

Aminoglycoside Overview

Aminoglycosides are narrow-spectrum antibiotics used against gram-negative infections. They disrupt protein synthesis, resulting in bacterial cell death. Aminoglycosides have the ability to cause serious toxicities, including damage to the inner ear and kidney; therefore, their use should be limited.



PLAY PICMONIC

End in "-mycin"

Mice

Aminoglycosides typically have a suffix ending with "-mycin," except for Amikacin and Gentamicin, which end in "cin." The most common drugs can be remembered by the acronym "GNATS," which represents Gentamicin, Neomycin, Amikacin, Tobramycin, and Streptomycin.

GNATS

Gentamicin

Magenta-gentleman-mouse

Gentamicin is used for gram-negative infections such as *Pseudomonas aeruginosa* and *Proteus mirabilis* but isn't used for *Neisseria* or *Legionella*. Its clinical use is limited due to its side effects of ototoxicity and nephrotoxicity, and it cannot be given orally due to its lack of small intestinal absorption. Combined with vancomycin or a beta-lactam antibiotic, gentamicin can be used to treat serious infections caused by gram-positive cocci (*Staphylococcus aureus*, *Enterococcus*, and some streptococci).

Neomycin

Neon-mouse

Neomycin is a popular topical aminoglycoside for eye, ear, and skin infections. It is not used as a systemic treatment, as it is highly ototoxic and nephrotoxic. It is used to reduce the risk of infection during intestinal surgery by eliminating intestinal bacteria. And because aminoglycosides are not absorbed well into the body through the GI tract, the risk of side effects is much lower when using it as a bowel prep for surgery.

Amikacin

Moccasin-mouse

This aminoglycoside is used for *Pseudomonas*, *Enterobacter*, and *Serratia* infections. This medication can be given in the form of suspension, inhalation, or injection. Like other drugs in its class, it can lead to nephrotoxicity and ototoxicity, so patients should be carefully monitored if they have renal disease.

Tobramycin

Cobra-mouse

Tobramycin is used for gram-negative infections. It has slightly better coverage than gentamicin when treating pseudomonal infections of the lungs. It cannot be given orally but has use in ophthalmic infections for bacterial conjunctivitis (Tobrex). It can also be inhaled via a nebulizer and given via an injection into a muscle or as an IV infusion. This drug leads to nephrotoxicity and ototoxicity.

Streptomycin

Stripper-mouse

Streptomycin was the first aminoglycoside discovered and is used for mycobacterium tuberculosis infections. It is still used for this purpose today as part of the multidrug treatment for TB. It is given via injection into a muscle, usually the thigh or upper buttocks. This drug has the side effects of nephrotoxicity and ototoxicity.

Mechanism of Action

Bactericidal

Bacteria-sliders

Unlike bacteriostatic agents, which simply stop bacteria from reproducing, bactericidal agents actually cause bacterial cell death. They work by inhibiting the synthesis of proteins and bacterial enzymes used for DNA replication and cell division. The lack of bacterial enzymes leads to breaks in the DNA, killing the bacteria directly. A higher concentration of medication leads to quicker eradication of the infection.

Indications

Severe Gram Negative Infections

Severed Gram-cracker Negative-devil

Aminoglycosides are typically used for the treatment of serious infections due to aerobic gram-negative bacilli. The most frequent use of these antibiotics includes empiric therapy for serious infections, including septicemia, complicated intraabdominal infections, UTIs, and nosocomial upper respiratory tract infections.

Bowel Surgery Prep

Bowel-bowl Surgery

The aminoglycoside Neomycin is often used for bowel surgery prep to suppress bowel flora and decrease the risk of infection after surgery. Remember, aminoglycosides are not absorbed well into the body through the GI tract, so the risk of side effects is much lower when using it for bowel surgery preparation.