**Classes of Antibiotics-Mechanism of Action and Spectrums of Activity**

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| **Antibiotics class** | **Examples** | **Mechanisms** | **Spectrum of Activity** | **S/E** |
| **INHIBITION OF CELL WALL**  |
| (β-Lactam)Penicillins | Natural; penicillin G Semi-synthetic: oxacillin, ampicillin-clavulanic acid, ampicillin-sulbactam | Inhibit peptoglycan synthesis necessary for cell-wall formation | Bactericidal-most active against gram +; synthetic and potentiated penicillin have improved gram – coverage | Hypersensitive, anaphylaxisGIT |
| (β-Lactam)CEPHALOSPHORINS  | 1ST generation:cephalothin, cephalexin,2nd generation: Cefuroxime 3rd generation**:** ceftriaxone, ceftazidime4th generation:Cefepime | Bactericidal 1st gen: Gram +, limited Gram -2nd gen: Gram+, improved Gram – and some anaerobes.3rd gen: limited Gram+, excellent Gram- and anaerobes |
| Glycopeptides  | Vancomycin | Bacteriocidal; Gram+ve bacteria only MRSA | \* Red man syndrome \*Neprototoxicity  |

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| **Inhibition of protein synthesis** (bind to ribosomes) |
| Aminoglycosides"Cannot be used for **anaerobes**"  | Gentamicin, amikacin, tobramycin, neomycin  | Bind 30S ribosomal subunit; inhibit peptide elongation | Bactericidal; Gram-, including*Pseudomonas* and M*ycobacterium*, S*treptococcus* and anaerobes are resistant  | Ototoxicity Nephrotoxicity " More important than Vancomycin" |
| Tetracyclines"Cannot be used for **pregnant** and **children under 8 year**"  | Tetracyclines, doxycycline | Bind 30S subunit; inhibit RNA function | Bacteriostatic; Gram+ and Gram -; *Rickettsiae, Mycoplasma, Clamydophila* | Teeth discoloration GITphotosensitivity |
| Chloramphenicol  | Chloramphenicol | Bind 50S subunit, inhibit protein synthesis  | bactericidal; broad Gram+ and Gram- spectrum\* used for meningitis  | BM aplastic anemia  |
| Macrolides  And lincosamides | ErythromycinAzithromycin Clarithromycin Clindamycin  | Bind 50S subunit; inhibit protein synthesis | Bacteriostatic; Gram+, *Legionella, Camphylobacter, Mycoplasma, Chlamydophila, Ricketstsiae*, \*Clindamycin has good anaerobic spectrum | GIT pseudo-membranous colitis  |

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| **Antibiotics class** | **Examples** | **Mechanism** | **Spectrum of Activity** | **S/E** |
| **INHIBITION OF NUCLEIC ACID SYNTHESIS**  |
| 1. QUINOLONES

"Cannot be used for **children under 18 year**"  | 1ST generation:Nalidexic acid 2nd generation: **Fluoroquinolones** Ciprofloxacin**-** 3rd generation: Gatifloxacin4th generation:Moxifloxacin | Inhibits DNA gyrase, preventing supercoiling →DNA degradation | Bactericidal; Gram +ve and gram -ve, INCLUDING Pseudomonas at a higher dosage | Cartilage damage  |
| 1. Nitroimidazoles
 | Metronidazole \* the only can cover Bactria and **parasite**  | Metabolized by anaerobes to intermediates that prevent DNA synthesis  | Bactericidal; anaerobes (Also antiprotozoal) | GIT |
| 1. Rifampicin

(used for **TB**) | Rifampicin | DNA degradation  | Bactericidal; Gram +ve and gram –ve bacteria | Discoloration of body fluid hepatotoxicity  |
| **INHIBITION OF BACTERIAL GROWTH** |
| Sulfonamides  | Trimethoprim-sulfadiazine, ormethoprim sulfa | Competitive analogue of para-aminobenzoic acid (PABA) →inhibits dihydrofolate reductase→blocks folic acid synthesis  | Bacteriostatic → bactericidal when combined. Gram –ve Chlamydia, nocardia, protozoa and pneumocystic | Discoloration of body fluid hepatotoxicity |

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| **Antibiotics class** | **ACTION** | **USE** | **S/E** |
| **Anti-Tuberculosis Agents** |
| 1. Anti TB isoniazide (INH)
 | BacteriocidalAll lung tissue | T.B treatment and prophylaxis | Hepatotoxicity peripheral neuropathy |
| 1. Ethambutol
 | bactericidal concentrated lung alveoli phagolysosome | TB treatment  | Optic neurititis , Hepatotoxicity |
| 1. Pyrazinamide
 | Acid environment of macrophages  | TB treatment | Hepatitis gouty arthritis, Hepatotoxicity |
| **ALTERATION OF CELL MEMBRANE** |
| Polymyxin "Cannot be used for **pregnant**"  | Colistin | Alter cell membrane permeability For multi-resistant organisms (MRO) | Bacteriocidal;Gram-ve bacteria |

Gram + / Gram - / anaerobes / form Dr.Ali