Vancomycin Side Effects & Toxicity

Vancomycin is a glycopeptide antibiotic used in the treatment of gram-positive bacterial infections. This antibiotic was originally indicated for the treatment of penicillin-resistant Staphylococcus aureus. Traditionally, it has been reserved as a drug of last resort, only after treatment with other antibiotics failed, and today, vancomycin-resistant organisms are increasing and becoming more common. This antibiotic inhibits cell wall mucopeptide synthesis by forming hydrogen bond interactions with the terminal D-alanyl-D-alanine moieties of the cell wall peptides. This binding to the D-Ala-D-Ala prevents synthesis of long polymers of N-acetylmuramic acid and N-acetylglucosamine, which normally forms the backbone strands of the bacterial cell wall and also prevents the polymers from forming cross-links. Resistance to vancomycin develops when the D-Ala-D-Ala moiety changes to D-ala-D-lac, preventing binding of vancomycin. Because gram-negative bacteria produce their cell walls via a different mechanism, vancomycin is not active against gram-negative bacteria. This antibiotic is indicated for the treatment of serious life-threatening infections caused by susceptible organisms including methicillin-resistant Staph aureus (MRSA), treatment of pseudomembranous colitis caused by the bacteria Clostridium difficile, and enterococci infections resistant to other penicillin derivatives. Well-known adverse reactions associated with IV vancomycin include thrombophlebitis, nephrotoxicity, ototoxicity and diffuse flushing known as vancomycin infusion reaction. Therefore, vancomycin must be administered slowly in a dilute solution. Vancomycin infusion reaction typically appears within 10 minutes after infusion and is characterized by flushing or an erythematous rash of the face, neck, and torso, due to nonspecific mast cell degranulation. Because of this mechanism of presentation, symptoms may be treated or prevented with antihistamines and are less likely to occur with a slow infusion rate.

PLAY PICMONIC

Side Effects

Thrombophlebitis
Trombone-flamingo
Thrombophlebitis, a complication of IV vancomycin use, refers to the inflammation and swelling of a vein, typically caused by chemical irritation from the infusion and not necessarily associated with a blood clot.

Nephrotoxicity
Kidney with Toxic-green-glow injured by van tank
Vancomycin has a strong association with nephrotoxicity, although the exact mechanism is poorly understood. To avoid nephrotoxicity in patients receiving vancomycin, serum levels should be kept within acceptable ranges, and other potentially nephrotoxic agents should be avoided.

Ototoxicity
Ear with Toxic-green-glow
Vancomycin has a rare and inconsistent association with ototoxicity, which may cause diminished hearing, particularly at higher frequencies, usually at very high serum concentrations or with concomitant ototoxic drugs. To minimize toxicity, serum vancomycin levels should be maintained within therapeutic ranges. Elevated vancomycin levels are more clearly associated with nephrotoxicity.

Vancomycin Infusion Reaction
Van-tank-mice IV Reaction
Vancomycin can cause diffuse flushing, known as a vancomycin infusion reaction. This reaction typically appears within 10 minutes after vancomycin infusion and is characterized by flushing. This erythematous rash of the face, neck, and torso occurs due to nonspecific mast cell degranulation.

Flushing
Flashlight
Flushing is a vasodilatory reaction that can occur when vancomycin is infused too rapidly. It is caused by non-IgE-mediated histamine release and presents as redness, warmth, and sometimes itching of the face, neck, and upper torso. This reaction is not a true allergy and can usually be prevented or reduced by slowing the infusion rate and premedicating with antihistamines.

Prevent with Antihistamine
Anti-history-book
Because vancomycin-related infusion reactions are associated with nonspecific mast cell degranulation, symptoms may be treated or prevented with antihistamine use.

Prevent with Slow Infusion

Snail IV

Vancomycin-related infusion reactions are less likely to occur with a slow IV infusion rate.