

LAB NOTES



EXCERPTS FROM “NEW PERSPECTIVES ON VANCOMYCIN USE IN HOMECARE, PART 1”

Kastango, ES, Hadaway, L. New Perspectives on Vancomycin Use in Homecare, Part 1. Int J Pharm Compd. 2001; 5: 465-469

Vancomycin is derived from the bacterium *Streptomyces orientalis*, which was isolated from the soil of India and Indonesia in 1956. It has been used to treat gram-positive bacterial infections, specifically staphylococci and enterococci since 1958. It is particularly effective against Methicillin-resistant *Staphylococcus aureus* (MRSA). MRSA has become a prevalent nosocomial pathogen in the United States.

The mechanism of action of vancomycin is by inhibition of bacterial cell wall synthesis. Unlike the aminoglycosides (gentamicin and tobramycin), vancomycin has no significant post-antibiotic effect (PAE). Post-antibiotic effect is defined as the continued suppression of bacterial growth despite the decline of the antimicrobial concentration to zero.

Stability

Solutions of vancomycin diluted in the range of 5mg/ml to 10mg/ml have been shown to be stable for extended periods of time, ideal for home care patients. Consulting an appropriate stability reference, such as Trissel's *Handbook of Injectable Drugs* or infusion device manufacturers, who may have conducted stability studies for drugs in their devices, provides the best source for accurate stability information. A recent stability study of vancomycin 10mg/ml in 0.9% Sodium Chloride in ethyl vinyl acetate (EVA) remained stable for 30 days at 4 °C and for seven days at 23 °C

Patient Management Considerations

Dosing

Vancomycin can be dosed by the following method:

- **Adults:** 15mg/kg (actual body weight, dose rounded off to nearest 250mg increment i.e. 500, 750, 1000,1250) matched against calculated creatinine clearance to determine dosing interval (see table below)
- **Children:** 10mg/kg per dose given q 6 hours
- **Infants/Neonates:** Initial dose 15mg/kg, followed by 10mg/kg per dose every 12 hours in the first week of life and q 8 hours thereafter until 1 month old then use child's dosing parameters above

DOSING TABLE

| Pt actual body weight (kilograms) | < 50 | 50 – 64 | 65 – 89 | 90 – 119 | > 120 |
|--------------------------------------|---------|---------|---------|----------|-----------------|
| Dose (milligrams) | 500 | 750 | 1000 | 1250 | 1500 |
| Calculated CrCl (milliliters/minute) | ≥ 70 | 40 – 69 | 30 – 39 | 20 – 29 | < 20 |
| Dose Interval | Q 12 hr | Q 24 hr | Q 48 hr | Q 72 hr | Not appropriate |

CrCl = creatinine clearance via Cockcroft or Sanaka equations



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Vancomycin Monitoring Considerations

The monitoring of serum vancomycin peak and trough concentrations has been a routine clinical practice, although there is very limited evidence to support the practice. Very little data exist to demonstrate a direct correlation between serum concentration of vancomycin and desired clinical outcomes. The bactericidal activity of vancomycin is concentration-independent at serum concentrations greater than 5mcg/ml. The key with vancomycin dosing efficacy is the time above the minimum inhibitory concentration (MIC) of the pathogen.

Most susceptible organisms will be killed when the trough concentrations of vancomycin can be maintained between 5 – 15 mcg/ml. There has been no data to support specific desired maximum concentrations of the drug. The literature is replete with information that following empiric-dosing guidelines can determine a safe and effective dosage regimen. Most common clinical practice involves modification of the dosing interval and not the dose. If the vancomycin trough level is too high, the dosing interval should be increased (e.g. from q12 hours to q18 or 24 hours). If the vancomycin trough level is too low, the dosing interval should be decreased (e.g. from q24 hours to q12 hours).

Vancomycin clearance is primarily via the kidneys and closely correlates to creatinine clearance. The initial and ongoing monitoring for renal toxicity in patients receiving vancomycin might include:

- Baseline serum creatinine (SCr) and blood urea nitrogen (BUN) level
- Weekly SCr thereafter while on therapy
- If therapy less than 5 days, no blood levels necessary
- If therapy longer than 5 days, weekly troughs (drawn immediately prior to next dose)
 - Desired trough levels between 5 and 15 mcg/ml (5mg/l – 15mg/l)