FACTORS INFLUENCING THE TRANSMISSION OF BACTERIA ALONG POLYMERIC THREADS

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Many reports have appeared in the literature relating the incidence of localised infections to the presence of foreign bodies such as intrauterine contraceptive devices (IUCDs), sutures and indwelling catheters. Most studies have proposed that these act as substrates for bacterial adhesion and that once attached, the bacteria can multiply and grow along the surfaces, hence gaining entry into the body. Motility as a factor in the role of bacterial transmission has been largely ignored, so the current study assesses the progression of a wide range of bacteria along IUCD threads, sutures and other monofilament materials.

An in vitro model previously described by Hanlon et al (1982) has been modified and improved. Silicone tubing containing gel is connected to a glass reservoir containing a standardised bacterial inoculum. The thread under investigation passes from the inoculum through the gel but there is no direct contact between the tubing and bacteria. Thus after 96 hours incubation at 37°C, when the tubing is sectioned and the gel and thread removed, the presence of bacteria in any 5 mm length segment must be in association with the thread rather than the tubing wall. The tables below show the average number of segments that each of a variety of bacterial species has progressed along the investigated threads.

Bacterial Species	Thread type				
	Polyethylene*	Polypropylene*	Nylon*	PVDC	No thread
E.coli	3.7	3.6	1.0	1.0	0.0
S.marcescens	2.5	2.0	2.7	3.0	0.2
Ps.aeruginosa	0.8	0.3	1.2	1.2	0.0
B.cereus	0.7	0.8	0.7	1.7	0.0
S.aureus	0.2	0.2	0.8	0.2	0.0
B.catarrhalis	0.2	0.2	0.2	0.3	0.0

Thread type	Progression of E.coli
Polyglycolic acid	2.8
Poly-4-methylpent-1-ene	2.3
Chromic catgut	3.7
Coated vicryl	1.5
Silk	2.0
Polyetheretherketone	2.2
Polyester	3.5

n = 6   * currently used as IUCD marker tails

Obviously motility plays an important role in bacterial transmission as E.coli and S.marcescens are able to progress to a greater extent than the non-motile species. However only in the case of E.coli was the rate found to be polymer dependent; nylon and PVDC significantly reducing transmission compared to other polymers ($p < 0.05$). Electron micrographs of threads removed from the in vitro model confirm that adhesion to the thread is also a factor in bacterial progression. Thread sections were fixed in glutaraldehyde, dehydrated through a graded ethanol series, critically point dried and observed under the microscope. S.aureus appears to progress along the thread via a process of cell adhesion and division. However the presence of discrete clusters of S.marcescens adhering to IUD threads indicates that S.marcescens cells may initially adhere to the thread, divide, break free, move along the surface of the thread and then readhere and begin the process of cell division again. It thus appears as though a combination of successful bacterial adhesion and motility will lead to a more rapid transmission of bacteria along foreign body surfaces (assuming that these surfaces are bathed in body fluids) and hence to a more rapid rate of infection.

Hanlon, G. et al (1982) J. Pharm. Pharmacol. 34: 31P