Efficacy of alcohol-based gels compared with simple hand wash and hygienic hand disinfection

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Summary A recent research letter on the limited efficacy of alcohol-based hand gels has alerted the global infection control community and raised the question of the true significance of data obtained according to EN 1500. It has been described that a 1 min simple hand wash reduces artificial contamination of hands by a log10 reduction factor of 2.8 and a 1 min reference hand disinfection with 2-propanol (60%, v/v) by a factor of 4.6 steps. The EN 1500 gel data show that the 30 s efficacy of most gels is closer to a simple hand wash than to the reference hand disinfection. The 30 s efficacy of most alcohol-based liquid products and one gel, however, is almost identical to the reference hand disinfection. In many European countries alcohol-based liquid products have been established as a standard practice in hygienic hand disinfection for decades. Replacement of these products with most available gels would be a step backward in terms of efficacy and has still to be seen critically from the efficacy point of view.

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Introduction

A recent research letter alerted the global infection control community to the limited efficacy of alcohol-based hand gels and has led to controversy over the use of hand gels in hospitals and the significance of test norm EN 1500. It was questioned what type and level of antimicrobial efficacy an alcohol-based hand rub should have if used in hospitals. Although many gels have been reported to be significantly less effective than the reference hand disinfection, it remains unclear what exactly this means in practice. A recent study has looked at the intra-laboratory reproducibility of the EN 1499 reference hand wash with a simple soap and the EN 1500 reference hand disinfection with 2-propanol (60%). Both procedures are carried out for 1 min. We have now assigned the EN 1500 efficacy data of alcohol-based gels and liquid products derived from various publications into this wider frame between simple hand wash and hygienic hand disinfection.
Material and methods

EN 1499 hand wash

EN 1499 is the standard by which antiseptic liquid soaps must demonstrate efficacy under practical conditions in comparison with the reference non-medicated soap (sapo kalinus) tested on *Escherichia coli* K12 (NTCC 10538). The product should be significantly more effective than the reference soap.3

A product is compared with the reference soap on artificially contaminated hands using a cross-over design with 12–15 volunteers. Hands are washed for 1 min with soft soap, dried with paper towels, immersed in the contamination fluid up to the mid-metacarpals for 5 s with fingers spread, and then allowed to air dry for 3 min. Fingertips are rubbed for 1 min in a petri dish containing a liquid broth. Counts of organisms obtained at this stage are designated ‘pre-values’. A specified volume of the test product or 5 ml of the reference soap is applied to the hands. The rub-in period is always 60 s for the reference soap. ‘Post-values’ of bacterial counts are determined immediately after the rub-in period using petri dishes containing neutralisers. For both reference and test procedures, the log10 counts from the left and right hands of each subject are averaged separately for pre-values and post-values. The difference between the pre-value and the post-value is the individual log10 reduction factor (RF).

Hygienic hand disinfection (EN 1500)

EN 1500 is the standard by which products for hygienic hand disinfection such as hand rinses or gels shall demonstrate efficacy under practical conditions in comparison with the reference disinfectant (2-propanol, 60% v/v) tested on *Escherichia coli* K12 (NTCC 10538). The product should not be significantly less effective than the reference alcohol.4

A product is compared with 2-propanol 60% (v/v) on artificially contaminated hands using a cross-over design with 12–15 volunteers. Hands are washed for 1 min with soft soap, dried with paper towels, immersed in the contamination fluid up to the mid-metacarpals for 5 s with fingers spread, and then allowed to air dry for 3 min. Fingertips are rubbed for 1 min in a petri dish containing a liquid broth and counts made (pre-values). A certain volume of the test product or 2 ml of the reference alcohol are applied to the hands. The rub-in period is always 60 s for the reference alcohol. Post-values are determined immediately after the rub-in period using petri dishes containing liquid broth with neutralisers. For both reference and test procedures, the log10 counts from the left and right hands of each subject are averaged separately for pre-values and post-values. The difference between the pre-value and the post-value is the individual log10 reduction factor (RF).

Evaluation of data

A recent paper on the reproducibility of the 1 min reference hand wash with non-medicated soap (EN 1499) and the 1 min reference hand disinfection with two 3 ml applications of 60% iso-propanol (EN 1500) was taken as a baseline for bactericidal efficacy of simple hand wash and hygienic hand disinfection.5 Efficacy for various alcohol-based hand gels and liquid products for hygienic hand disinfection were compared with their mean log10 reduction relative to simple hand wash and reference hand disinfection.1,6

Results

A simple 1 min hand wash with non-medicated soap reduced bacteria by an average log10 reduction factor of 2.8 s. A 1 min reference hygienic hand disinfection with two 3 ml applications iso-propanol (60%) reduced test bacteria on average by a factor of 4.64 (Figure 1). Most hand gels are closer to a 1 min simple hand wash (Figure 1) than to a 1 min reference disinfection.1 Alcohol-based liquid products like Sterillium are closer to the 1 min reference disinfection.1 So far only one ethanol-based hand gel (Sterillium Gel) has been reported to

![Figure 1](image-url)
pass EN 1500 within 30 s and is so far the only gel that is closer to the 1 min reference disinfection.  

Discussion

Reservations remain regarding the use of many common alcohol-based hand gels in hospitals\(^2\) since the efficacy of most is closer to a 1 min simple hand wash and not to the reference hand disinfection. In addition, the user-acceptability of different gels may vary greatly,\(^6,7\) which may have a substantial effect on compliance in hand hygiene. In many European countries alcohol-based liquid products such as Sterillium have been established as a standard in hygienic hand disinfection for decades. Replacement of these products with most gels would be a step backward in terms of efficacy and has still to be seen critically from the efficacy point of view.

References