SNS COLLEGE OF ALLIED HEALTH SCIENCE

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY - II YEAR

COURSE NAME: PHARMACOLOGY

TOPIC - ANTIBIOTICS

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Lecturer

ANTIBIOTICS

•Antibiotics are compounds that target bacteria to treat and prevent bacterial infections by destroying bacterial cells, preventing reproduction, or altering necessary cellular functions.

•They are classified as bacteriostatic (prevent growth) or bactericidal (kill bacteria) based on MBC:MIC ratio.

CLASSIFICATION

By Mechanism of Action:

- Inhibit protein synthesis: Aminoglycosides, Macrolides, Tetracyclines, Oxazolidinones, Lincosamides.
- Inhibit cell wall synthesis: Beta-lactams (Penicillins, Cephalosporins, Carbapenems), Glycopeptides.
- Inhibit DNA synthesis: Fluoroquinolones.
- Inhibit folate synthesis: Sulfonamides.
- Disrupt cell membrane: Lipopeptides.
- By Spectrum: Narrow (specific bacteria) vs. Broad (multiple types, e.g., Gram+ and Gram-).

MECHANISMS OF ACTION (BY CLASS)

- **Beta-lactams (e.g., Amoxicillin)**: Inhibit cell wall synthesis by binding penicillin-binding proteins, preventing peptidoglycan cross-linking.
- **Macrolides (e.g., Azithromycin)**: Inhibit protein synthesis by binding 50S ribosomal subunit, blocking translocation.
- **Fluoroquinolones (e.g., Ciprofloxacin)**: Inhibit DNA gyrase and topoisomerase IV, preventing DNA replication.
- **Tetracyclines (e.g., Doxycycline)**: Bind 30S ribosomal subunit, blocking tRNA binding and protein synthesis.
- **Aminoglycosides (e.g., Gentamicin)**: Bind 30S ribosomal subunit, causing mRNA misreading and protein synthesis inhibition.

Pharmacokinetics

- **Metabolism**: Hepatic
- **Excretion**: Renal

Pharmacodynamics

- **Amoxicillin**: Onset ~1-2h (oral); Duration long (twice daily); Dosage: 500-875 mg BID for infections.
- **Azithromycin**: Onset not specified; Duration 68h half-life; Dosage: 500 mg day 1, 250 mg days 2-5 for respiratory infections.
- **Ciprofloxacin**: Onset ~1h (oral); Duration not specified; Dosage: 250-750 mg BID for UTIs/skin infections.
- **Doxycycline**: Onset ~2h; Duration sustained; Dosage: 100 mg BID for acne/infections.
- **Gentamicin**: Onset rapid (IV); Duration 2-3h; Dosage: 3-6 mg/kg/day divided for serious infections.

Interactions and Adverse Effects

Interactions: Common with other drugs (e.g., Amoxicillin with anticoagulants; Ciprofloxacin with CYP substrates); Food (e.g., dairy reduces Doxycycline absorption).

Adverse Effects:
Renal (nephrotoxicity, e.g., Gentamicin)
Hematologic (thrombocytopenia)
Dermatologic (rash); Neurologic (ototoxicity)
Cardiac (arrhythmias, e.g., Azithromycin).

Drug Name	Onset (approx.)	Mechanism of Action	Adverse Effects (Common)	Dosage (Adult Example)
Amoxicillin	1-2 hours	Inhibits cell wall synthesis	Rash, diarrhea, anaphylaxis	500-875 mg BID
Azithromycin	Not specified	Inhibits protein synthesis (50S)	Arrhythmias, hepatotoxicity, diarrhea	500 mg day 1, 250 mg days 2-5
Ciprofloxacin	1 hour	Inhibits DNA gyrase/topoisomerase	Nausea, tendon rupture, QT prolongation	250-750 mg BID
Doxycycline	2 hours	Inhibits protein synthesis (30S)	Photosensitivity, GI upset	100 mg BID
Gentamicin	Rapid (IV)	Inhibits protein synthesis (30S)	Nephrotoxicity, ototoxicity	3-6 mg/kg/day divided