BACTERIAL ADHESION TO POLYHEMA COATED MONOFILAMENT FIBRES

J.Bilbruck,G.W.Hanlon,G.P.Martin, Pharmaceutical Sciences Research Group, Department of Pharmacy, Brighton Polytechnic, Moulsecoomb, Brighton BN2 4GJ U.K.

It has been proposed that the presence of indwelling devices, such as intrauterine contraceptive devices (IUCDs), sutures and indwelling catheters, act as substrates for bacterial adhesion and that once attached the bacteria can multiply and grow along the surface, thus gaining access to the body (Stamm et al 1978). In the case of IUCDs, the monofilament marker tail, attached to such devices, has been implicated in the aetiology of pelvic inflammatory disease (PID), since it traverses the dense microbial environment of the vagina with the normally sterile uterus. Bacterial adhesion to the marker tail followed by growth along the surface has been suggested as a factor in the development of PID (Wilkins et al 1989). One possible method of overcoming this problem may be to modify the surface of the substrate using polymer-coating technology. Poly (2-hydroxyethyl methacrylate) (PHEMA) hydrogel has been reported to be non-adhesive to mammalian fibroblasts (Lydon et al 1985) although few studies have examined the effect of hydrogel coatings on bacterial adhesion.
In this present study, coated threads, of polyester, nylon and polyvinylidene chloride (PVDC), were prepared by dip-coating with a 5% (w/v) solution of PHEMA in 95% (v/v) ethanol. The threads were air-dried at room temperature for 1 hour and stored in distilled water for at least 24 hours prior to use. Lengths of thread, both PHEMA coated and uncoated, were incubated with a *E. coli* suspension ($5x10^8$ cells ml^{-1}) for 24 hours at 37°C. The threads were then washed three times in 0.9% (w/v) saline to remove loosely and non-adhered bacteria. Adenosine triphosphate (ATP) was then extracted from those bacteria remaining firmly attached to the thread surface by immersion of the threads in 0.05% (v/v) trichloroacetic acid containing 2mmol l^{-1} EDTA. These extracts were then assayed for ATP content using a bioluminescent assay described by Ludwicka et al (1985), the light produced in the assay being proportional to the amount of ATP, which can, in turn, be transformed, via standard curves, to bacterial number.

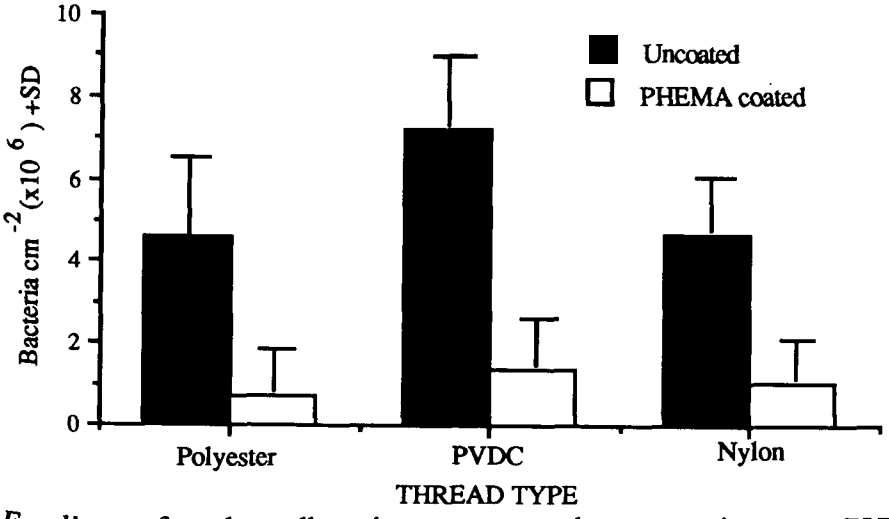

Figure 1:- Adhesion of *E.coli* to polymeric monofilaments (n=6)

E.coli was found to adhere in greatest numbers per unit area to PVDC (Fig 1), while significantly fewer bacteria adhered to the nylon and polyester threads (two-tailed Mann-Witney U-test; $p< 0.05$). Coating with PHEMA, in all cases, significantly reduced bacterial attachment to the monofilament ($p< 0.05$). Adhesion to the hydrogel layer is independent of the thread type to which the PHEMA is coated ($p<0.05$). It is concluded that modification of the surface of substrates, in this manner, would have implications to situations where bacterial adhesion has been shown to predispose to infection.

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