

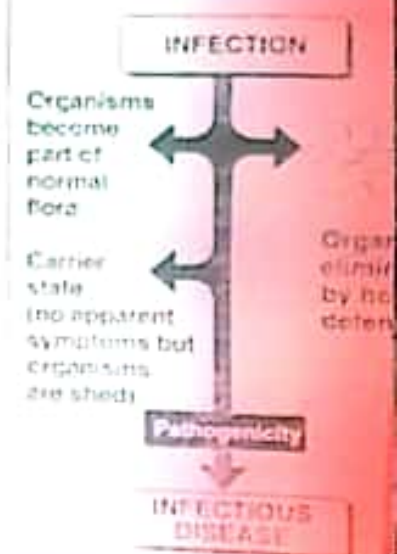
Principles of Infectious Diseases

Most infectious diseases are initiated by **colonization**: That is, the establishment of proliferating microorganisms on the skin and mucous membranes.

Infection: one of the following occurs:

Subclinical or silent infection: no apparent signs and symptoms (carrier).

Infectious disease: when the organism causes tissue damage and impairment of body function.



Microbial Pathogenesis

Pathogenicity: means the ability of the microorganism to cause disease.

Virulence: is the degree of pathogenicity.

Factors Affecting the Host-Parasite Relationship

Virulence factors

- Adherence.
- Invasiveness.
- Resistance to host defense mechanisms.
- Tissue damage

Host Factors

1. Natural Immunity.
2. Acquired Immunity.

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Host Factors

1. Natural Immunity.
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Adherence: Adhesion factors are:

Pili

b. Capsule

c. Glycocalyx

Invasiveness:

It is the ability of the organism to invade and grow in host tissues. Invasion is facilitated by:

Exoenzymes: e.g.

• **Hyaluronidase:** that dissolves the hyaluronic acid, which is the cement substance of connective tissue leading to spreading of infection.

• **Collagenase:** hydrolyzes collagen in connective tissue.

Resistance to host defense mechanisms:

Capsule: Antiphagocytic: The capsule prevents the phagocytes from adhering to the bacteria.

- b. **Coagulase** that converts fibrinogen in plasma to fibrin: causing deposition of fibrin on the surface of the organism; thus protecting the organism from phagocytes.
- c. **Leukocidin:** destroy neutrophils and macrophages escape phagocytosis.

Damage of host cell:

The microorganism can damage host cells by:

- a. **Stimulation of inflammatory response:** hypersensitivity reactions.
- b. **Production of toxins.**

Exotoxins

Endotoxins

Excreted by living bacterial cells; found in high concentrations in fluid media.

Usually from Gram +ve bacteria.

Protein in nature

Integral part of bacterial cell walls.

Usually from Gram -ve bacteria.

Lipopolysaccharide

Very specific in its action.

Not specific in its action.

Can be converted into toxoids (non-toxic preparations) used in vaccinations

Can not be converted to toxoids.

MCQ

Resistance of bacteria to host defense mechanisms through :

- a. collagenase
- b. capsule
- c. coagulase
- d. both b&c
- e. both a&c

There are four major sites in the bacterial cells that are sufficiently different from the human cell that they serve as the basis for the action of antibacterial agents:

- A. Cell wall.
- B. Ribosomes.
- C. Nucleic acids.
- D. Cell membrane

Cell Wall Synthesis

Beta Lactams
Penicillins
Cephalosporins
Carbapenems
Monobactams

Vancomycin
Bacitracin

Cell Membrane
Polymyxins

Folate synthesis

Sulfonamides
Trimethoprim

PABA
DHE A
DHE A

Nucleic Acid Synthesis

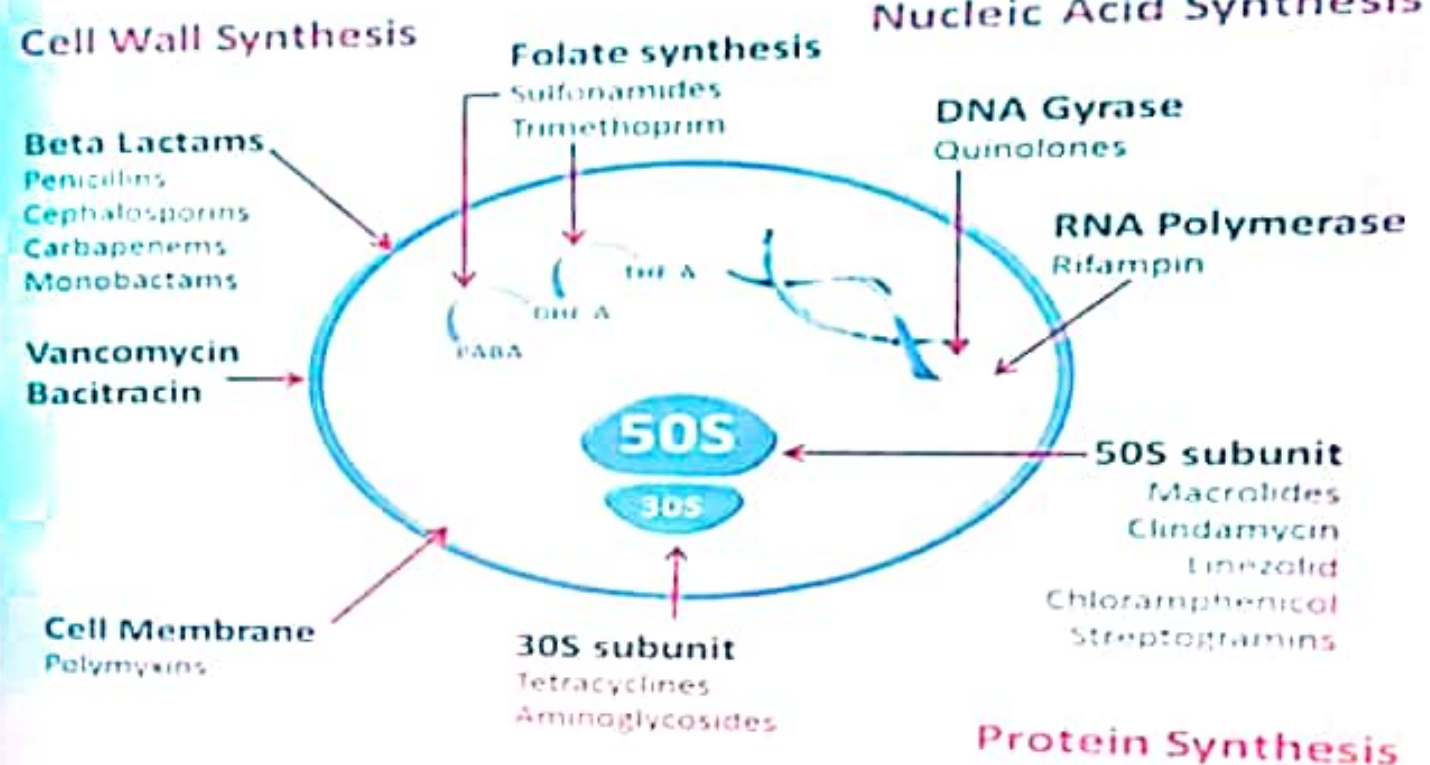
DNA Gyrase
Quinolones

RNA Polymerase
Rifampin

30S subunit
Tetracyclines
Aminoglycosides

Protein Synthesis

50S subunit
Macrolides
Clindamycin
Linezolid
Chloramphenicol
Streptogramins



Properties of an ideal antimicrobial agent

1. Has a **selective toxicity** i.e. selective inhibition of the growth of the microorganism without damage to the host.
2. Has **cidal** (lethal) rather than static (inhibit growth only) effect on micro-organisms.

3. **Does not induce allergy or hypersensitivity.**
4. **Not acquire resistance** from micro-organism.
5. **Broad-spectrum** rather than narrow-spectrum drug.



Combined antimicrobial treatment

Complications of Chemotherapy

Surgical indications for prophylaxis

Prevention of subacute bacterial endocarditis;
In dental patients:

High-dose of oral amoxycillin is given to patients with congenital or rheumatic heart disease: 1h before dental extraction, manipulation, or surgery.

4. To achieve bactericidal action (synergism) e.g

One drug may prevent the inactivation of a second drug by microbial enzymes

e.g. a combination of a beta lactam antibiotic with beta lactamase inhibitor may prevent destruction of the antibiotic by β -lactamases: combination of **amoxicillin** with the enzyme inhibitor **clavulanic acid**.

Indication of drug combinations

1. **Treating a life-threatening infection:**
e.g. bacterial meningitis in children.
2. **To delay the emergence of microbial mutants resistant** to one drug in chronic infections by the use of a second or third non-cross-reacting drug.
e.g. in treatment of active tuberculosis .
3. **To treat mixed infections** e.g. gingivitis

Drug toxicity

Tetracyclines:

Permanent brownish staining of the teeth of fetus and young children and shortening of enamel as a result of deposition of the drug in the developing teeth. For this reason, tetracycline is contraindicated for use in pregnancy and in children younger than 8 years.

Allergy:

e.g. penicillin: manifested by anaphylactic shock, rashes, or fever.

Super infection:

Disturbance in the normal flora of the body, with disease resulting due to over-growth of drug-resistant organisms e.g.

- Candida infections (oral thrush).

Mention the scientific term:

- ❖ Exotoxin lost toxicity but retained antigenicity.
- ❖ The ability of a pathogen to spread in the host tissues after establishing the infection

CAUSES OF ANTIBIOTIC RESISTANCE



Over-prescribing of antibiotics



Patients not taking antibiotics as prescribed



Unnecessary antibiotics used in agriculture



Poor infection control in hospitals and clinics



Poor hygiene and sanitation practices



Lack of rapid laboratory tests

IV. Development of microbial resistance:

The resistant mutants is enhanced by:

- Use **low dose** of antibiotics.
- Use antibiotics in infections for which they are **not indicated**.
- Prescribing **unnecessarily long courses**, or **interrupted** course of antibiotic therapy.