



◉Sheet ○Slides

number : 13

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We have finished discussing Penicillins and Cephalosporins, and today we'll continue with three subgroups in cell wall inhibitors ; Cabapenem, Monobactam, and Vancomycin. And they are easy!

**Carbapenem**

- We have to know two drugs here, Imipenem and Meropenem. We call them ULTRA extended spectrum of cell wall inhibitors. (Like Cefepime and Tazosine) they cover G+ve and G-ve in addition to the most of **anaerobic bacteria**.
- Used in treatment of mixed infection. If a pneumonia patient came with pus in the lung, "usually when there is pus that means this infection is caused by more than one microorganism and one of them more likely to be anaerobic bacteria". So we have to use a drug with bacteriocidal activity such as ULTRA extended spectrum as mentioned above 'Imipenem/Tainam (commercial name)".
- 10% of Klebsilla pneumonia produce carbapemase "Delhi enzyme" which is a metalo-beta lactamase that is only active against Imipenem but not Mropenem.
- Carbapenems "mainly Imipenem" have two side effects **nausea and vomiting.** 90% of the patients using this drug develop this**.** And at high doses they can cause **Neurotoxicity**; thus can cause seizure in patients that have never had epilepsy.
- So, these drugs are contraindicated with epileptic patient.
- All the carbapenem are injectable -They are hospital drugs
- Imipenem is given with Cilastatin**.** Cilastatin inhibits *dihydropeptidase* in the renal tubule that metabolize the imipenem quickly. **Remember Potentiation: 0+1>2**
- KEEP IT UNTILL YOU NEED IT

**Vancomycin**

- A bacteriocidal antibiotic that inhibits the cell wall synthesis
- Narrow spectrum drug (gram positive) and mainly used to treat MRSA and Enterococci that is resistant to ampicillin.
  *"remember that the first 4 generations of Cephalosporins didn't include enterococci in their spectrum"*

- Psedumembranous colitis is a GI infection that is caused by Clostridium Difficile. We treat it by Metronedazol, which is the drug of choice in this case. But if the patient didn't respond we give him Vancomycin **ORALLY**. Although the vancomycin cannot be absorbed at all, and that's what we want here, the drug stays in the GI!
- Usually given IV and IM, but IM is much more painful.
- Main indication for parental Vancomycin is Sepsis or endocarditis (caused by MRSA ).
- It's valuable in **severe** staphylococcus infection in patient allergic to peniciilins and cephalosporins. *"Severe, so we need a bacteriocidal action"*
- Vancomycin in combination with Gentamicin is used for treatment of Enterococcal endocarditic in patient with serious Penicillin and Cephalosprin allergy.
  " we don't give Macrolides because they are bacteriostatic"
- VRSA and VRE appeared as a result of the antibiotic misuse
- **Side effects**: Thrombophlebitis, rash, anaphylactic shock and **Red-man syndrome**, which is a severe allergic reaction that starts at the neck that's why sometimes it's called Red-neck syndrome. This is the reasond behind the fact that we don't give it bolus, instead we give it as a fusion in a dilute solution over near 60 mins.
- In books you will always read that Vancomycin causes ototoxicity and nephrotoxicity, but it's wrong. In the past, usually vancomycin was used with gentamicin, so the patients developed ototoxicity and nephrotoxicty. But to be specific, only the gentamicin that cause the ototoxicity. Also even the nephrotoxicity is rare and more common with risk factors including; renal impairment, prolonged therapy, high doses or being too young "under one year- and we use in this case **Tacoblanin**"
- Teicoplanin : the same as vancomycin, we use it if we are afraid that this patient will develop a nephrotoxicity.

**Monobactam**

- Aztreonam, a narrow spectrum drug active against gram –ve. We need it in patients allergic to Penicillins and Cephalosporins.
- We are done with Cell wall inhibitors. And now we'll start with **Protein Synthesis Inhibitors**.

Protein synthesis inhibitors include; Aminoglycosides, Tetracyclines, Lincosamides and Macrolides

They are active against a wide variety of organisms/broad spectrum antibiotics. Most of them are bacteriostatic *except Aminoglycosides*. And because of the overuse, resistant is common.

**Bacterial Ribosome is different from the eukaryotic one; thus enabling the antibiotic to develop a selective toxicity.

They interfere in many processes in protein synthesis such as:

1- Binding of amino acid and tRNA "ex. tetracycline"
2- Normal codon/anticodon recognition "ex. aminoglycosides"
3- Transpeptidation

**Tetracyclin**

- In the past it was active against G+ve and G-ve and almost everything but most of these made a pump that pump out tetracyclines.
- Nowadays mostly active on Chlamydia and Mycoplasma "Atypical bacteria"
- Chlamydia mainly cause urethritis and can be treated by 250mg/twice a day doxycyclin for 5 to 7 days.
- Mycoplasma pneumonia, as a definitive therapy we treat it with doxycyclin. *But it can't be used as an empirical treatment for community acquired pneumonia because there are bacteria that this drug doesn't include in its spectrum.*
- Mycoplamsa "military bacteria" lives in university, schools, closed areas... but not in houses. *keep that in mind when you want to treat a pneumonia child who doesn't leave his house, you DON'T have to include Mycoplasma in your empirical treatment.. we give him augmantine or cefuroxime,… *
- A new tetracyclin emerge to overcome the "pump" problem which is **Tigecyclin** that will be discussed in the next sheet.