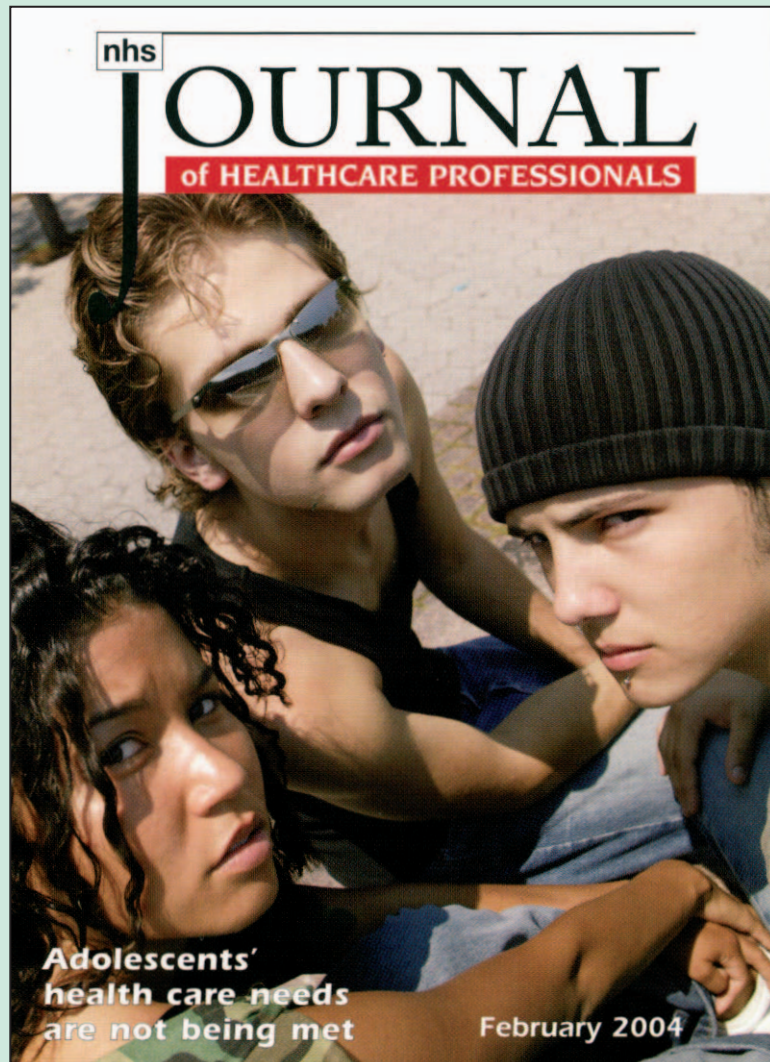


INFECTION CONTROL, HAND WASHING AND IRRITANT DERMATITIS – A POSSIBLE SOLUTION



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INFECTION CONTROL, HAND WASHING AND IRRITANT DERMATITIS – A POSSIBLE SOLUTION

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The emergence of antibiotic resistant pathogenic micro-organisms in patients is now a major problem in many hospitals¹. Since transmission most frequently occurs via the hands of healthcare workers, regular hand washing by medical personnel is a most important precautionary measure². However, numerous studies have reported that compliance is low, averaging only about 40%^{3,4}, due mainly to the development of skin irritation and dryness⁵. These problems arise with ordinary soaps and detergents which are **anionic** and can therefore act as primary irritants⁶. One example, sodium lauryl sulphate, is actually used as a positive marker for skin susceptibility to irritancy⁷.



A **non-ionic** surface active agent avoids these problems and is therefore more acceptable as a soap substitute for repeat usage and also for those occasions when the skin is already in a sensitive state due to a local inflammatory process. Appropriately, there is available a licensed **non-ionic** antimicrobial emollient, which can be used as a soap substitute - Dermol 500 Lotion. This lotion has been developed for its antibacterial action and its lack of irritancy in the topical management of dry skin conditions such as atopic dermatitis⁸, where there is a high level of colonisation with *Staphylococcus aureus*⁹.

Dermol 500 Lotion is formulated as a non greasy mobile emulsion in which the two immiscible oil and water phases are stabilised with the **non-ionic** emulsifier Cetomacrogol 1000, which is present at a concentration sufficient to provide the cleansing properties of a soap substitute.

The antimicrobial agents in Dermol 500 Lotion are benzalkonium chloride and chlorhexidine hydrochloride, both present at the relatively low concentration of 0.1%. These are known to act synergistically¹⁰ to enhance their activity and, being antiseptic rather than antibiotic, are most unlikely to induce resistant strains of micro-organisms¹¹.

Significantly, it has been shown that chlorhexidine is just as active against methicillin resistant *Staphylococcus aureus* (MRSA) as it is against methicillin sensitive strains (MSSA)^{12,13}. This has been confirmed with Dermol 500 Lotion, as exposure both to the neat lotion and to a 10 x dilution produced no viable counts of either MRSA or MSSA after as little as 5 minutes contact¹⁴ (Table).

Table: *in vitro* antimicrobial activity of Dermol 500 Lotion against methicillin sensitive (MSSA) and methicillin resistant (MRSA) *Staphylococcus aureus*

Strain of <i>S. aureus</i>	Dilution of Dermol 500 Lotion	Control	Total Viable Count		
			Contact time (mins)		
			0	5	10
MSSA	Undiluted	120 million	5.6 million	0	0
	x10 dilution	120 million	0.7 million	0	0
MRSA	Undiluted	83 million	1.3 million	0	0
	x10 dilution	83 million	0.13 million	0	0

Micro-organisms found on the hands may be classified as 'transients' and 'residents'. Transients, e.g. *Escherichia coli*, do not usually grow on the skin and are acquired by day-to-day contact with contaminated surfaces. 'Residents' are the normal stable microflora of the skin and are more difficult to remove by washing or disinfection¹⁵. They consist mainly of *S. epidermidis*, other staphylococci, micrococci and corynebacteria. In circumstances where elimination of 'transient' organisms is desired¹⁶, a model involving artificial contamination can be used to assess the effectiveness of an antibacterial agent^{17,18}. Accordingly, a study was undertaken in which the fingertips of volunteers were surface inoculated with *E. coli*, a likely contaminant in the clinical setting, and viable organisms recovered after washing, with Dermol 500 Lotion used as a soap substitute and emollient¹⁹.

The hands of 10 healthy human volunteers (aged 18 - 60) were first washed with 70% v/v ethanol to eliminate bacteria already present and then rinsed under sterile Ringers solution and patted dry using a clean tissue. The palmar surfaces of the fingertips and thumb of the left hand were then inoculated with 20µl of an *E. coli* suspension containing approximately 10⁸ colony forming units (CFU) per ml.

Opposing fingers and thumbs from both hands were then rubbed together for 20 seconds and air dried for a further 100 seconds. 3 ml Dermol 500 Lotion (3 pumps) was applied to cupped hands and the opposing hands rubbed together for one minute. The hands were then rinsed gently under 500 ml sterile Ringers solution and patted dry. 1 ml of Dermol 500 Lotion was re-applied with gentle massage.

Recovery of viable organisms was determined after the use of ethanol (negative control), after application of *E. coli* (positive control), and after application of *E. coli* followed by hand washing with Dermol 500 Lotion. The efficacy of the lotion was evaluated as a log₁₀ reduction factor (RF) when compared to the positive control.

No viable counts of *E. coli* were detected in the negative controls. The average RF value was 3.02, and the percentage of organisms killed following cleansing with Dermol 500 Lotion ranged between 99.8 and 100% (Figure).

Figure: The *in vivo* antimicrobial properties of Dermol 500 Lotion when used as a soap substitute



The FDA recommendation for removal of bacteria is 1 log₁₀ reduction for a non medicated soap. For a medicated soap, they recommend a 2 log₁₀ reduction after one wash and a 3 log₁₀ reduction after 10 washes. Impressively, Dermol 500 Lotion showed an average of a 3 log₁₀ reduction after just one wash, indicating that it meets the FDA requirements for a medicated soap far more effectively than the 10 washes permitted and so compares most favourably with other hand washes^{16,20}.

It may be supposed that pre-operative surgical scrubs or products with high concentrations of alcohol and/or strong, chemical disinfectants are likely to provide potent eradication of bacteria, but such products are of little practical use for routine, frequent hand washing by healthcare workers if they cause dermatitis.

Dermol 500 Lotion can therefore be considered to be an effective, well tolerated hand wash to control bacterial contamination. Its presentation in a 500ml pump dispenser is ideally suited for improved hygiene and ease of use.



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