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# Accepted Manuscript

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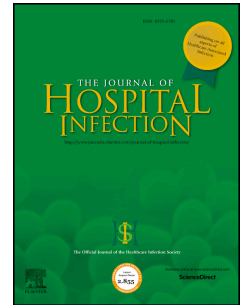
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**Handwash product and handwash technique are equally important**

Sir,

Kim and Rhee<sup>1</sup> report the comparative *in vitro* bactericidal effect of plain bar soap and an antiseptic-containing bar soap product. Gram negative bacteria were more susceptible to both soaps than were Gram positives. However, except for *Enterococcus faecalis* they found no significant difference between plain soap or triclocarban soap, and no meaningful reduction in bacterial count using the triclocarban product in simulated real-life conditions.

Though bar soap is rarely used in healthcare premises, the results highlight controversy surrounding the effectiveness of antibacterial soaps. Our own observations, gathered over several years of laboratory-based teaching of qualified Infection Prevention and Control (IPC) nurses and IPC Link Nurses, provide further insight. For the last 5 years, nurses attending the University of West London were asked to wash their hands with a widely-used antibacterial liquid soap formulated with a quaternary ammonium agent, with chlorhexidine hand wash, with plain non-mediated liquid soap, and with water alone. Every student selected the order in which they used the 4 different handwash products. Approximately 60 minutes elapsed between each handwash cycle. Hands were dried using paper towels. Fingertip impression cultures were collected on blood agar before and immediately after each handwash cycle. Plates were incubated at 35°C for 24-48 hours and scored by a single observer.

These semi-quantitative studies were not intended to generate robust research data but to provide students with additional insight into the microbiology of handwashing. Though standardised in approach to testing, our studies were not subject to rigorous experimental control. However, with more than 1,000 individual handwashing assessments, a clear trend becomes apparent. Chlorhexidine handwash was superior and reduced fingertip colony counts by at least 80% in almost every individual. Non-medicated liquid soap and medicated (quaternary ammonium) liquid soap were each successful in reducing counts by 50-60% in all but a small subset of students. Surprisingly, bacterial reduction after washing with water alone was as great as that achieved using either non-medicated or quaternary ammonium soaps. The logical conclusion is that handwashing technique is a key determinant for a good microbiological outcome.

For a small cohort comprising around 10% of participants, a single confounding factor became apparent. For these individuals, initial pre-wash counts were invariably high with no discernible difference found between pre-and post-wash counts when using the quaternary ammonium or non-medicated soaps or water alone; with chlorhexidine hand wash, reduction in counts was limited to

30% or less. On questioning, each of these individuals reported heavy and frequent use of hand cream with more than 5 or 6 applications and for some more than 10 applications every day. Others were using hand cream regularly but not more than 2 - 3 times daily and this did not show a negative impact on bacterial count reduction after washing hands with any of the products tested, included water alone. A further and common deficiency in handwashing technique noted more recently was the application of liquid soap product to the dry palm of one hand before wetting with water. Observed in 10 - 20% of trained nurses – precise records were not retained – this increases the risk of irritant contact dermatitis, contributing to additional bacterial colonisation and encouraging overuse of hand cream.

Chlorhexidine handwash was clearly superior in reducing fingertip bacterial counts. Though providing useful lubrication to facilitate handwashing, our observations suggest that liquid soap products, whether medicated or not, have modest impact on the residual microbial burden of hands. This supports the observations of Kim and Rhee<sup>1</sup> and, as water alone achieves seemingly good results compared with non-medicated and some antibacterial soaps, highlights the importance of good technique as an essential requirement for handwashing success. When handwashing technique is inadequate, any advantage from medicated soaps will be reduced or lost.

The mode of application of pre-operative skin antiseptic products has been noted to be as important as their formulation to prevent surgical site infection.<sup>2,3</sup> The same may be true also for handwashing where technique appears to be as important as the product used. The excessive use of hand cream by some nurses is of concern as this defeats effective hand washing and impedes removal of bacteria. Our observations should create a focus for further microbiological study of handwashing technique, an additional focus for hand hygiene training, raising important questions about the negative impact of excessive hand cream use on hand hygiene when hands are washed with soap and water, and perhaps also when using an alcohol hand rub.

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