

Antimicrobial"

is a general term that refers to a group of drugs that includes antibiotics, antifungals, antiprotozoals, and antivirals.

For example, antibacterials are used against bacteria and antifungals are used against fungi. They can also be classified according to their function.

Classification of antibacterial agents

Antimicrobials are classified in several ways, including:

1-Spectrum of activity

2-Effect on bacteria

3-Mode of action

1-Classification according to spectrum of activity:

a-Broad spectrum antibacterials :

An antibiotic that is effective against a wide range of bacteria, both gram-positive and gram-negative examples the aminoglycosides, the 2nd and 3rd generation cephalosporins.

b-Narrow spectrum antibacterials:

Antibiotics that kill just gram-positive or gram-negative bacteria or could be specific to one type of bacteria examples penicillins (penG), and vancomycin

Effect on Bacteria

a-Bactericidal drugs :

a-An antibiotics kill bacteria examples of bactericidal drugs include aminoglycosides, cephalosporins, penicillins, and quinolones.

b-Bacteriostatic drugs:

An antibiotics inhibit bacterial growth examples of such include tetracyclines, sulfonamides, and macrolides.

3- Mode of action

- 1-Inhibitors of cell wall synthesis**
- 2-Inhibitors of cell membrane function**
- 3-Inhibitors of protein synthesis**
- 4-Inhibitors of nucleic acid synthesis.**
- 5-Inhibitors of other metabolic processes.**

1-Inhibitors of cell wall synthesis

A drug that targets cell walls ,kill or inhibit bacterial organisms. Examples: penicillins, cephalosporins, bacitracin and vancomycin.

2-Inhibitors of cell membrane function

this class of antibiotic are often poorly selective and can often be toxic for systemic use in the mammalian host. Most clinical usage is therefore limited to topical applications. Examples: polymixin B.

3-Inhibitors of protein synthesis

Protein synthesis is an essential process necessary for the multiplication and survival of all bacterial cells. Several types of antibacterial agents target bacterial protein synthesis by binding to either the 30S or 50S subunits of the intracellular ribosomes e.g. tetracyclines

4-Inhibitors of nucleic acid synthesis

DNA and RNA are keys to the replication of all living forms, including bacteria. Some antibiotics work by binding to components involved in the process of DNA or RNA synthesis,

causes interference of the normal
cellular processes as bacterial
multiplication and Examples:
quinolones,

5-Inhibitors of other metabolic processes.

Other antibiotics act on selected cellular processes essential for the survival of the bacterial pathogens. For example, both sulfonamides and trimethoprim disrupt the folic acid pathway,.

**which is a necessary step for
bacteria to produce precursors
important for DNA synthesis**

trimethoprim inhibit dihydrofolate reductase; both of these enzymes are essential for the production of folic acid, a vitamin synthesized by bacteria, but not humans.

Antibiotic resistance

The ability of bacteria to resist the effects of an antibiotic .Antibiotic resistance occurs when an antibiotic has lost its ability to effectively control or kill bacterial growth; in other words, the bacteria are "resistant" and continue to multiply in the presence of therapeutic levels of an antibiotic.

Resistance cause

1-Mutation

2-Gene Transfer

3-Bacterial conjugation

1-Mutation

1. The act or process of being altered or changed.
2. An alteration or change, as in nature, form, or quality.
3. *Genetics*

a. A change of the DNA sequence within a gene or chromosome of an organism resulting in the creation of a new character or trait not found in the parental type.

b. The process by which such a change occurs in a chromosome, either through an alteration in the nucleotide sequence of the DNA coding for a gene or through a change in the physical arrangement of a chromosome.

Genetic Mutation Causes Drug Resistance

Non-resistant
bacteria
exist

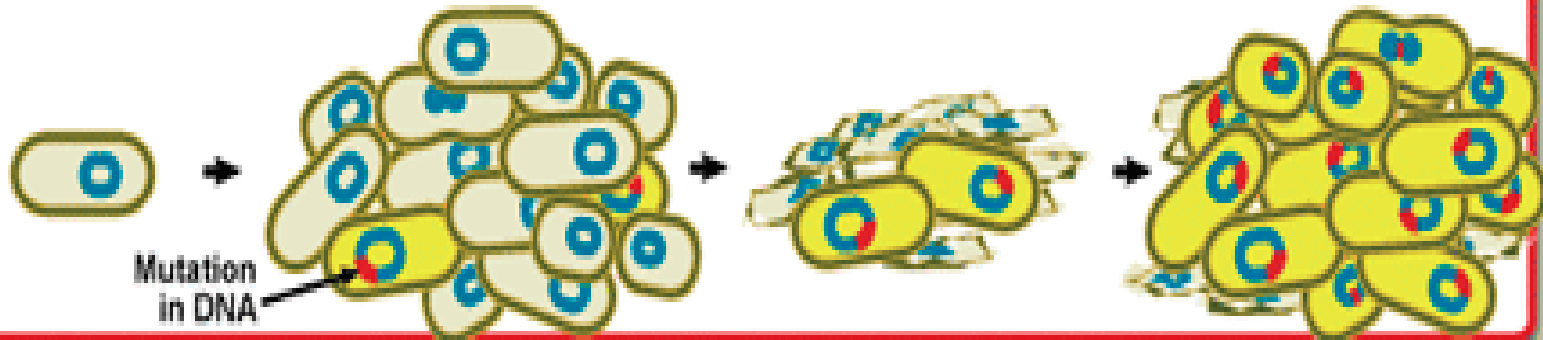
Bacteria
multiply by
the billions

Some mutations
make the bacterium
drug resistant

Drug resistant
bacteria multiply
and thrive.

A few of these
bacteria will
mutate.

In the presence of drugs,
only drug resistant
bacteria survive.



2-Gene Transfer

bacterial transformation the exchange of genetic material between strains of bacteria by the transfer of a fragment of naked DNA from a donor cell to a recipient cell, followed by recombination in the recipient chromosome.

Gene Transfer Facilitates the Spread of Drug Resistance

Resistant and non-resistant bacteria exist

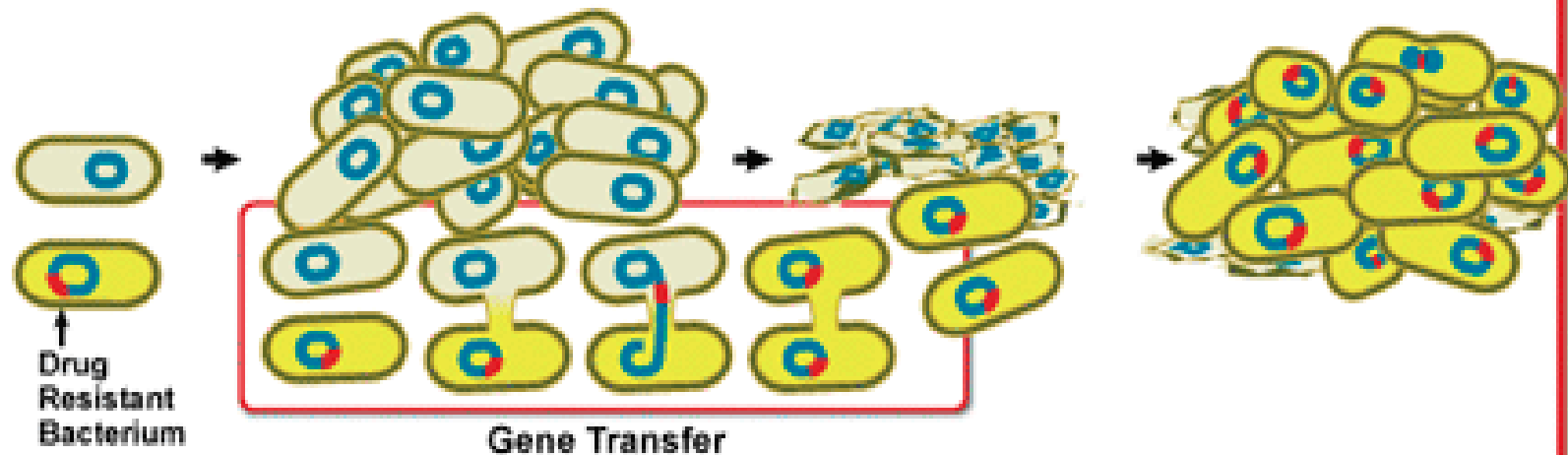
Bacterium multiply by the billions

Non-resistant bacteria receive new DNA.

Drug resistant bacteria multiply and thrive.

Bacteria that have drug resistant DNA may transfer a copy of these genes to other bacteria.

Non-resistant bacteria become resistant. In the presence of drugs, only drug-resistant bacteria survive.



3-Bacterial conjugation

Bacterial conjugation is the transfer of genetic material between bacterial cells by direct cell-to-cell contact or by a bridge-like...

The process in bacterial cells in which two bacterial cells come together in a temporary fusion to transfer genetic material by the plasmid from the donor cell to the recipient cell.

