



## Lecture 7. Antimicrobial agents cont.

### Learning objectives

Upon completion of this lecture, student should be able to:

- List the general mechanisms for antimicrobial resistance and provide at least one example of an antimicrobial agent that is known to be affected by each mechanism.

### Resistance to antimicrobial drugs

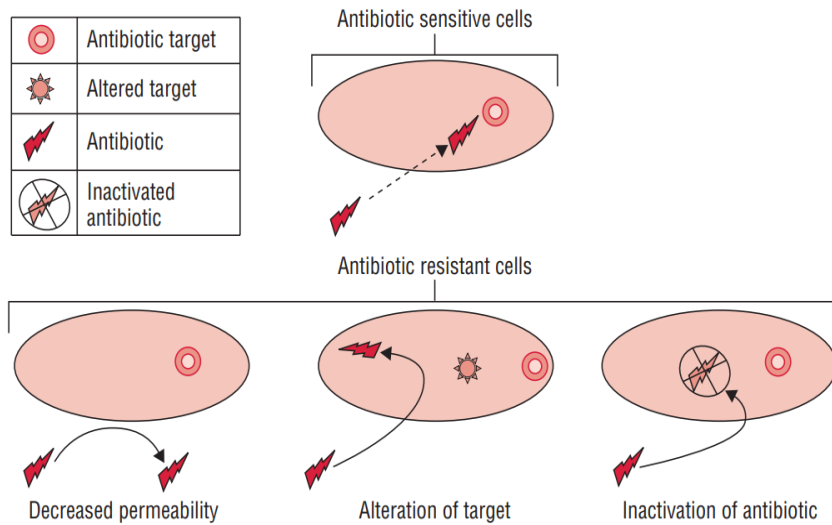
It is a condition in which the bacteria that were earlier susceptible to antibiotics develop resistance against the same antibiotics.

Antibiotic resistance is seen more commonly in hospital acquired infections than in community-acquired infections.

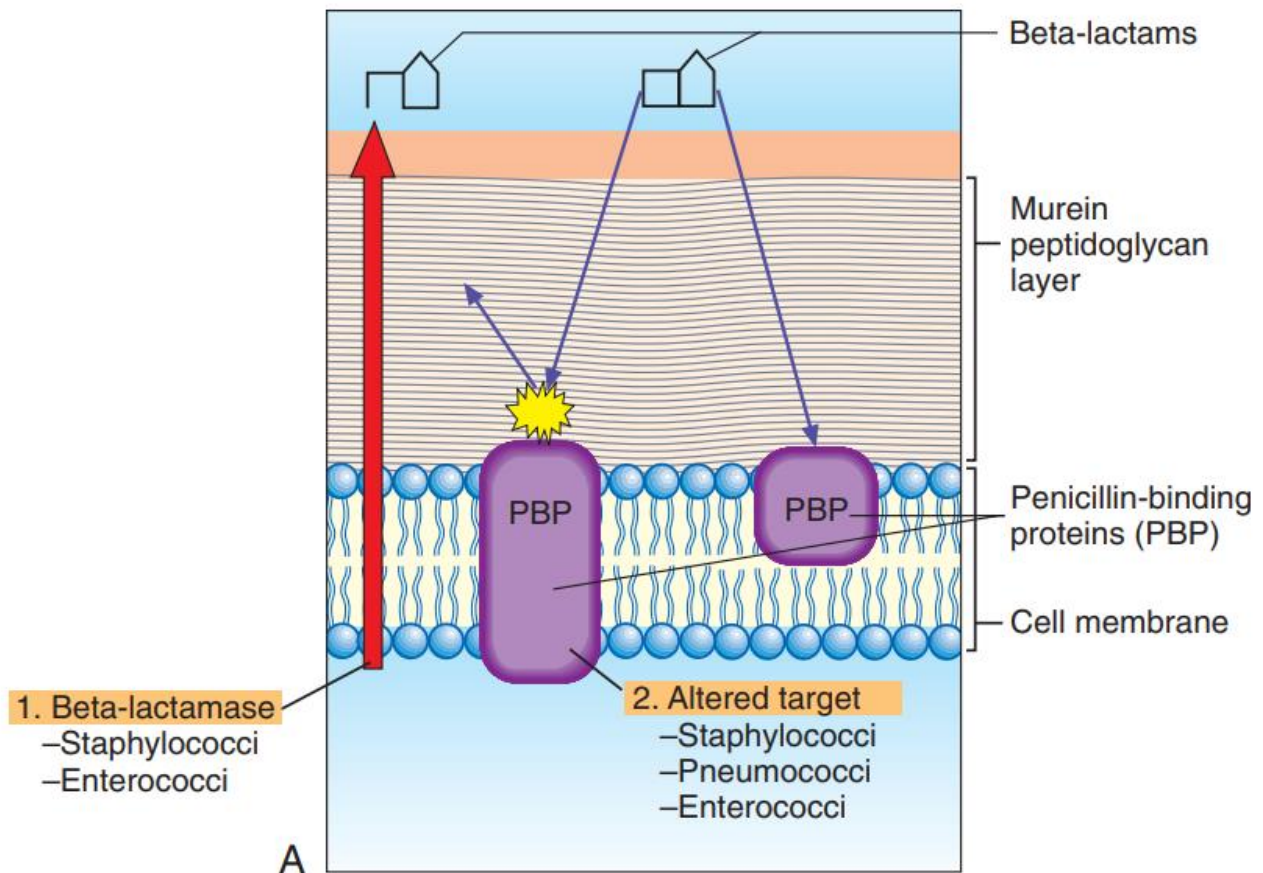
- This is due to widespread use of antibiotics in hospitals that select for these bacteria.
- Such as hospital strains of *S. aureus* and *Escherichia coli* and *Pseudomonas aeruginosa*.

### Mechanisms of antibiotic resistance

1. production of enzymes
2. production of altered enzymes
3. synthesis of modified targets
4. alteration of permeability of cell wall
5. alteration of metabolic pathways
6. efflux pump



Mechanism	Definition	Example
Production of enzymes	Certain bacteria produce <b>enzymes</b> that <b>inactivate antibiotics</b>	Penicillin-resistant staphylococci produce an enzyme <b><math>\beta</math>-lactamase</b> that destroys the <b>penicillins</b> and <b>cephalosporins</b> by <b>splitting the <math>\beta</math>-lactam ring</b> of the drug
Synthesis of modified targets	Certain bacteria produce modified targets against which the antibiotic has no effect	Penicillin resistance in <i>S. pneumoniae</i> and enterococci is caused by the loss or alteration of PBPs



## Basis of resistance

Resistance by bacteria against antibiotic may be classified as:

### 1. Nongenetic basis

- Certain bacteria under **ordinary circumstances** are usually **killed by penicillins**.
- But these bacteria, if **lose their cell wall** (become protoplast), **become nonsusceptible** to the action of **cell wall-acting drug (penicillins)**.

## 2. Genetic basis

- The genetic basis of drug resistance, mediated by genetic change in bacteria. This is of two types as follows:

### a. Chromosome-mediated resistance (mutations)

### b. Extra chromosomal-mediated resistance (transferable)

- Plasmid**-mediated resistance
- Transposons**-mediated resistance

Feature	Mutation resistance	Transferable resistance
No. of drugs to which resistant	Usually one	Usually multiple
Degree of resistance	Low	High
Can be overcome by increasing dose	Yes	No
Preventable by combination of drugs	Yes	No
Transferability	Nontransferable	Transferable
Virulence of bacterium	Low	Not decreased