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## Antimicrobial efficacy of a benzethonium chloride hand sanitizer, in vitro and in vivo studies

L. Jimenez, M. Chiang

**BACKGROUND/OBJECTIVES:** Alcohol-based hand sanitizers are just one of the few products employed by healthcare professionals to maintain clean and hygienic hands. However, these same products have some limitations, such as drying hands and being hazardous to handle in large quantities. In addition, alcohol-based hand sanitizers may have limited use in facilities such as rehabilitation, school, and penal institutions. An alternative ingredient to alcohol is benzethonium chloride (BC). The antimicrobial efficacy of a benzethonium chloride hand sanitizer formulation was evaluated by in vitro and in vivo studies.

**METHODS:** Chlorine equivalency analysis, time-kill, and minimum inhibitory concentration (MIC) studies were performed to determine the antimicrobial kinetics and spectrum of the formulation. In vivo testing consisted of a modified general use handwash procedure performed in a 30-member human handwash panel, where 15 members tested an alcohol-based sanitizer and a control and the other 15 members tested the BC formulation, Lonzagard™, against a control.

**RESULTS:** Chlorine equivalency studies showed that the formulation was efficacious in killing 10 repetitive inoculations of *S. choleraesuis* and *S. aureus*. MIC studies demonstrated the widespread antimicrobial activity of the formulation against aerobic and anaerobic gram-positive bacteria, gram-negative bacteria, and yeasts. The antimicrobial activity was immediate upon contact as demonstrated by time-kill studies. In vivo studies demonstrated that both the BC and an alcohol-based sanitizer were equally effective in reducing the bacterial populations of *Escherichia coli* by a log<sub>10</sub> value of 1.70 + 0.72 and 2.07 + 0.61, respectively, after the first application. After the fifth application, the log<sub>10</sub> reduction values were 2.75 + 1.13 and 2.50 + 0.95.

**CONCLUSIONS:** The data indicated that the BC formulation was equally effective in reducing the number of microbial counts in contaminated hands as the proven alcohol sanitizer in a human clinical trial. Furthermore, chlorine equivalency analysis and MIC and time-kill studies demonstrated a consistent, broad-spectrum, and rapid antimicrobial activity. The study demonstrates the suitability of the formulation for use as a hand sanitizer.

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ABSTRACT

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