Anti-infective

Anti-infective is a general term that applies to any drug that is effective against pathogens. In its broadest sense, an anti-infective drug may be used to treat bacterial, fungal, viral, or parasitic infections. In clinical practice, however, the terms antibacterial, anti-infective, antimicrobial, and antibiotic are often used interchangeably.

Actions of Anti-Infective Drugs

The primary goal of antimicrobial therapy is to assist the body's defenses in eliminating a pathogen. Medications (drugs) that accomplish this goal by killing bacteria are called **bacteriocidal**. Some drugs do not kill the bacteria but instead slow their growth, allowing the body's natural defenses to eliminate the microorganisms. These growth-slowing drugs are called **bacteriostatic**.

Mechanism of action of antimicrobial therapy

In general the anti-infective drug act by:

- Cell wall synthesis inhibitor
- DNA synthesis inhibitor
- RNA synthesis inhibitor
- Protein synthesis inhibitor
- Antimetabolite.

Every antimicrobial agent is able to kill a specific range of microorganisms, and this must be considered in selecting appropriate antimicrobial therapy. In severe infections and/or immunocompromised patients, it is customary to use bactericidal agents in preference to bacteriostatic agents.

Combination antimicrobial therapy may reduce the emergence of resistance. This is recommended in treatment of patients infected with HIV, which is highly prone to spontaneous mutation

antimicrobial resistance

Factors implicated in the emergence of antimicrobial resistance include the

- inappropriate use of antibiotics when not indicated .
- inadequate dosage or treatment duration,
- excessive use of broad-spectrum

Mechanisms of action of antimicrobial drugs

Classes of Anti-Infective Drugs

Penicillins

Penicillins kill bacteria by disrupting their cell walls. Penicillins are usually bactericidal in action. They bind reversibly to several proteins on the bacterial cytoplasmic membrane known as penicillin-binding proteins (PBPs),these proteins are involved in cell-wall synthesis and cell division. Interference with these proteins inhibits cell-wall synthesis, causing rapid destruction of the cell. The portion of the chemical structure of penicillin that is responsible for its antibacterial activity is called the **beta-lactam ring**. Some bacteria secrete an enzyme, called beta-lactamase or penicillinase, which splits the beta-lactam ring. This structural change allows these bacteria to become resistant to the effects of most penicillins.

Classification of pencillins

Penicillins remain one of the most important and useful antibacterials, the penicillins can be divided into four groups:

- Natural penicillins (penicillin G benzathine, penicillin G potassium)
- Penicillinase-resistant penicillins (dicloxacillin, nafcillin, oxacillin),they are effective against penicillinase-producing bacteria, thgey also called antistaphylococcal penicillins.
- Aminopenicillins (amoxicillin, ampicillin), are effective against a wide range of microorganisms and are called broadspectrum penicillins. The aminopenicillins have been some of the most widely prescribed antibiotics for sinus and upper respiratory and genitourinary tract infections.
- Extended-spectrum penicillins (carbenicillin, ticarcillin, Piperacillin). Extended-spectrum penicillins are effective against even more microbial species than the aminopenicillins, including Enterobacter, Klebsiella, and Bacteroides fragilis. Their primary advantage is activity against Pseudomonas aeruginosa.

Co-amoxiclav

Co-amoxiclav is a combination of amoxicillin and clavulanic acid, a β-lactamase inhibitor. It is effective against Staphylococcus aureus, E. coli, some Haemophilus influenzae strains and many Bacteroides and Klebsiella.

Adverse Effects

Rash, pruritus, diarrhea, nausea, fever, drowsiness, Anaphylaxis symptoms, including angioedema, circulatory collapse, and cardiac arrest; nephrotoxicity.

Drug interactions

- Probenecid increases the plasma concentration of penicillins.
- Tetracyclines and chloramphenicol reduce the bactericidal action of penicillins.
- Penicillins reduce tubular secretion of methotrexate in the kidney, increasing the risk of methotrexate toxicity.
- The effectiveness of hormonal contraceptives is reduced when they're taken with penicillin V or ampicillin.
- Large doses of I.V. penicillins can increase the bleeding risk of anticoagulants by prolonging bleeding time.
- High dosages of penicillin inactivate aminoglycosides.

Drug	Route and Adult Dose (max dose where indicated)
NATURAL PENICILLINS	
penicillin G benzathine (Bicillin)	IM; 1.2 million units as a single dose (max: 2.4 million units/day)
penicillin G potassium	IM/IV; 2–24 million units divided every 4–6 h (max: 80 million units/day)
penicillin G procaine (Wycillin)	IM; 600,000–1.2 million units/day (max: 4.8 million units/day)
PENICILLINASE-RESISTANT (ANTISTAPHYLOCOCCAL)	
dicloxacillin	PO; 125–500 mg qid (max: 4 g/day)
nafcillin	PO; 250 mg–1 g qid (max: 12 g/day)
oxacillin	PO; 250 mg–1 g qid (max: 12 g/day)
BROAD-SPECTRUM (AMINOPENICILLINS)	
amoxicillin (Amoxil, Trimox)	PO; 250–500 mg every 6 h (max: 1,750 mg/day)
amoxicillin–clavulanate (Augmentin)	PO; 250 or 500 mg tablet (each with 125 mg clavulanic acid) every 8–12 h
ampicillin (Principen)	PO/IV/IM; 250–500 mg every 6 h (max: 4 g/day PO or 14 g/day IV/IM)
EXTENDED-SPECTRUM (ANTIPSEUDOMONAL)	
piperacillin	IM/IV; 2–4 g tid–qid (max: 24 g/day)
ticarcillin and clavulanate (Timentin)	IV; 3.1 g every 4–6 h