Aztreonam

Aztreonam, the trade name Azactam, is a monobactam antibiotic that is resistant to most beta-lactamases, though it may be inactivated by extended-spectrum beta-lactamases. It has a special affinity for penicillin-binding protein 3 (PBP3), which is found in Gram-negative bacteria. By binding specifically to PBP3, aztreonam inhibits cell wall synthesis, leading to bacterial cell lysis and death. It is classified as a bactericidal antibiotic and is effective only against Gram-negative aerobic bacteria, as it has a low affinity for the penicillin-binding proteins of Gram-positive bacteria and anaerobes. It is typically administered intravenously (IV) or intramuscularly (IM), and a nebulized form is available for respiratory infections, especially in cystic fibrosis patients where aztreonam is particularly effective. Aztreonam is often used synergistically with aminoglycosides. It is structurally distinct from penicillin, so it does not cause allergic reactions in individuals with penicillin allergies. Common side effects include mild to moderate GI upset and pain at the injection site.

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MECHANISM

Monobactam
Mono-man-backgammon
Monobactams differ from the other beta-lactam antibiotics by having a standalone beta-lactam ring with a special affinity for penicillin-binding protein 3 (PBP3).

Resistant to Beta-Lactamases
Resisting (B lac) Black Beta-fish wearing Resistance-bandana
As a monobactam antibiotic, aztreonam is resistant to beta-lactamases but may still be susceptible to extended-spectrum beta-lactamases.

Binds to Penicillin-Binding Protein (PBP)
PBJ-sandwich
Aztreonam has a special affinity for penicillin-binding protein 3. Gram-positive bacteria and anaerobes have different penicillin-binding proteins that aztreonam does not bind well.

Inhibit Cell Wall Synthesis
Disrupted Cell Wall
By binding tightly to PBP3, aztreonam disrupts cell wall synthesis, which leads to cell lysis and death. Its affinity for PBP3 is key to its bactericidal effect in gram-negative bacteria.

Bactericidal
Bacteria-sliders
Aztreonam is a bactericidal antibiotic. It inhibits cell wall synthesis by binding specifically to penicillin-binding protein 3 (PBP-3) in Gram-negative bacteria, weakening the bacterial cell wall. The disruption of the cell wall's integrity causes bacterial cell lysis and death.

INDICATIONS

No Activity on Gram-Positives or Anaerobes
No Activity on Graham-cracker Positive-angel or Ant-robe
In clinical use, aztreonam is limited to Gram-negative bacteria because it has no useful activity against Gram-positives. It also has no activity against anaerobes and can only be used for aerobic organisms.

Gram-Negative Rods
Graham-cracker Negative-devil with Rod
Aztreonam has strong activity against susceptible Gram-negative bacteria, especially Gram-negative bacilli, including Pseudomonas, Enterobacter, E. coli, Haemophilus, Klebsiella, and Proteus.

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Cystic Fibrosis

Sisters with Fibrous-sacks

Aztreonam is commonly used to treat cystic fibrosis exacerbations, as Pseudomonas aeruginosa is one of the most common pathogens involved. It is typically administered IV or IM, but a nebulized form is available for respiratory infections.

CONSIDERATIONS

Non Allergenic to Penicillin

Nun Allergy-alligator with Pencil-villain

Aztreonam is structurally different enough from penicillin that there is no cross-reactivity to individuals with penicillin allergies. Therefore, this antibiotic is often used in patients who have penicillin allergies.

Synergistic with Aminoglycosides

A-mean-ol'-glider

Many studies demonstrate synergism between aztreonam and aminoglycoside antibiotics like gentamicin and tobramycin. The combination is particularly effective against Pseudomonas aeruginosa. Aztreonam disrupts cell wall synthesis, making it easier for aminoglycosides to enter bacterial cells and inhibit protein synthesis.

SIDE EFFECTS

GI Upset

GI-guy Upset

Aztreonam causes mild to moderate digestive disturbances. Symptoms can include nausea, vomiting, diarrhea, and abdominal pain. These symptoms are generally self-limiting and not severe, though they can impact patient comfort and adherence to the medication.

Pain at Injection Site

Pain-bolts at Injection Site

Patients may experience pain at the injection site. Thrombophlebitis, an inflammation of the vein due to a blood clot (thrombus), may also occur. This side effect can cause pain, swelling, warmth, and redness around the affected vein.

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