

Antimicrobial agent is any natural, semisynthetic or synthetic substance has the ability to kill, inactivates or inhibits growth of microorganisms with little or no damage to the host cells.

Antibiotic is any natural or semisynthetic substance (**produced by living organisms**) has the ability to kill, inactivates or inhibit growth of microorganisms with little or no damage to the host cells.

Activity Spectrum: It means the range of pathogenic bacteria that antibiotic has the ability to act (kill or inhibit) on it.

Selective Toxicity: It is the ability of an antimicrobial agent to kill or harm the microorganism cells without harming the cells of the host organism.

Ex. Penicillin interferes with cell wall synthesis. Animal cells have no cell walls, so penicillin is not toxic to animals.

Hint...

All the antibiotics are antimicrobials, but not all antimicrobials are antibiotics.

Classification of Antibiotics:

✚ According to their nature...

Natural antibiotics: These antibiotics are totally produced and derived from microorganisms, like penicillin G.

Semi-synthetic antibiotics: These antibiotics are produced and derived from microorganisms with chemical modified, like ampicillin.

✚ According to their spectrum...

Broad spectrum antibiotic: Act on both gram positive and negative bacteria.

Narrow spectrum antibiotic: Act only on gram positive or negative bacteria.

Limited spectrum antibiotics: These antibiotics are effective against single organism.

✚ According to their actions...

Bactericidal antibiotics: These antibiotics have the ability to **kill** microorganisms, like penicillins.

Bacteriostatic antibiotics: These antibiotics are used to **inhibit** growth of microorganisms, like tetracycline.

Note:

- ✚ Unlike the bactericidal agents, the bacteriostatic agents must work together with the immune system to inhibit the microorganisms.
- ✚ According to drug concentration, the activity may vary. For example, if we use high concentrations of bacteriostatic agents, they may act as bactericidal, whereas low concentration of bactericidal agents may act as bacteriostatic.
- ✚ The minimum concentration of a drug that is needed to inhibit bacteria is known as 'minimum inhibitory concentration' or **MIC**.
- ✚ The minimum concentration of a drug that is needed to kill bacteria is called the 'minimum bactericidal concentration' or **MBC**.

Bactericidal VS Bacteriostatic

Bactericidal antibiotics

1. Kill bacteria directly
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2. Number of bacteria decreases
3. Don't allow the immune system to deal with infections
4. It act as bacteriostatic agents when the doses of it is low
5. Measured by MBC

Bacteriostatic antibiotics

1. Inhibit the growth of bacteria
2. Number of bacteria remains the same
3. Allow the immune system to deal with infections
4. It act as bactericidal agents when the doses is high
5. Measured by MIC

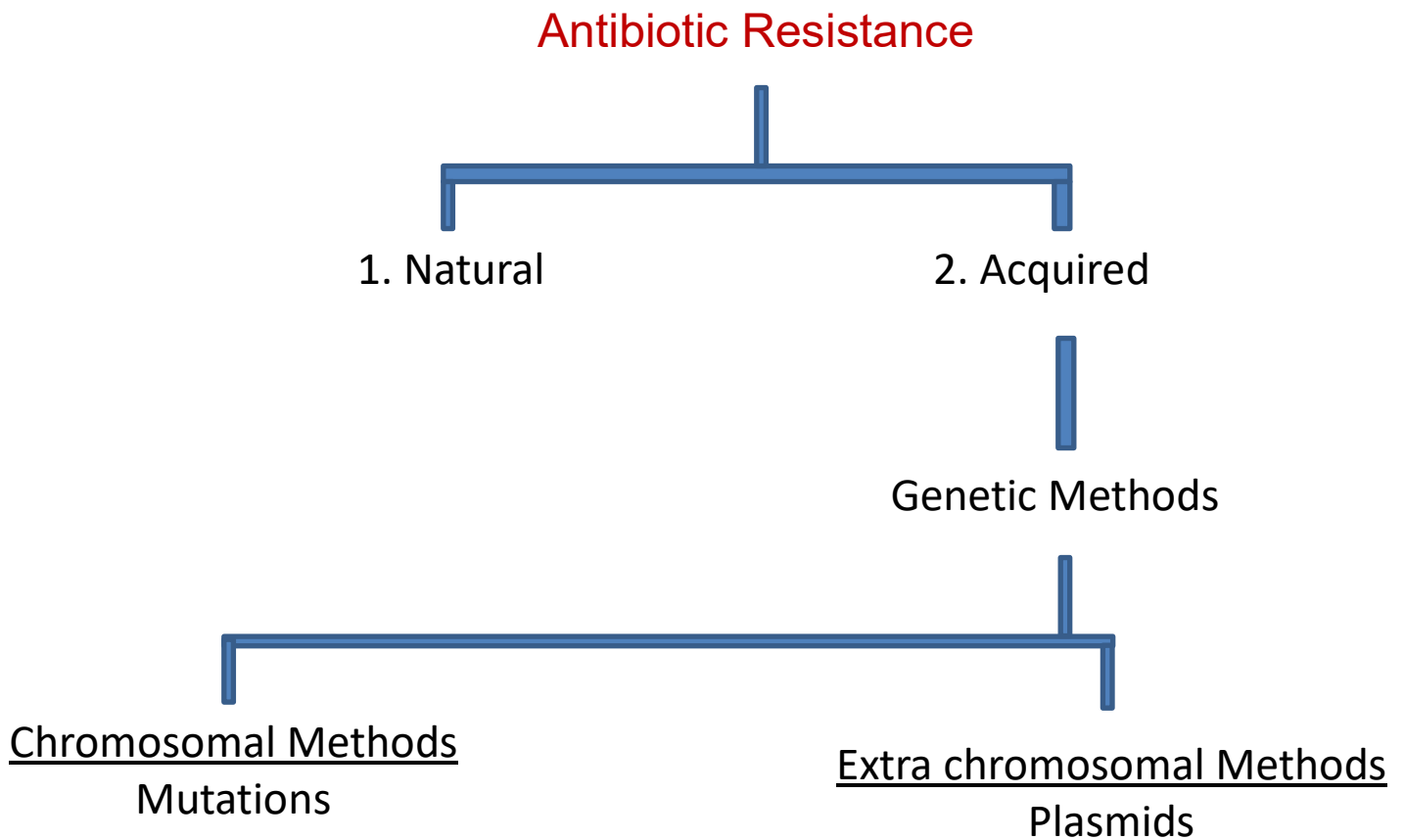
Factors of choosing the right antibiotics...

Physicians use either one or sometimes a combination of antibiotics when treating an infection and it depends on many factors such as:

- Type of infection.
- Type of pathogenic agent.
- Spectrum of activity.
- Bacterial growth density.
- Duration of infection.
- Immunity state of patients.
- Cost.

Antimicrobial resistance ...

It is the ability of microbes to grow and multiply in the presence of antimicrobial agent that would normally kill them or limit their growth. The concentration of drug at the site of infection must inhibit the organism and remain below the level that is toxic to human cells.



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