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Letters to the Editor

A new method of assessing the penetration of bacteria through fabrics used in the operating theatre

Sir,

The passage of bacteria through surgical drapes and gowns poses a potential risk of wound contamination. Newer disposable fabrics are supposed to be less permeable to bacteria than reusable woven materials. We describe a new method to test the permeability of fabrics to bacteria.

Mackintosh and Lidwell[1] performed experiments to determine the resistance to penetration by aqueous fluids of certain materials commonly used to make surgical drapes. Untreated woven fabrics were rapidly penetrated; non-woven synthetic materials resisted longer and tightly woven cotton fabrics resisted the longest. Of the fabrics tested only the Johnson and Johnson Dexter fabric proved to be impermeable to tap water.[1] Ha'eri and Wiley[2] used human albumin microspheres labelled with ^{99}Tc as tracer particles to determine the permeability of drapes. The particles penetrated woven drapes, but not non-woven drapes.[2] Neither of these studies took into account the physical and biological differences between water, albumin and bacteria. These differences may affect rates of penetration.

We used a new technique to determine the passage of viridans streptococcis and coagulase negative staphylococci (common skin commensals) through various wet surgical drapes.

We tested four different types of non-woven disposable fabrics and three different types of woven reusable fabrics that are commonly used to manufacture surgical gowns and drapes.

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A polyvinyl chloride surgical tray, known to be impermeable to liquid and bacteria, was used as a control (Infla-tec®, Intavent-Orthofix Ltd, Maidenhead, Berks, UK).

Twenty-four agar plates, with a diameter of 90 mm, were prepared by filling to the brim with Columbia agar (Becton Dickenson, Oxford) containing 8% whole horse blood (TCS Microbiology). The plates were inoculated with 10^7 cfu/mL Viridans Streptococci and coagulase-negative staphylococcus and incubated in air at 37°C for 18 h. Uninoculated plate served as controls. The plates were divided into eight sets of three plates. A set of agar plates was assigned to each type of drape to be tested. A sterile section of drape was placed over each agar plate. Each drape was then wet with 15 mL sterile normal saline placed with a sterile pipette over the centre of each agar plate.

Twenty-four square agar plates, 100 mm × 100 mm in size, were filled to the brim with blood agar. Each of these plates was inverted and placed over a round agar plate. After 30, 60 and 90 minutes a square agar plate was removed from each set and incubated for 48 hours. All the square plates were inspected for growth of *Streptococcus viridans* and coagulase negative staphylococci.

The entire experiment was performed twice to demonstrate that the results were reproducible.

The results are shown in the table below. Drapes made of non-woven synthetic materials were impermeable except for one. All of the reusable woven drapes allowed penetration by bacteria within 30 minutes.

Tests were not continued for longer than 90 minutes and therefore these results cannot be extrapolated to operations lasting longer.

Very similar results were obtained when the experiments were repeated; all drapes that were permeable in experiment one were also permeable in experiment two and similarly all those

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Table I Penetration of bacteria through different surgical drape fabrics

	Fabric One*	Fabric Two*	Fabric Three*	Fabric Four*	Fabric Five#	Fabric Six#	Fabric Seven#	Control
Exp1 30 minutes	No growth	$<10^2$ cfu	No growth	No growth	$>10^5$ cfu	$>10^5$ cfu	$>10^5$ cfu	No growth
Exp2 30 minutes	No growth	No growth	No growth	No growth	10^{2-5} cfu	$>10^5$ cfu	$>10^5$ cfu	No growth
Exp1 60 minutes	No growth	$>10^5$ cfu	NO growth	No growth	$>10^5$ cfu	$>10^5$ cfu	$>10^5$ cfu	No growth
Exp2 60 minutes	No growth	No growth	No growth	No growth	10^{2-5} cfu	$>10^5$ cfu	$>10^5$ cfu	No growth
Exp1 90 minutes	No growth	$>10^5$ cfu	No growth	No growth	$>10^5$ cfu	$>10^5$ cfu	$>10^5$ cfu	No growth
Exp2 90 minutes	No growth	10^{2-5} cfu	No growth	No growth	$>10^5$ cfu	$>10^5$ cfu	$>10^5$ cfu	No growth

* Non-woven single use materials, # Woven reusable materials. Exp 1/2, duplicate experiemnts 1 and 2.

that were impermeable in experiment one were impermeable in experiment two. Although the rate of penetration of fabric two and fabric five varied slightly between experiment one and experiment two, both types of drape were permeable to bacteria in both experiments.

We believe the method is a simple, cheap, reproducible and accurate measure of the permeability of surgical drapes and gowns to common skin commensals.

Using this new method we have shown a significant difference in permeability to bacteria between different types of fabrics.

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Identification of an IV-Dextrose solution as the source of an outbreak of *Klebsiella pneumoniae* sepsis in a newborn nursery

Sir,

In July 1996 we noticed an increase in the number of isolates of *Klebsiella pneumoniae* from blood cultures of newborn infants in the intensive care nursery.

Fifteen babies had *K. pneumoniae* isolated from their blood in a total of nineteen samples within the space of three weeks. Most (9/15) were preterm, very low birth wight babies for whom IV 10% dextrose was mandatory for initial stabilization. The others needed parenteral fluids for respiratory distress (three cases), feed intolerance (two cases), and birth asphyxia (one case). The mean duration of fluid administration was 7·2 ± 3·4 days. The outbreak was recognized on the fifth day when the sixth patient was identified as having *K. pneumoniae* septicemia. Over an 18-month period preceeding this outbreak, there were only nine cases of