THE DIFFERENTIAL BINDING OF ANTIBIOTICS TO RESINS AND ITS USE IN STERILITY TESTING

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The use of an antimicrobial removal device (ARD) has been proposed as an adjunct to the sterility testing of antibiotics (Breeze, 1984). The ARD consists of a glass vial containing a mixture of antibiotic-binding resins suspended in 0.025% sodium polyanethole sulphonate (SPS) in saline. The antibiotic binding capacity of the device was shown to be greatly in excess of that required by the European Pharmacopoeia (1980) for a sterility test.

The two resins contained in the device are Amberlite XAD-4, a polymeric adsorbent resin, and C-249, a cation exchange resin. The XAD-4 is coated with Triton X-100 to decrease bacterial adsorption (Melnick & Wallis, 1979). This combination of resins is claimed to remove a wide range of antibiotics from clinical specimens (Wallis et al., 1980), without affecting the recovery of micro-organisms (Lindsey & Riely, 1981).

In this present work, the capacity of each of the component resins and of suitable alternatives for the removal of selected antibiotics has been investigated. Because of the unavailability of resin C-249, this component was removed from an ARD, separated from the XAD-4 and washed. The two resins were then examined individually to assess their role in the removal of antibiotics. Other resins evaluated were Amberlite IRC-50, a cation exchange resin suggested as an alternative to C-249 (Melnick & Wallis, 1979) and Dowex HCR-5, a stronger cation exchange resin.

Antibiotic	Amount* added	Amount* removed by: Complete ARD	XAD-4	C-249	IRC-50	HCR-5
Gentamicin	80	79.9	77.3	79.9	74.4	79.9
Chloramphenicol	50	49.6	49.6	0	0	0
Benzylpenicillin	100	98.4	98.4	0	85.9	98.4

*Total amount of antibiotic in mg dissolved in 10 ml appropriate solvent.

St. aureus NCTC 8625 was used in the determination of residual antibiotic activity after resin treatment.

The table shows that gentamicin is removed principally by cation exchange with C-249 and HCR-5 whereas chloramphenicol and benzylpenicillin are both removed by adsorption to XAD-4. The coating of XAD-4 with Triton X-100 made no difference to the removal of chloramphenicol and benzylpenicillin but did enhance the recovery of St.aureus (results not shown). The presence of SPS, which might have been expected to reduce the activity of gentamicin (Traub, 1969), had no discernible effect on this, or either of the other antibiotics.

The resins were used originally in vials similar to those employed in the ARD but other forms of presentation have been investigated. These may well be more suitable for the sterility testing of large volumes of antibiotic solutions.

Breeze, A.S. (1984): J. Pharm. Pharmacol. 36: 57P.

European Pharmacopoeia (1980): 2nd Ed. Part I: Maisonneuve S.A. (St.Ruffine, France).

Lindsey, N.J. & Riely, P.E. (1981): J. Clin. Microbiol. 13: 503-507.

Melnick, J.L. & Wallis, C. (1979): U.S. Patent 4, 145, 304.

Traub, W.H. (1969): Experientia 25: 206-207.

Wallis, C. et al (1980): J. Clin. Microbiol. 11: 462-464.