Aztreonam: Uses, Mechanism of action, Dosage and Side effects

Aztreonam (Azactam) is an antibiotic belonging to a class known as monocyclic beta-lactam antibiotics (Monobactams). Aztreonam is not affected by beta-lactamases, therefore, it is used in the treatment of gram-negative infections, especially of the meninges, bladder, and kidneys.

It is a manufactured version of a chemical from the bacterium Chromobacterium violaceum.

Class

- **Monobactam** (Monocyclic ?-lactam antibiotic)

Mechanism of Action

- Inhibits bacterial **cell wall synthesis** by binding to **penicillin-binding protein 3 (PBP-3)** .
- Prevents cross-linking of peptidoglycan ? **bactericidal** against susceptible **aerobic Gram-negative bacteria** .
- **No significant activity** against Gram-positive organisms or anaerobes.

Spectrum of Activity

Effective against:

- *Pseudomonas aeruginosa*
- *Escherichia coli*
- *Klebsiella spp.*
- *Haemophilus spp.*
- *Proteus spp.*
- *Serratia spp.*
- *Enterobacter spp.*
- *Citrobacter spp.*

Ineffective or resistant organisms:

- *Gram-positive cocci* (e.g., *Staphylococcus aureus* , *Streptococcus spp.*)
- *Anaerobes* (e.g., *Bacteroides*)
- *Xanthomonas maltophilia*
- *Aeromonas hydrophila*
- *Streptococcus pyogenes*

Clinical Indications

- **Moderate to severe infections** caused by aerobic Gram-negative bacteria:

    - **Urinary tract infections (UTIs)**
    - **Pneumonia** (including ventilator-associated)
    - **Sepsis**
    - **Intra-abdominal infections**
    - **Endometritis**
    - **Bone infections** (e.g., osteomyelitis)
    - **Pelvic inflammatory disease**
    - **Febrile neutropenia**
    - **Skin and soft tissue infections**
    - **Peritonitis**
- **Inhaled aztreonam (Cayston®)** :
    - FDA-approved for **cystic fibrosis-related pulmonary infections**
    - **Off-label** : Non-CF bronchiectasis, COPD exacerbations, post-lung transplant infections

Dosage & Administration

Route

- **Parenteral (IV/IM)** or **Inhalation (Nebulized)**

Adult Dosage

- **Moderate infections** : 1–2 g IV/IM q8–12h
- **Severe infections** : 2 g IV q6–8h (Max: 8 g/day)
- **Cystic fibrosis (inhaled)** : 75 mg nebulized TID for 28 days on/off cycles
- Duration: Varies (7–21 days depending on infection severity)

Pediatric Dosage

- IV: 30 mg/kg q6–8h (max 2 g/dose or 8 g/day)
- Inhaled (?7 years): Same as adult dose for CF

Renal Adjustments

- **CrCl 10–30 mL/min** : 1–2 g loading dose, then 50% of usual dose
- **Hemodialysis** : Administer post-dialysis

Pharmacokinetics

- **Poor oral absorption** ? must be given IV/IM or inhaled
- Crosses the **blood-brain barrier** (useful for meningitis)
- Excreted **unchanged in urine** ? renal dosing required

Side Effects

Common

- Local: Pain, erythema at injection site
- GI: Diarrhea, nausea, vomiting
- Skin: Rash

Rare but Serious

- **Clostridioides difficile-associated diarrhea (CDAD)**
- **Toxic epidermal necrolysis**
- **Drug-induced eosinophilia**
- **Anaphylaxis** (esp. if ceftazidime-allergic)

Allergy and Cross-Reactivity

- **Safe in most penicillin/cephalosporin allergies**
- **Exception** : Cross-reactivity with **ceftazidime** due to similar side chain
- Use with **caution** in ceftazidime-allergic patients

Drug Interactions

- **Synergistic** with aminoglycosides (e.g., **tobramycin** , **arbekacin**) against *P. aeruginosa*
- Compatible with ?-lactam antibiotics in combination therapy

Pregnancy Category

- **Category B** : No known teratogenic effects; generally considered **safe in pregnancy**

High-Yield Notes

- Aztreonam is **?-lactamase-resistant** , but **not effective** against **ESBL-producing bacteria**
- Ideal for patients with **severe ?-lactam allergy** (except ceftazidime)
- **Does not cover** Gram-positives or anaerobes ? not suitable as monotherapy for mixed infections
- **Inhaled form (Cayston®)** significantly improves **lung function in CF**

Memory Aids

- **A** ztreonam = **A** erobic **Gram-negative** coverage only
- Think **“Aztreonam = Alone vs. Aerobes”**
- Avoid in **ceftazidime** allergy