Antimicrobial: Inhibits growth of micro-organisms (bacteria, virus, fungus).
Antibacterial: Inhibits or kill growth of bacteria.

Antibiotic: refers to a natural substance produced by a microorganism that can kill other microorganisms. However, many of the newer drugs that are available to treat bacterial infections are now produced synthetically.

Properties of good antibiotics

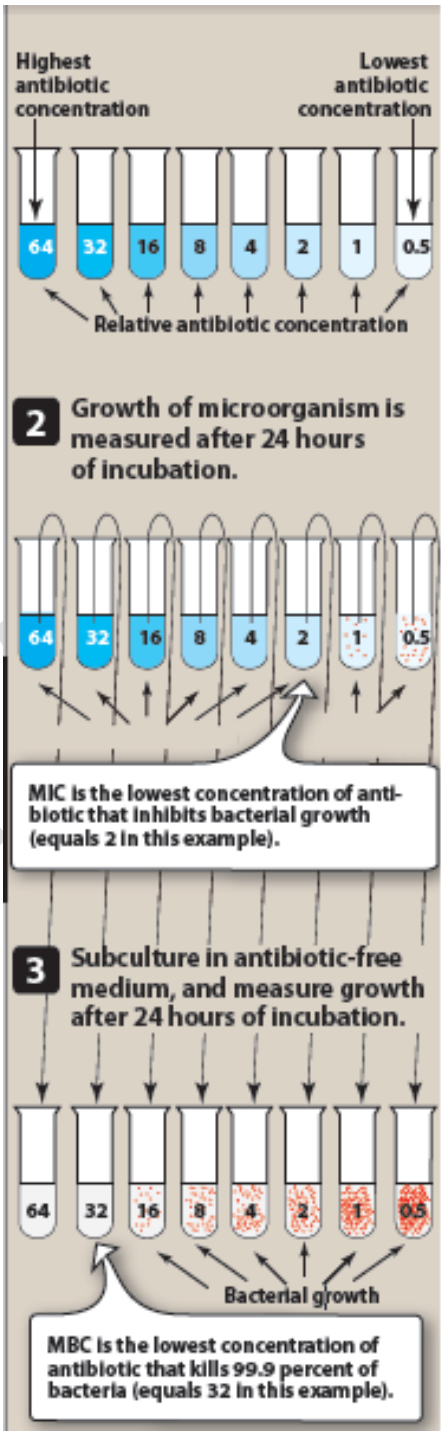
- Antibiotics should be:
- Selectively toxic.
- Bactericidal vs bacteriostatic.
- No resistance to the drug emerging.
- Broad spectrum of activity.
- No toxic side effects.
- Active *in vivo* (in the body).
- Active at low concentrations.

Selection of Antimicrobial agents:
Selection of the most appropriate antimicrobial agent requires knowing
1) the organism's identity.
2) the organism's susceptibility to a particular agent.
3) the site of the infection. 4) patient factors.
5) the safety of the agent. 6) the cost of therapy.

Empiric therapy: Immediate administration of drug prior to bacterial identification and susceptibility testing, **In case of emergency.**

Minimum inhibitory concentration (**MIC**): Is the lowest antimicrobial concentration that prevents visible growth of an organism after 24 hours of incubation.
Minimum bactericidal concentration (MBC): Is the lowest concentration of antimicrobial agent that results in a 99.9% decline in colony count after overnight broth dilution incubations.

Combinations of antibacterial drugs:



Advantage of combination:

1-Achieve synergism

2- treat mixed infection.

3-treat un diagnosed infection.

4- decrease the toxicity.

5- prevent or delayed resistance.

6- to broaden the spectrum of antibacterial.

Disadvantage of combination:

1-Antagonism effect.

2- Act on the same target.

3-Stimulation of B-lactamase (increase bacterial resistance).

Resistance of bacteria to Antibacterial drugs:

One of the most serious threats affecting the world today.

Mechanisms of resistance:

1-Alteration of drug target inside the cell

2-Alteration of membrane permeability

- Prevention of entry of drug into the cell
- Change a membrane transport protein or increase ability to pump out of the membranes

3-Inactivation of the drug by enzymes (Penicillinases or β lactamases).

4. Alteration of an enzyme, so a metabolic pathway is no longer affected by the drug.

How Resistance Occurs:

1-Mutations

2- acquiring a plasmid (R factors).

Classification of Antibacterial:

A. According to Spectrum:

1-Narrow spectrum: All bactericidal are narrow spectrum which mean acting only on a single or a limited group of microorganisms. e.g Cephalosporin.

2-Extended spectrum: Antibiotics that are effective against gram-positive organisms and also against a significant number of gram-negative bacteria. For example, ampicillin.

3-Broad spectrum: Drugs such as tetracycline, fluoroquinolones and carbapenems affect a wide variety of microbial species. (may be affected on normal flora).

B. Classification of Antibacterial according to mechanism of action:

1-Cell wall inhibitors (beta lactum , vancomycin)

2-Protien synthesis inhibitors (Aminoglycoside, tetracycline)

3-Cell membrane inhibitors (Amphotercin B , polymyxins)

4-Nucleic acid function inhibitors (fluroquinolones , rifamipin)

5-Metabolism inhibitors (Sulfanomide , trimethoprim).

C. Classification of Antibacterial according to kills:

1-Bacteriostatic Drugs: drugs do not kill pathogens but instead slow their growth, allowing natural body defenses to eliminate the microorganisms. If the drug is removed before the immune system has eliminated the organism, remaining viable organisms can begin a second cycle of infection. e.g. Tetracycline, erythromycin

2-Bactericidal Drugs: Irreversible inhibition of growth When the antibiotic is removed, almost none of the bacteria can replicate. e.g. Penicillin, cephalosporin.