"READY-TO-USE" INTRAVENOUS VANCOMYCIN TO AVOID DILUTION ERRORS IN THE NEONATAL INTENSIVE CARE UNIT (NICU): CHEMICAL STABILITY AND MICROBIOLOGICAL POTENCY

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Background and Objective

Vancomycin is the drug of choice in NICUs when severe neonatal infection is suspected after day 3-4 of life1. The initial empirical therapy in this rapidly life threatening condition often associates an aminoglycoside to broaden the spectrum. When sepsis is suspected in the neonate, antibiotic treatment has to be initiated immediately. Commercially available vancomycin, targeted for adults, needs to be reconditioned for neonatal use. Prior to IV infusion, 500mg of sterile dry powder are reconstituted to produce a concentration of 100mg/ml. Based on dose regimens of 10-15 mg/kg2 in the very low birth weight infant (<1500g) further dilutions are necessary to obtain a final strength of 5mg/ml. These dilution procedures are carried out at the moment when the staff is preoccupied by the patients vital conditions. Medical errors increase in such stress situations3 and could lead to dangerous under or over dosage. Vancomycin toxicity is debated, but has been associated with lasting ototoxicity4. Multiple aseptic manipulations can also lead to bacterial contamination5,6. Ready-to-use low concentration vancomycin prepared in the pharmacy could reduce these risks. Immediate availability around the clock is mandatory. This study investigated its chemical stability and microbiological potency (MP), which are prime conditions for its clinical use.

Methods

Solutions of vancomycin (Vancocin®, E. Lilly) in Glucose 5% and NaCl 0.9% (50mg/10ml) were filled under aseptic conditions into 10ml polypropylene syringes (Plastipak® Becton Dickinson) and stored at 4°C and 25°C. Samples were analysed at T0, 1, 2, 4, 7, 14, 28, 42, 56, 98, 112, and 140 days. The microbiological assay was carried out according to the European Pharmacopoeia 2002 and the 6th Swiss Pharmacopoeia for the statistical analysis. The chemical stability was determined using HPLC7.

The standards were the T0 solutions kept at -70° C and also the Vancomycin Reference (VRS). After 56 days at 4°C samples were placed at 25°C and analysed after 48 hours to simulate ward conditions (SWC).

Results

Vancomycin is chemically stable in Glucose 5% and NaCl 0.9% after 140 days when stored at 4°C and its MP remains intact. Important losses are already seen after only 4 days at 25°C in both cases. The results using the two methods develop in an identical manner. The SWC samples were stable. Analysis will be continued until signs of chemical degradation and/or loss of MP is seen.

![Chemical Stability of Vancomycin in NaCl 0.9% and Glucose 5%](image1)

![Microbiological Potency of Vancomycin in NaCl 0.9% and Glucose 5%](image2)

Conclusions

Syringes of "ready to use" low dose vancomycin, manufactured and supplied by the pharmacy in sterile sachets, can be stored in the NICU refrigerator for 140 days. They can be used in emergency situations, thus avoiding the danger of dilution errors and bacterial contamination without delaying the onset of the treatment. Once brought to 25°C, the solution must be used within 48 hours. This approach will be applied to other high risk products used in the NICU.

![Ready to use syringe](image3)

References

2. W-H Tan et al *AHC* 2002; 87: F214-F216

Acknowledgements: We would like to thank Marie-Louise Chappuis (Laboratory of Bacteriology, University of Geneva); Victor Herrera and Béatrice Matthey, (Pharmacy, University Hospitals of Geneva) for their precious help.

![Image of pharmaceutical equipment](image4)