



# Cephalosporins

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## **Cephalosporins**

**Derivatives of 7-aminocephalosporanic acid**

**$\beta$ -lactam antibiotics, Cidal effect  
, Semisynthetic, from fungus**

**Broad spectrum**

**Inhibitors of microbial cell wall synthesis  
(similar way to penicillin)**

**Differ in pharmacokinetic properties and  
spectrum of activity**

**Classified into 1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup> 4<sup>th</sup> and 5<sup>th</sup>  
generations**

## \* First generation

رکزوا  
علی الملون بالزهری

Cefadroxil

Cefalexin Oral

Cefazolin IM, IV

Cephapirin

Cephradine

Cephaloridine

## \* Second generation

Cefaclor Oral

Cephmandole IM, IV

ركزوا على الزهري (الأصفر الي حكي عنهم  
الدكتور)

**Cephmetazole**

**Cefonicid**

**Cefotetan**

**Cefoxitin**

**Cefprozil**

**Cefuroxime**

**Cefuroxime axetil**

**Loracarbef**

### \* Third generation

Cefixime Oral

Cefoperazone IM, IV

Cefdinir Cefpodoxime

Cefotaxims Ceftazidime

Ceftriaxone Cefibuten Cefizoxime

### \* Fourth generation

Cefepime IM, IV

### \* Fifth generation

Ceftaroline IV

1<sup>st</sup> generation cephalosporins have the best activity against G+ve microorganisms, less resistant to  $\beta$ - lactamases, and do not cross readily the BBB as compared to 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>h</sup> generations

Cephalosporins never considered drugs of choice for any infection, however they are highly effective in upper and lower respiratory infection, H. influenza, UTI's, dental infections, severe systemic infection...

## كله حفظ يعني

**\*\* Among cephalosporins:**

- Cefoxitin (2<sup>nd</sup>) has the best activity against **Bacteroides fragilis**
- Cefamandole (2<sup>nd</sup>) has the best activity against **H. influenza**
- Cefoperazone (3<sup>rd</sup>), Ceftazidime (3<sup>rd</sup>) and Cefepime (4<sup>th</sup>) have the best activity against **P. aeruginosa** infections
- **Ceftaroline** (5<sup>th</sup>) has a broader G+ve spectrum of activity than all other cephalosporins due to its activity against MRSA; also has some activity against G-ve bacteria

► Side effects to cephalosporins:

- **Allergy**

Cross allergy with penicillins (10%)

- **Hepatotoxicity**

- **Nephrotoxicity**

Mostly seen with Cephalexin (1<sup>st</sup>)

↑ with concomitant aminoglycosides use

- **Hemolytic anemia**

All cephalosporins are excreted by the **kidney** except **Ceftriaxone (3<sup>rd</sup>)** which is excreted by the **liver**

# حکی لا ترکزوا علی route of administration

► Other  $\beta$ - lactam antibiotics:

- Carbapenems e.g. Imipenem, Meropenem

\* **Imipenem**

Has the broadest spectrum of activity of all  $\beta$ -lactam antibiotics, effective against most G+ve & -ve bacteria and anaerobes, given IM, IV;  $\beta$ -lactamase resistant

More potent against *E. faecalis*, *B. fragilis* and *pseudomonas aeruginosa* as compared to 3<sup>rd</sup> generation cephalosporin



Some consider imipenem the drug of choice in the management of polymicrobial pulmonary, intra-abdominal and tissue infections

Imipenem is metabolized and excreted by the kidney. It is metabolized in kidney by the enzyme dehydropeptidase I; so it is combined with **Cilastatin** (inhibitor to dehydrpeptidase I) to decrease rapid metabolic clearance of imipenem

Seizures are major side effect to imipenem



\* **Meropenem**; has similar activity to imipenem; but resistant to metabolism by dehydropeptidase I (no need to combine it with cilastatin) and incidence of seizures is less than imipenem

- **Carbacephems** e.g. Loracarbef Oral

Spectrum of activity similar to 2<sup>nd</sup> generation cephalosporin particularly cefaclor and cefprozil; effective orally; excreted renally



- **Monobactams** e.g. Aztreonam IM, IV

Has excellent activity against G-ve bacteria

little if any effect against G+ve MO's

$\beta$ -lactamase resistant

Considered a substitute to aminoglycosides to treat G-ve infections (less toxic)

Rarely, causes allergic reactions in pts with type I allergy to other  $\beta$ -lactam antibiotics

## **Vancomycin & Teicoplanin**

**Glycopeptides (Large molecules)**

**Prevent crosslinking of peptidoglycans**

**Bactericidal**

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

**Alternatives to PNC's to treat G+ve Strep &  
Staph infections in pts allergic to PNC's**

**Given IV (oral absorption is poor)**

Considered drug of choice  $\pm$   
metronidazole to treat  
pseudomembranous colitis=antibiotic  
associated colitis (Clostridium difficile  
colitis; Staph enterocolitis) and in this  
case vancomycin could be given  
orally (IV in life threatening cases)

Teicoplanin is given IM

Side effects:

- Rapid IV  $\rightarrow$  flushing, tachycardia,  $\downarrow$  BP,  
skin rashes... (Red man syndrome)
- Thrombophlebitis, ototoxicity,  
circumoral parasthesia...