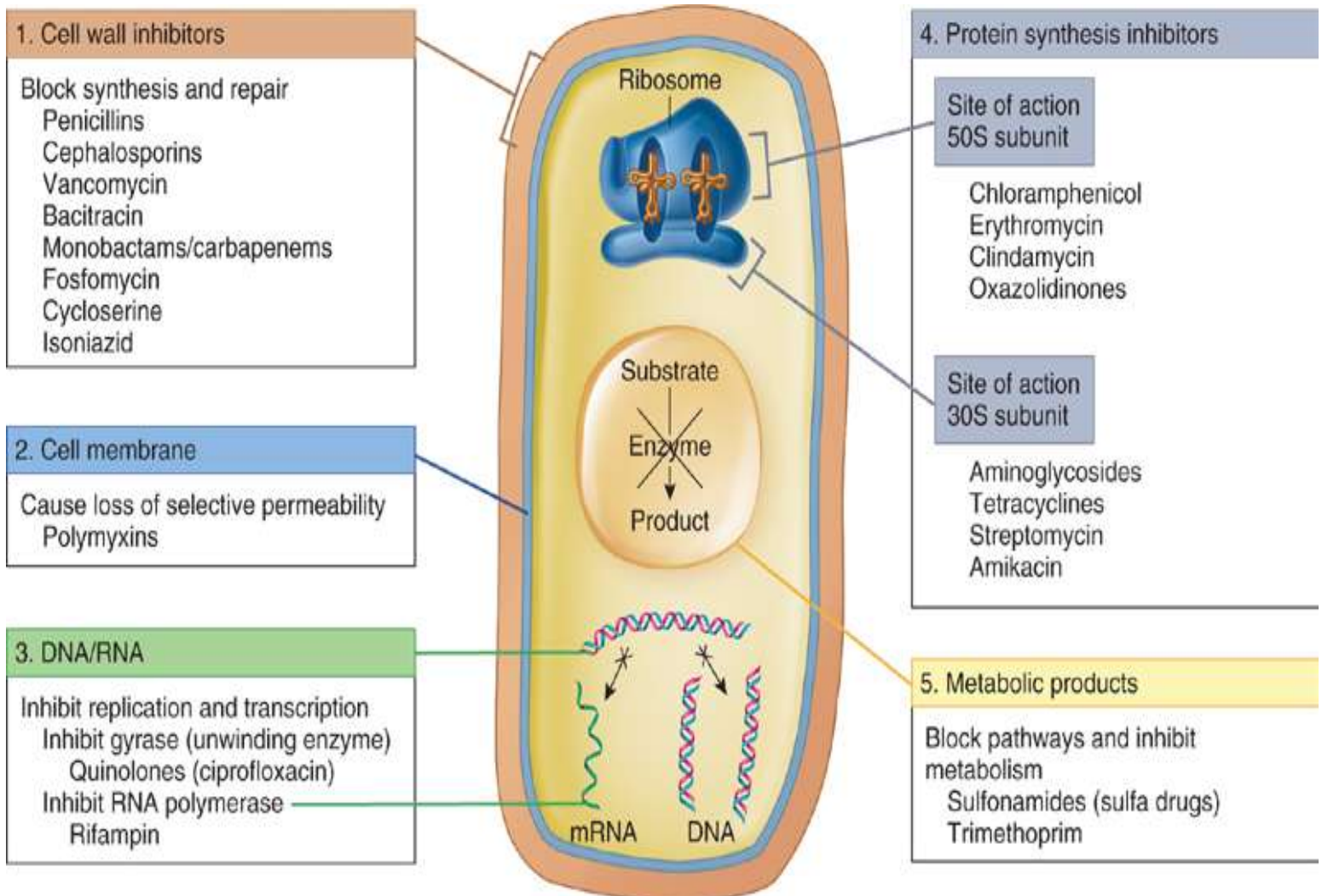
- Antibiotics are common metabolic products of aerobic spore forming bacteria and fungi .
 - Bacteria in genera *Streptomyces* and *Bacillus* .
 - Fungi in genera *Penicillium* and *Cephalosporium* .
- Act by inhibiting the other microbes in the same habitat, antibiotic producers have less competition for nutrients and space.

➤ Interactions Between Drug and Microbe .

- Antimicrobial drugs should be selectively toxic - drugs should kill or inhibit microbial cells without damaging or degraded host tissues.
- As the characteristics of the infectious agent become more similar to the vertebrate host cell , complete selective toxicity becomes more difficult to achieve and more side effects are seen.

➤ Mechanisms of Drug Action

1. Inhibition of cell wall synthesis
2. Disruption of cell membrane structure or function
3. Inhibition of nucleic acid synthesis, structure or function
4. Inhibition of protein synthesis
5. Blocks on key metabolic pathways .



➤ The Spectrum of an Antimicrobial Drug .

Spectrum – means **range** of activity of a drug .

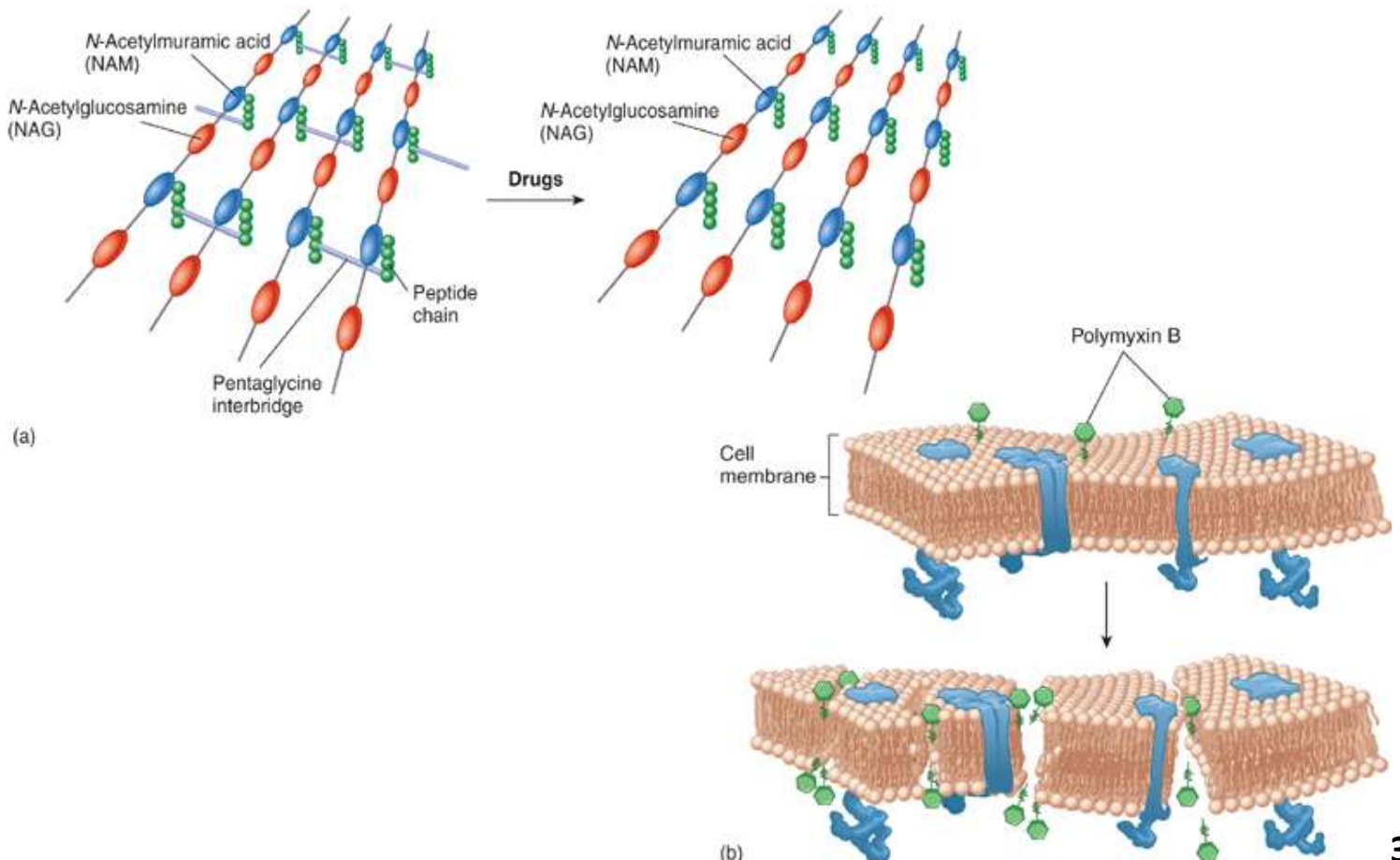
- **Narrow-spectrum** (limited spectrum) Antimicrobials effective against a limited array of microbial types for example. A drug effective mainly on gram positive bacteria .
- **Broad-spectrum** (Extended spectrum) Antimicrobials effective against a wide variety of microbial types for example a drug effective against both gram - positive and gram-negative bacteria .

➤ 1- Antimicrobial Drugs that Affect the Bacterial Cell Wall .

- Penicillins and Cephalosporins block synthesis of peptidoglycan, causing the cell wall to lost .
- Active on young , growing cells .
- Penicillins do not penetrate the outer membrane and are less effective against Gram-negative bacteria.

➤ 2- Antimicrobial Drugs That Disrupt Cell Membrane Function .

- A cell with a damaged membrane dies from disruption in metabolism or lysis .
- Polymyxins interact with phospholipids and cause leakage, particularly in Gram-negative bacteria.
- Amphotericin B and nystatin form complexes with sterols on fungal membranes which causes leakage.



➤ **3- Drugs That Inhibit Nucleic Acid Synthesis .**

- May block synthesis of nucleotides, inhibit replication, or stop transcription .
- Chloroquine binds and cross-links the double helix; quinolones inhibit DNA helicases. (Enzyme Helicase Unwinds double-stranded DNA).

➤ **4- Drugs That Block Protein Synthesis .**

- Ribosomes of eucaryotes differ in size and structure from procaryotes ; antimicrobics usually have a selective action against procaryotes ; can also damage the eucaryotic mitochondria .
- Aminoglycosides (streptomycin, gentamycin) insert on sites on the 30S subunit and cause misreading of mRNA.
- Tetracyclines block attachment of tRNA on the A acceptor site and stop further synthesis.

➤ **5- Drugs that Affect Metabolic Pathways .**

- Sulfonamides and trimethoprim block enzymes required for tetrahydrofolate synthesis needed for DNA and RNA synthesis.

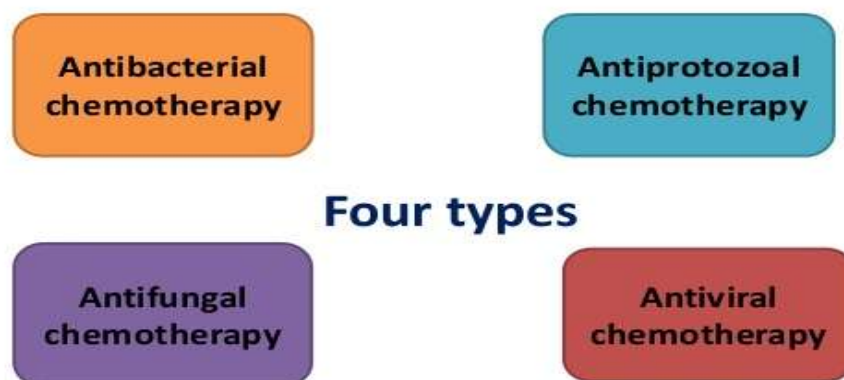
➤ **Interactions Between Drug and Host**

- Interactions Between Drug and Host Estimate that 5% of all persons taking antimicrobials will experience a serious adverse reaction to the drug – side effects .

Major side effects include :-

- direct damage to tissue due to toxicity of drug
- allergic reactions
- disruption in the balance of normal flora- super infections possible .

Types of antimicrobial chemotherapy



WHAT IS AN ANTIBIOTIC?

❖ **“Antibiotic”** is from antibiosis, meaning against life.

“Substances produced by various species of microorganisms (bacteria, fungi, actinomycetes) to kill or suppress the growth of other microorganisms”

The minimal inhibitory concentration (MIC)

the minimum amount of a drug required to inhibit the growth of bacteria in vitro.

- **The minimal bactericidal concentration (MBC)**

the minimum amount of a drug required to kill bacteria in vitro.

TYPE

Natural Antibiotics Antimicrobial drugs produced by microorganisms.

Synthetic Antibiotics Antimicrobial drugs synthesized in the lab.

CON ...

Susceptibility Test (Sensitivity Test) .

A sensitivity analysis is a test that determines the “sensitivity” of bacteria to an antibiotic. It also determines the ability of the drug to kill the bacteria. The results from the test can help your doctor determine which drugs are likely to be most effective in treating your infection.

The Aims of antimicrobial Susceptibility test :-

- 1- To the effective drug against the isolated bacteria .
- 2- To determine minimal inhibitory concentration (MIC) , which the lower concentration of antimicrobial agent which inhibits the growth of test microorganisms .

Factors effecting of antimicrobial Susceptibility of bacteria :-

- 1- Inoculum size
- 2- The rate of growth of the bacterium
- 3- The incubation conditions and periods
- 4- The nature of the medium used
- 5- The stability of antibiotic used
- 6- Diffusion rate of antibiotic disc
- 7- Concentration of the antibiotics .

