All drugs in pharma

L1

- Anti-inflammatory drugs have no antibacterial activity: steroids and NSAID.
- antibiotics have both antibacterial and anti-inflammatory effects:

azithromycin,tetracyclines and co-trimoxazole.

- Penicillin is an antibiotic(natural source).
- Sulfonamides is a chemotherapeutic agent.
- Examples of bactericidal drugs:

Penicillin , Cephalosporin , Aminoglycosides .

- Examples of bacteriostatic drugs:

Sulfonamides, Tetracyclines, Macrolide antibiotics.

NOTE: One drug (chloramphenicol) could be bacteriostatic for one organism (gram negative rods), & cidal for another (S. pneumoniae).

L2

- Antimicrobial drugs exhibiting a long PAE (several hours) require only one dose per day:

Aminoglycosides & Fluroquinolones.

- Ciprofloxacin: Development of resistance to ciprofloxacin is 10,000 times more frequent at 2 times the MIC compared to 8 times the MIC.
- Inhibitors of cell wall synthesis: Penicillins, Cephalosporins, Bacitracin, Vancomycin, Cycloserine.

- Interference with permeability or function of plasma membrane: Antifungal agents (Colistin, Nystatin, Amphotericin B, Polymyxin B.

- Inhibitors of DNA synthesis or replication: Quinolones (Nalidixic acid), Fluoroquinolones, Griseofulvin, Novobiocin.
- Inhibitors of RNA synthesis: Rifampicin.

- Inhibitors of protein synthesis: Aminoglycosides (Streptomycin, Gentamicin...), Chloramphenicol, Tetracyclines, Lincomycin, Clindamycin.

- Interference with metabolism of microorganisms: Sulfonamides and Trimethoprim.
- drugs only effective in specific infections (Isoniazid is only active against mycobacteria T.B): Narrow spectrum.

- Extended-spectrum antibiotics:

Antipseudomonal penicillin.

- antibiotics that are concentrated or eliminated by liver are contraindicated in liver diseases :

Erythromycin & tetracycline.

- Antibiotic that is contraindicated or we should decrease the given dose in patients with poor kidney function:

Aminoglycosides.

- Antibiotics cause severe hemolysis in G6PD deficient individuals (hemolytic anemia):

Sulfonamides, Chloramphenicol, Nitrofurantoin.

- Streptomycin → Deafness(this drug can cross the placenta).
- Sulfonamides → hemolysis in G6PD deficient newborn(this drug can pass into breast milk).

L3

- Penicillins+aminoglycosides: Synergism effect.

- Inhibitors of cell wall synthesis:

1.β-lactam antibiotics: include : Penicillin, Cephalosporins, Carbapenems, Carbacephems& Monobactam.

1.A.Penicillins (PNC's): (Bactericidal effect)

- Natural penicillin:

1.Benzylpenicillin=Penicillin G (IM, IV)

2.Procaine penicillin given IM twice/day; IV injection contraindicated (could lead to ↓ BP & convulsions).

3. Benzathine penicillin given is mainly used for rheumatic fever prophylaxis.

-Phenoxy methyl penicillin= Penicillin V Oral.

~ Considered drugs of choice to treat infections with G+ve Strep. β-hemolytic type A (most common microbe in tonsillitis).

~ Have little effect if any against G-ve bacteria.

- Narrow spectrum penicillinase resistant penicillin (anti Staph penicillin):

Nafcillin IM, IV

Oxacillin IM, IV

Cloxacillin Oral

Dicloxacillin Oral

Flucloxacillin Oral & parenteral.

- Broad spectrum penicillinase sensitive PNC' s (amino PNC's):

- Ampicillin (IM, IV, Oral) , Amoxicillin (Oral).

~ Amino penicillins are widely used in tonsillitis, otitis media ,gonorrhea, respiratory infections, shigella infections, UTI's (urinary tract infections).

- Antipseudomonal PNC's:
- Piperacillin(the most potent) > Mezlocillin=Ticarcillin > Carbenicillin(the least potent).
~ All are synergistic with aminoglycosides against Pseudomonas.

- Aminopenicillins:
Mecillinam (IM; IV) , Pivmicillinam(oral).
~ Most potent PNC's against enterobacteria (Salmonella, E. coli, Klebsiella, Shigella…), have little or no activity against G+ve cocci or pseudomonas; synergistic with other β-lactams but not with aminoglycosides.

L4

-Probenecid inhibits tubular secretion of PNC' s (nafcillin & oxacillin are mainly excreted by the liver).

-β-lactemase inhibitors:
Clavulanate , sulbactam and tazobactam.

- A combination of penicillin and B-Lactamase inhibitor:
(Augmentin® =amoxicillin/clavulinate)
(Unasyn®=ampicillin/sulbactam)
(Zosyn®=piperacillin/tazobactam)

-Neurotoxicity: (more common with oxacillin).

- Hepatotoxicity: (more common with IV oxacillin).

- Bone marrow depression (reversible): (more common with IV nafcillin).

- Nephrotoxicity: (more common with Methicillin).

-Restricted use in pts with hypertension or heart failure: Na+ penicillin.

-Restricted use in pts with renal failure (Hyper or hypokalemia both are dangerous):

K+ Penicillin

1.B. Cephalosporins (Cidal):

- Classified into 1st 2nd 3rd 4th and 5th generations.

* First generation	*Second generation	* Third generation	* Fourth generation	* Fifth generation
• Cefadroxil • Cefalexin Oral • Cefazolin IM, IV • Cephapirin • Cephradine • Cephaloridine	• Cefaclor Oral • Cephamandole IM, IV • Cephmetazole • Cefonicid • Cefotetan • Cefoxitin • Cefprozil • Cefuroxime • Cefuroxime axetil • Loracarbef *we will talk about it later	• Cefixime Oral • Cefoperazone IM, IV • Cefdinir Cefpodoxime • Cefotaxims Ceftazidime • Ceftriaxone Ceftibuten Ceftizoxime	• Cefepime IM, IV	• Ceftaroline IV *has the widest spectrum of activity.

طريقة ممكن تساعدكم في تذكرهم بالامتحان (اذا حابين تحفظوهم دوا دوا ف سكيب مع انه ما اتوقع في حدا مستعد يحفظ كل هالاسماء , ما علينا ركزوا معي (:

1. ال 4th and 5th كل واحد دوا ابصمهم .
2. اي دوا بحتوي على FA or PHA يعني اللفظ تبعهم "فا" بكون first ما عدا ال cefaclor and cephamandole يعتبروا second .
3. اي دوا بنتهي ب IME , ONE , TEN يعتبر third , برضه ما عدا دوا cefuroxime يعتبر second .(الله يرضى عليكم لا تخربطوا و تفكروا ال cefepime من ال 3rd انتبهوا هاد من ال 4th الي اتفقنا نبصمه).
4. اشي مهم في دوا يعتبر 3rd بس هو مختلف عنهم ما بنتهي بالاشياء الي حكيناها اسمه cefdinir.
5. اي اشي غير الي حكيناهم يعتبر 2nd .

~ Among cephalosporins:

- Cefoxitin (2nd) has the best activity against Bacteroides fragilis.

- Cefamandole (2nd) has the best activity against H. influenza.

- Cefoperazone (3rd), Ceftazidine (3rd) and Cefepime (4th) have the best activity against P. aeruginosa infections.

- Ceftaroline (5th) has a broader G+ve spectrum of activity than all other cephalosporins due to its activity against MRSA(Methicillin resistant Staphylococcus aureus); also has some activity against G-ve bacteria.

- Nephrotoxicity Mostly seen with: Cephaloridine (1st).

- disulfiram-like reaction: (cefamandole, cefoperazone, ceftriaxone, cefmetazole...).

- Hemolytic anemia: All cephalosporins are excreted by the kidney except Ceftriaxone (3rd) which is excreted by the liver.

1.C. Carbapenems: (Imipenem, Meropenem)

- given IM, IV.

-it is combined with Cilastatin (inhibitor to dehydrpeptidase I) to decrease rapid metabolic clearance of imipenem.

~ broadest spectrum of activity of all β-lactam antibiotics, effective against most G+ve & - ve bacteria and anaerobe.

1.D. Carbacephems e.g. Loracarbef (Oral)

- ❖ Spectrum of activity similar to 2nd generation cephalosporin particularly cefaclor and cefprozil even some list it under 2nd generation cephalosporins; effective orally; excreted renally.

1.E. Monobactams e.g. Aztreonam IM, IV.

~ Considered a substitute to aminoglycosidesto treat G-ve infections (less toxic compared to aminoglycosides).

2. **Non-β-lactam antibiotics:**

- Vancomycin & Teicoplanin.

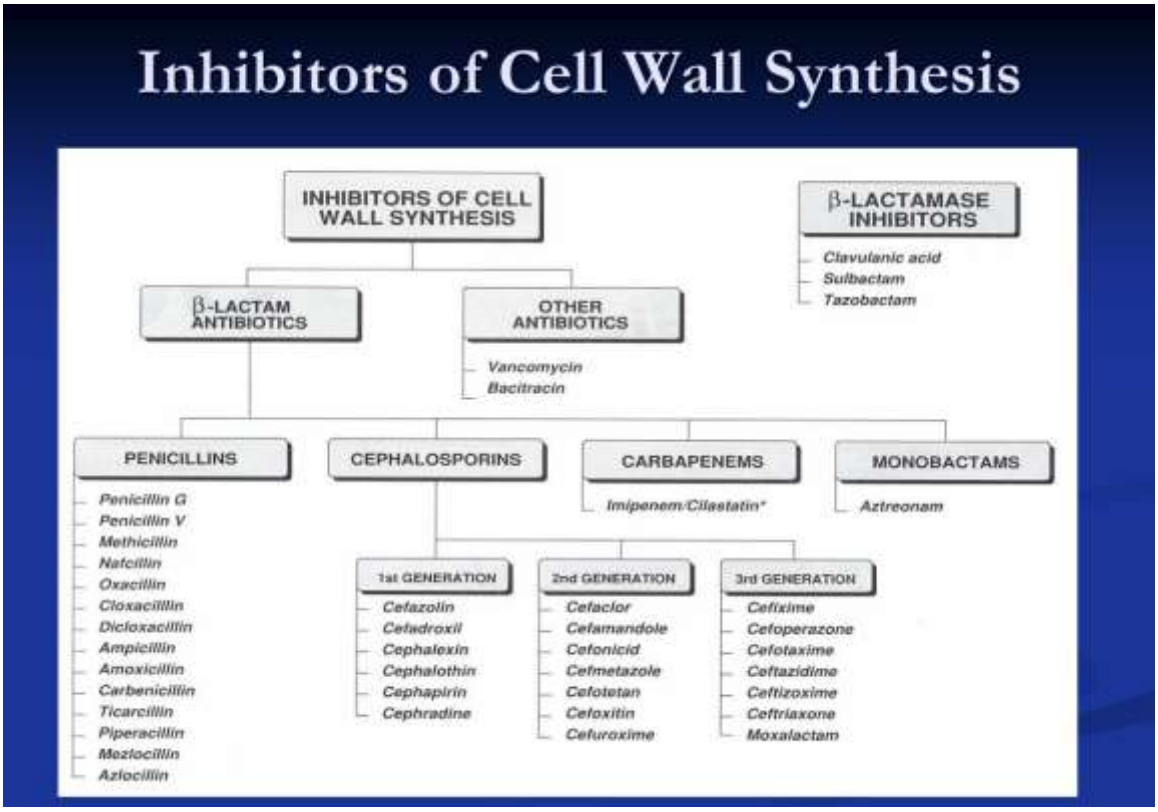
- Bactericidal in nature but vancomycin has a static action to certain bacteria specially Enterococcus bacteria.

- Given IV (oral absorption is poor).

- Teicoplanin is given IM.

~ Narrow spectrum of activity, effective against G+ve bacteria especially methicillin resistant Staph aureus (MRSA).

~ Considered drug of choice + metronidazole to treat pseudomembranous colitis=antibiotic associated colitis (Clostridium difficille colitis; Staph enterocolitis) and in this case vancomycin could be given orally.



We finished inhibitors of cell wall synthesis, keep going. 😊

-Inhibitors of Microbial Protein Synthesis:

- Buy AT 30 , ccel (sell) at 50

A:aminoglycosides , T : Tetracyclin (30S inhibitors).

C: Chloramphenicol , C: Clindamycin , E: Erythromycin L: Lincomycin (50S inhibitors).

NOTE: All inhibitors of protein synthesis are bacteriostatic except aminoglycosides are bactericidal.

1.Aminoglycosides(Ineffective orally):

- Streptomycin, Gentamicin , Netilmicin , Kanamycin , Tobramycin , Amikacin , Neomycin , Paromomycin.

- Interfere with the integrity of bacterial membrane and inhibit bacterial protein synthesis (30S inhibitors) (bind irreversibly to the 30S subunit of ribosome inhibiting protein synthesis and cause misreading of mRNA.

~ Highly effective against G-ve bacteria .

- Gentamicin, netilmicin, tobramycin, amikacin:

1. Very potent against G-ve bacilli (E. coli, Klebsiella, Proteus, Pseudomonas...).

2. Synergistic with antipseudomonal PNC's.

3. Strains resistant to gentamicin could be sensitive to amikacin and vice versa (important sentence).

4. Gentamicin is considered the drug of choice to treat neonatal G-ve bacilli meningitis.

5. Netilmicin Similar to gentamicin but less ototoxic and could be effective in infections resistant to gentamicin.

6. Kanamycin Same as above but has no activity against Pseudomonas.

7. Neomycin Most nephrotoxic (not given systemically), used to sterilize bowel before abdominal surgeries (along with

erythromycin as prophylactic agents) Also used locally on skin and eye.

8. Streptomycin Highly effective against TB, used with PNC's to treat Strep endocarditis Highly effective against brucellosis (Malta fever).

9. Paromomycin Effective only to treat tape worm infestation and intestinal amoebiasis. It is a first-line treatment for amebiasis or giardiasis during pregnancy.

L5

2. Macrolide antibiotics:

- Erythromycin; Clarithromycin; Azithromycin, Oleandomycin ; Telithromycin ; Roxithromycin; Spiramycin.

- Reversibly bind 23S rRNA of the 50S subunit of the ribosome inhibiting translocation during protein synthesis.

- Given orally; distribute well but cross well inflamed meninges.

~ Macrolides are considered drugs of choice to treat Corynbacteria diphtheria and mycoplasma pneumonia (along with tetracyclines).

~ Erythro. has high activity against G+ve bacteria, little effect against G-ve bacteria.

~ Clarithromycin and Azithromycin are more active than erythromycin against G- as well as Mycoplasma pneumonia, Helicobacter pylori, Toxoplasma gondii, cryptosporidia and several atypical mycobacteria.

3. Chloramphenicol:

- Binds to rRNA of 50S subunit of the ribosome inhibiting transpeptidation during protein synthesis.

- Highly lipid soluble, orally effective and widely used locally on eye.

- The best antibiotic that crosses BBB.

4. Spectinomycin:

- Chemically related to aminoglycoside.

- It binds to the 30S subunit of the bacterial ribosome and inhibits protein synthesis.

- A single IM injection is adequate.

~ Alternative to PNC's and cephalosporins to treat uncomplicated gonococcal infection in pts allergic to PNC's and cephalosporins.

5. Tetracyclines:

- Inhibitors of bacterial protein synthesis (bind to the 30S ribosomes).

- Tetracyclines include: Tetracycline , Chlortetracycline Oxytetracycline , Demeclocycline , Doxycycline , Minocycline Methacycline.

- Could be given orally and parenterally (IV).

- Distribution good but do not cross BBB.

~ Effective against G+ve and -ve bacteria.

~ Considered drugs of choice to treat: Rickettsia Mycoplasma pneumonia (erythromycin 2 nd line) , Clamydia Also effective

against certain protozoal infections, long term treatment of acne and vibrio cholera.

6. Lincomycin & Clindamycin:

Inhibitors of protein synthesis (bind exclusively to the 50S subunit of bacterial ribosomes, thus suppressing protein synthesis by disrupting the formation of the 70S initiation complex and by inhibiting the aminoacyl translocation step of peptide bond formation).

~ Have good activity against G+ve (Strep; Staph), Enterobacteriaceae (Salmonella, Shigella, Escherichia, Klebsiella, Proteus); Vibrioaceae (Vibrio Cholera); Pasteurellaceae (Pasteurella, Haemophilus).

-Locally effective antimicrobials:

- Polymyxins (Polymyxin B & Polymyxin E = Colistin)

- Cidal Interfere with function or permeability of the plasma membrane.

- Their use is restricted to topical preparations in combination with Bacitracin (cell wall inhibitor) & neomycin (creams, oint's, eye & ear drops...).

~ Have good activity against G-ve bacteria & high activity against Pseudomonas.

L6

-**Inhibitors of microbial DNA synthesis(cidal):** Quinolones; Fluoroquinolones .

~ Broad spectrum (effective against pseudomonas).

-Quinolones(orally effective)

1st generation	Nalidixic acid, Pipemidic acid, Oxolinic acid
2nd generatipon	Ciprofloxacin , Ofloxacin Norfloxacin, Enoxacin Lomefloxcin ,Nadifloxacin
3rd generation	Levofloxacin , Sparfloxacin Gatifloxacin
4th generation	Moxifloxacin , Prulifloxacin Gemifloxacin

- Nitrofurantoin Synthetic:

-bactericidal , orally effective antibiotic.

~ It is effective against G+ve & G-ve bacteria

~ Has good activity against G-ve bacteria particularly E. coli.

-Fosfomycin:(disrupts cell wall synthesis)

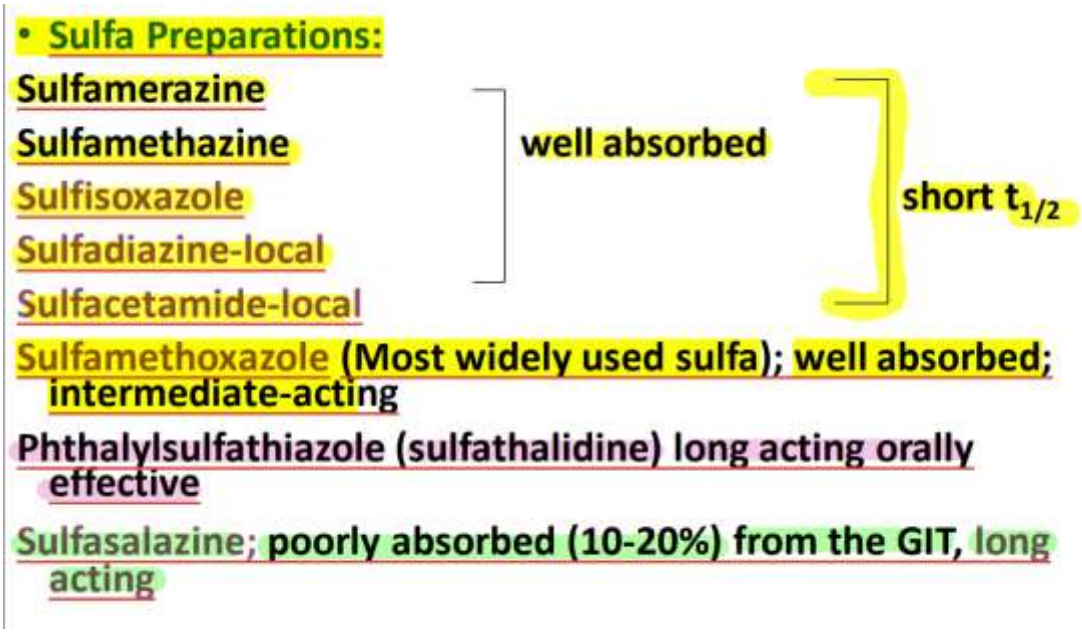
- It is a broad-spectrum bactericidal drug.

~ primarily used to treat lower UTI (cystitis) and occasionally is used for prostate infections.

- Antimetabolites :

1.(Sulfonamides):(Static)

~ Effective against many G+ve & -ve bacteria, nocardia, lymphogranuloma, trachoma, blastomycosis, and many protozoal infections.



2. Trimethoprim:(static)

~ effective against E. coli; H. influenza; K. pneumonia ineffective against Pseudomonas & Proteus MO's.

- has more rapid OOA as compared to sulfa.

- Well absorbed orally like sulfa.

- Sulfamethoxazole + trimethoprim combination: - is known as Co-trimoxazole.

- acts sequentially in preventing nucleic acid synthesis in bacteria (selective).

- is synergistic.

- has more spectrum (but still ineffective against Pseudomonal infections).

- more cidal and bacterial resistance is less likely.