

Rational Use of Antibiotics

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Chemotherapy & Antibiotics

Chemotherapy is the use of drugs that are selectively toxic to invading cells while having minimal effects on host.

Antibiotic formed from “anti” against “biotics” life.

Today Antibiotics are defined as agents that kill or inhibit the growth of micro-organisms, such as bacteria, fungi, protozoa or parasites such as worms.

Selective toxicity targets

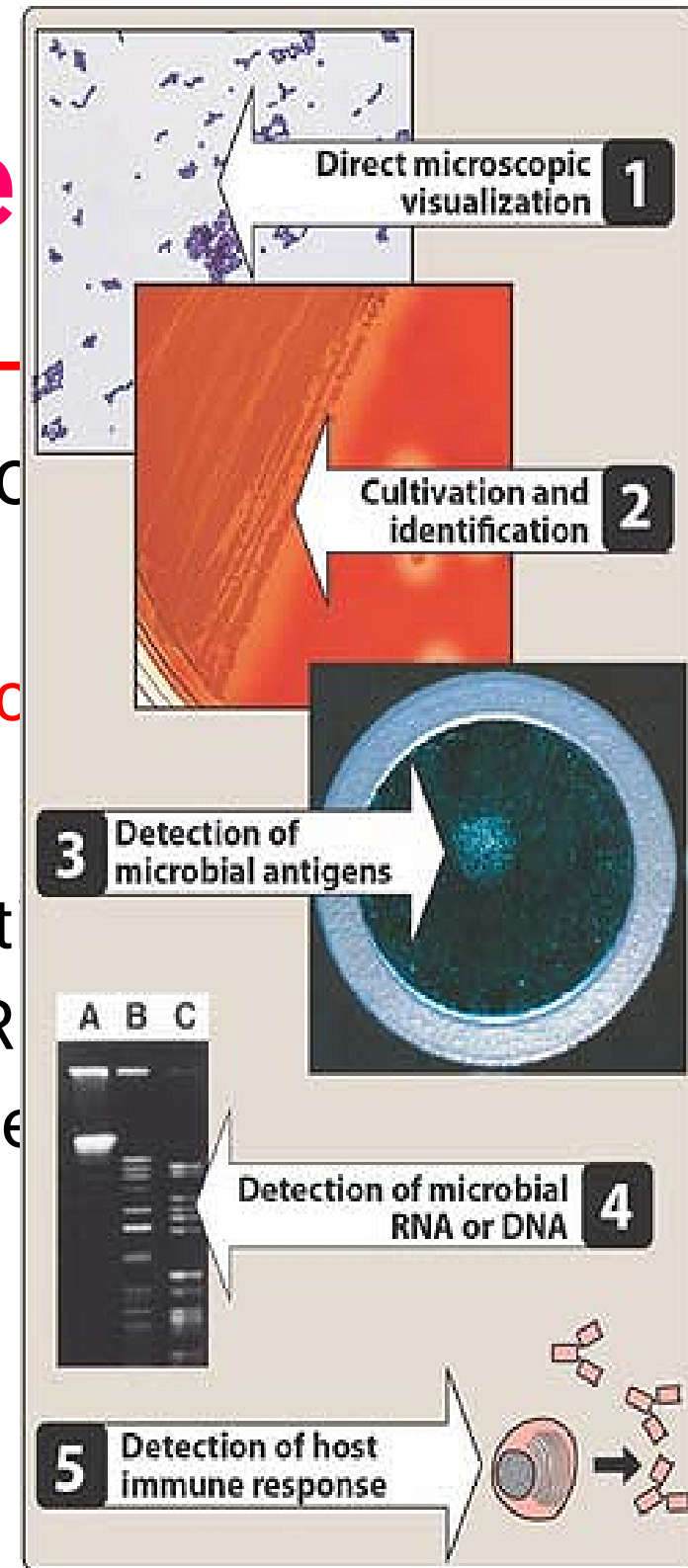
1. Cell wall
2. Ribosomes
3. Metabolic pathways
4. Specific enzymes

Selection of Antimicrobial Agents

- 1) the organism's identity
- 2) the organism's susceptibility to a particular agent
- 3) the site of the infection
- 4) patient factors
- 5) safety of the agent
- 6) the cost of therapy

1) Identify the pathogen

- Sampling from normally sterile body fluids
- Obtain culture before starting antibiotics
- Gram Stain
- other laboratory techniques (detecting of microbial antigens, microbial DNA or RNA or host inflammatory or immune response to the microorganism)



2) organism's susceptibility

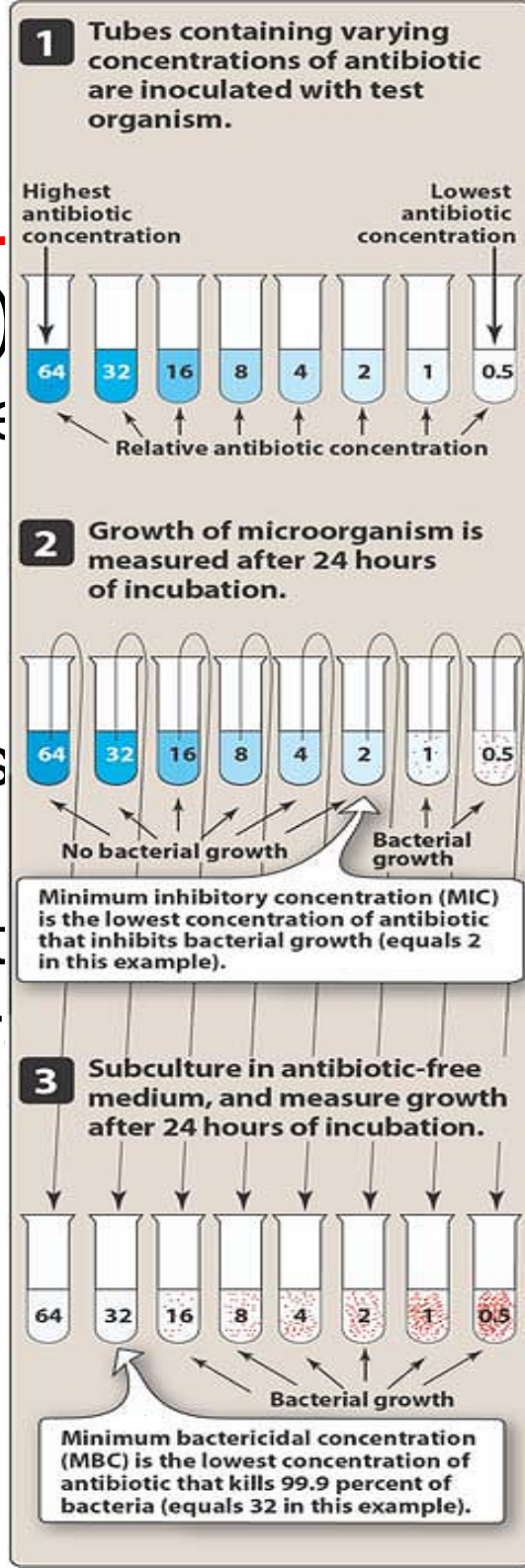
1. Minimum Inhibitory Concentration (MIC)

- Lowest concentration of drug that prevents visible bacterial growth

- **Susceptible:** at suggested dosage of antibiotic will achieve concentration that inhibits organism's growth

- **Intermediate:** at maximum dosage may attain serum and tissue levels for which response may be lower than for susceptible isolates

- **Resistant:** will not achieve appropriate concentration to treat infection



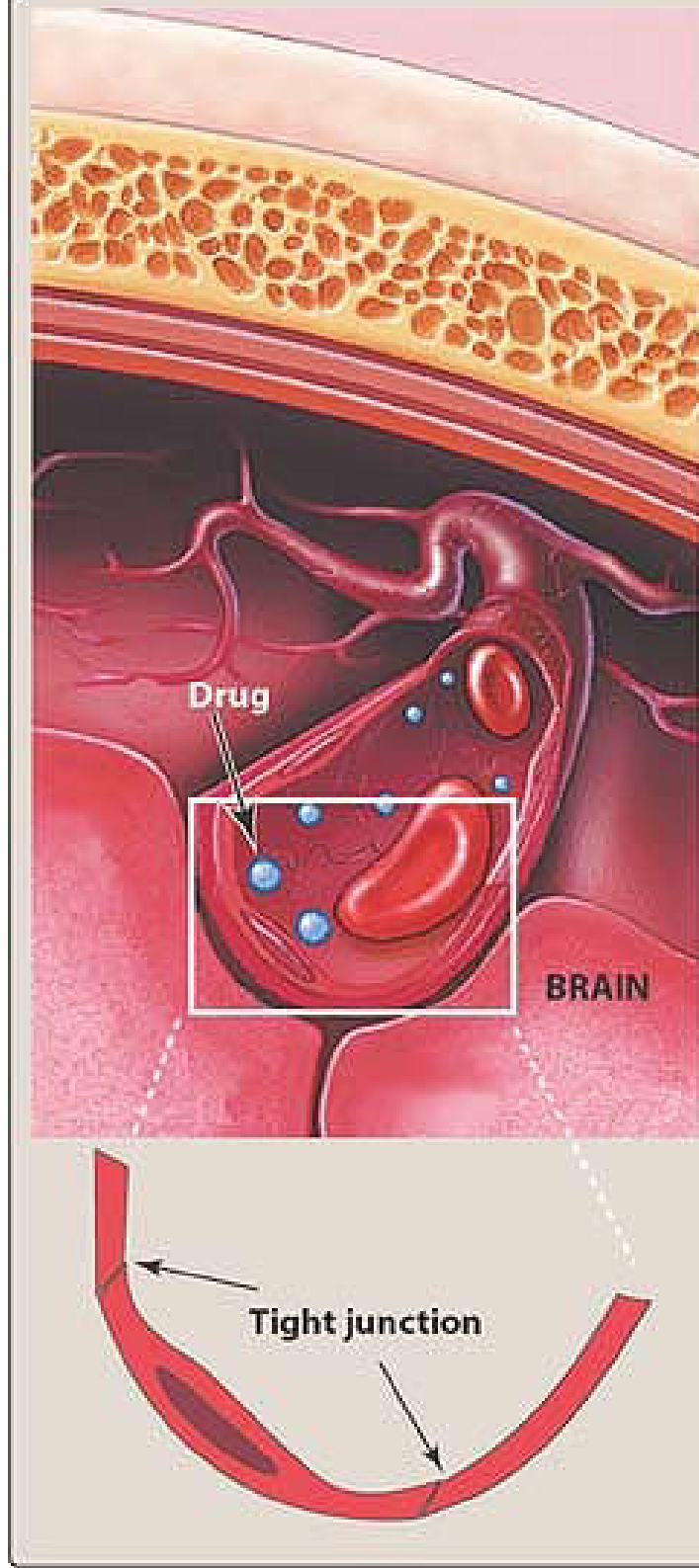
3) site of infection

Central nervous system

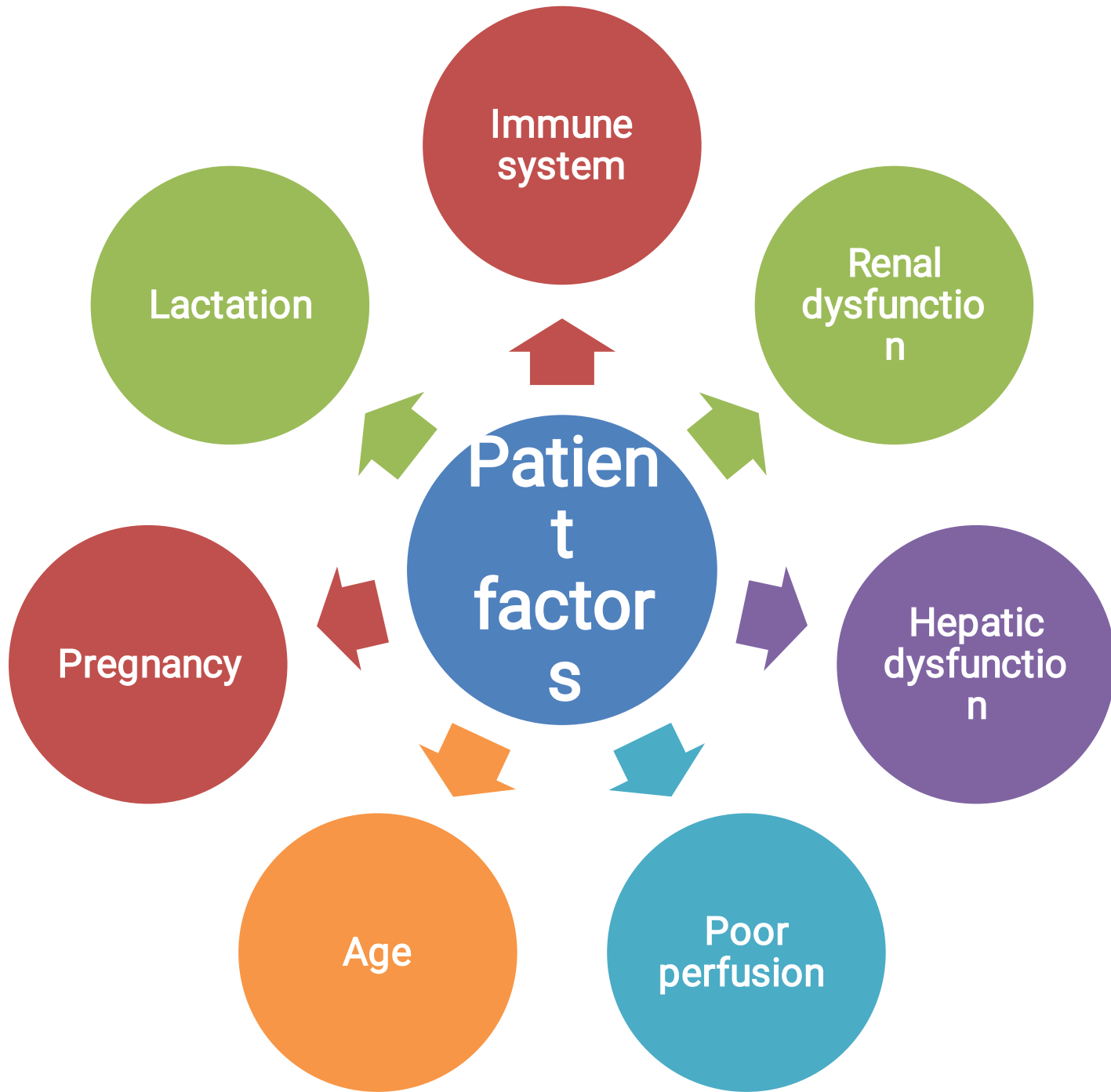
Prostate

Bone

Vitreous body of the eye



4) Patient factors



5) Safety of the agent

- Many of the antibiotics, such as the penicillins, are among the least toxic of all drugs, because they interfere with a site unique to the growth of microorganisms.
- Other antimicrobial agents (for example, chloramphenicol) are less microorganism specific and are reserved for life-threatening infections because of the drug's potential for serious toxicity to the patient.

6) Cost of therapy

When several drugs show similar efficacy in treating an infection, cost of therapy become important.

Route of Administration

➤ Oral:

- Mild infections and outpatient basis
- Economic

➤ Parenteral:

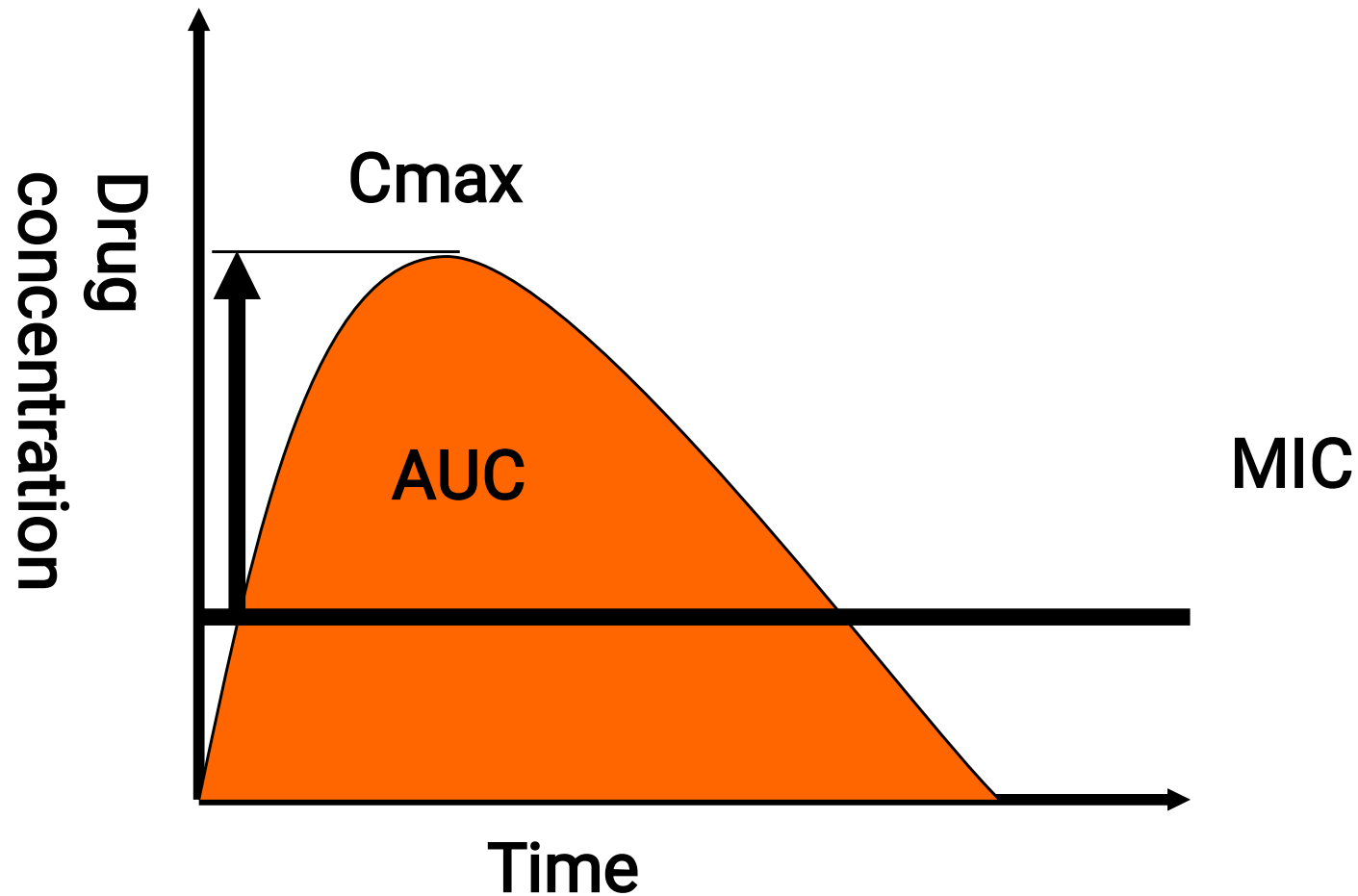
- Poor oral absorption
- Serious infections

Determinants of Rational Dosing

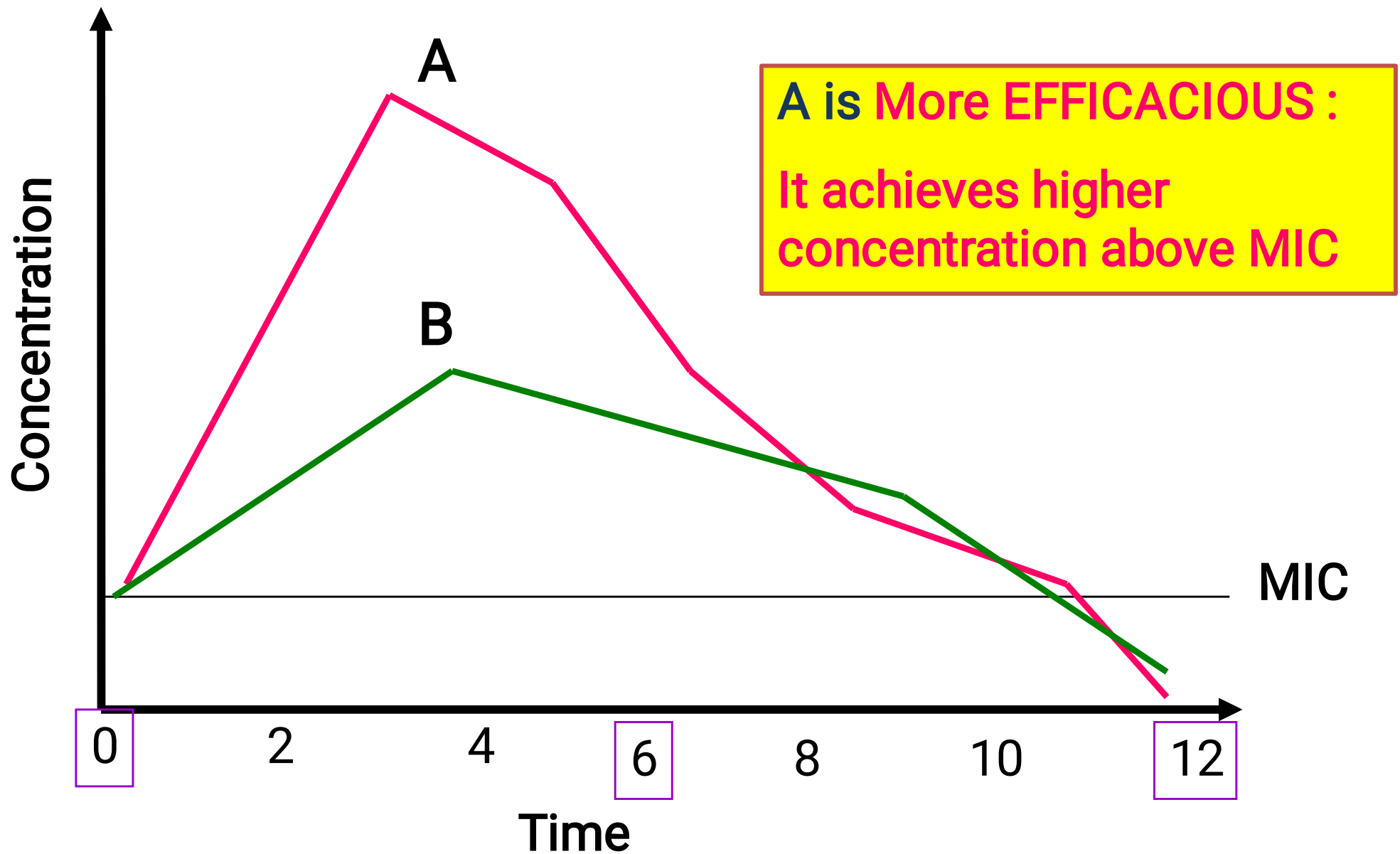
Rational dosing of antimicrobial agents is based on:

- ☐ Pharmacodynamics
- ☐ Pharmacokinetic properties
- ☐ Concentration-dependent killing
- ☐ Time-dependent killing
- ☐ Post-antibiotic effect

Concentration dependent Antibiotics



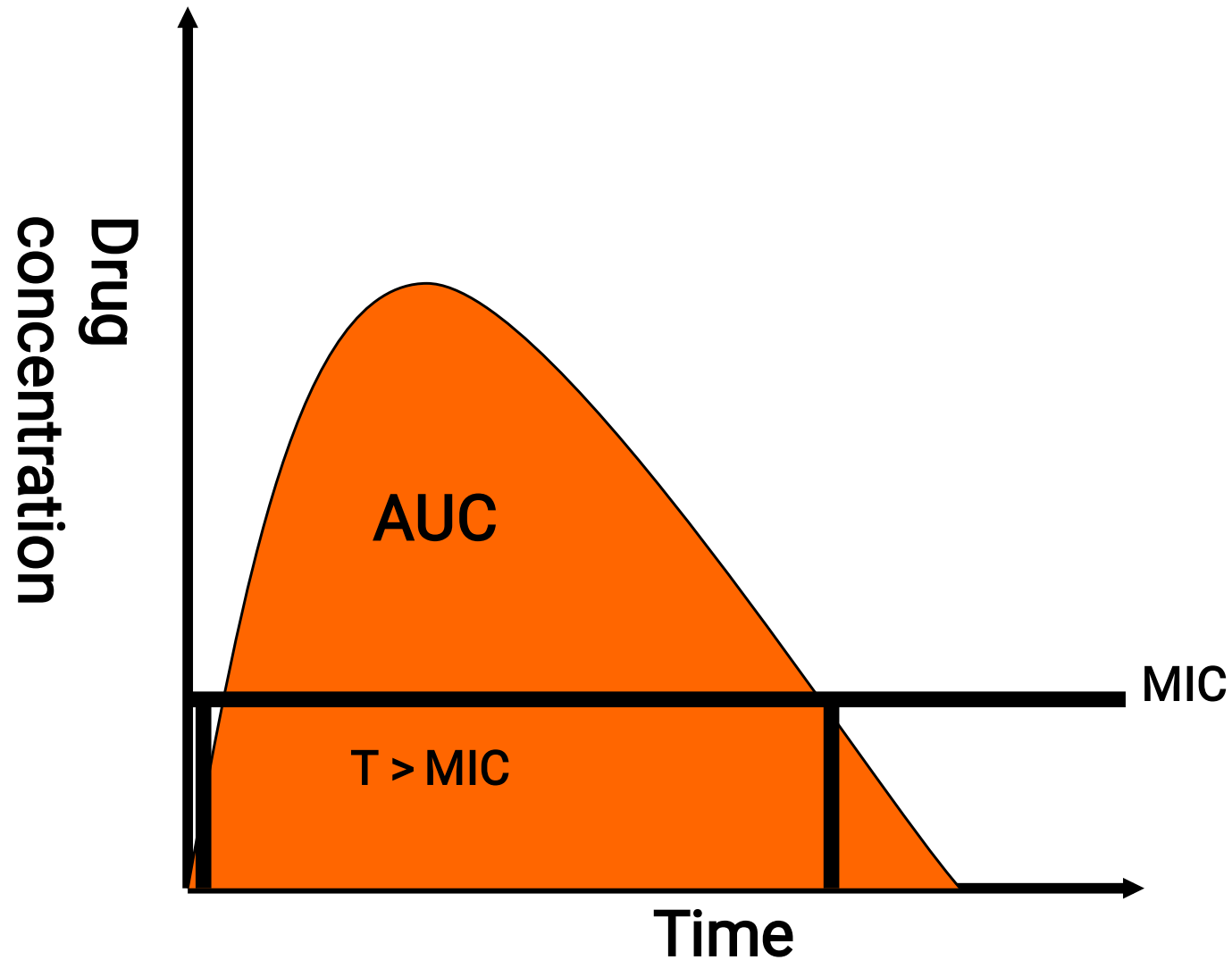
CONCENTRATION DEPENDENT ANTIBIOTICS



Antibiotic follow concentration dependent activity includes:

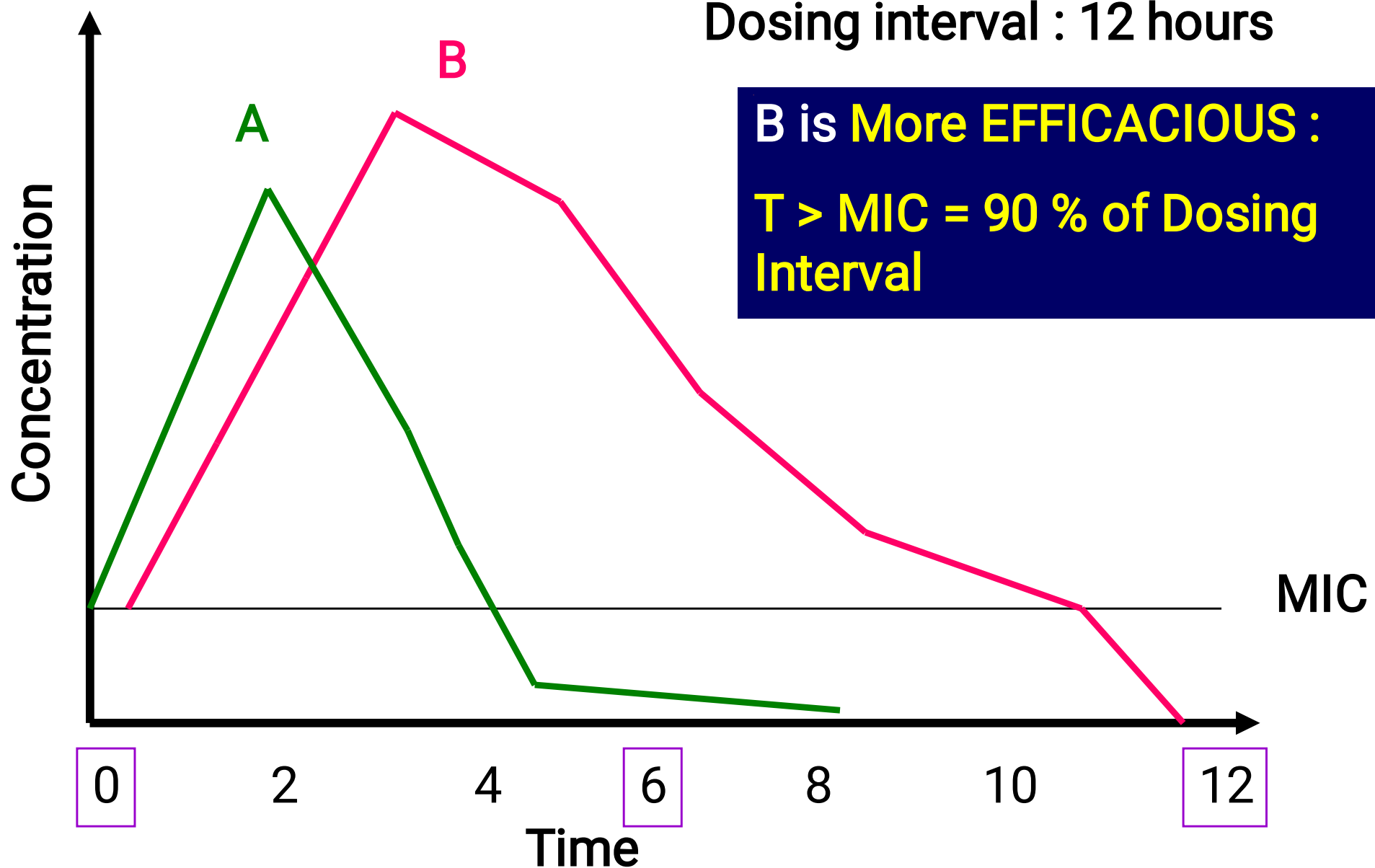
- **Aminoglycosides**
- **Fluoroquinolones**
- **Carbapenems**

Time dependent antibiotics



Time dependent killing

Dosing interval : 12 hours



Antibiotic follow Time dependent activity includes:

- Penicillin
- Cephalosporin
- Monobactam
- Glycopeptides
- Macrolides
- Clindamycin
- Linezolid

Postantibiotic effect

- ❑ The postantibiotic effect (PAE) is a persistent suppression of microbial growth that occurs after levels of antibiotic have fallen below the MIC.
- ❑ Antimicrobial drugs exhibiting a long PAE (several hours) often require only one dose per day.
- ❑ Aminoglycosides, Fluoroquinolones and Quinupristin-Dalfopristin exhibit a long PAE

Effectiveness of combination therapy

1. Synergistic Effect: $2+2=5!$

Two bactericidal antibiotics
penicillin + gentamycin

2. Additive Effect: $2+2=4$

Two bacteriostatic agents with the same
mechanisms of action are used

3. Antagonism: $2+2=1!$

Bacteriostatic are antagonistic to bactericidal
Chloramphenicol & penicillin

Untoward Effects of Antibiotics

The End

