**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, anaphylaxis  GIT |
| (β-Lactam)  CEPHALOSPHORINS | 1ST generation:  cephalothin, cephalexin,  2nd generation:  Cefuroxime  3rd generation**:** ceftriaxone, ceftazidime  4th 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  GIT  photosensitivity |
| Chloramphenicol | Chloramphenicol | Bind 50S subunit, inhibit protein synthesis | bactericidal; broad Gram+ and Gram- spectrum  \* used for meningitis | BM aplastic anemia |
| Macrolides  And  lincosamides | Erythromycin  Azithromycin  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: Gatifloxacin  4th 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) | Bacteriocidal  All 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