

Aim: Assessment of antimicrobial activity of KHG fiteBac Hand Gel.

Methods:

Subjects: Study included a panel of 12 participants (subjects), divided into 4 groups (1,2,3 and 4, n=3/group), recruited (paid or volunteer) for the study. All subjects were between 18 and 60 years old of age.

Microorganisms and growth conditions: The bacterial strains used in these studies Test were *Staphylococcus aureus*, ATCC #6538, and *Escherichia coli*, ATCC #11229, (non-pathogen), were purchased from Fisher Scientific, (MicroBioLogics; EZ-Accu Shot; Delivers <100 CFU per 0.1mL, Cat# 23004135 and 23004137). Culture and detection media were purchased from Microbiology labs and Fisher Scientific (ColiScan Easygel and BD* BBL* Prepared Plated Media: S).

Hand contamination: Palmar-surface technique. Two single-ply paper towels (Brawny Light-Duty; Georgia Pacific) were folded together into a rectangle approximately 12.7 cm by 21.6 cm. The towels were placed inside an aluminum foil pouch and sterilized by autoclaving. Just prior to subject contamination, one pouch for each hand was opened, exposing the paper towel. A 30-ml bacterial suspension was poured evenly onto the towel, allowing for the complete absorption of the suspension. The subjects' hands were placed directly above the individual towels and then pressed down firmly for 5 ± 1 seconds, ensuring that the entire palms, fingers, and finger pads were in contact with the saturated towel. The hands were then air dried for 90 ± 5 seconds, followed by a standard swab bacterial recovery method/hand treatment as described below.

Bacterial recovery method: Sterile cotton swabs were used to collect the bacteria from hands' surfaces. Sterile swabs were moisturized with sterile water prior to be applied on the subjects' hands. Swabs then were rubbed firm and gently all over the hands prior to be placed in either transferring medium (for E Coli) or rubbed against and inoculated into the agar medium (for *S. aureus*).

Hand treatment with test article: Following the hand contamination and bacterial recovery method as described above, the subjects were instructed to perform a hand treatment, group 1, with anti bacterial liquid hand soap (ALHS, antimicrobial hand soap containing 0.46% triclosan), group 2, with non-anti bacterial liquid hand soap (LHS) and group 3, with KGHC (test article). Group 4 had no post contamination hand treatment. For hand treatment with either ALHS, LHS or KGHC, the subjects spread the material over the entire surface of each hand, including the back of the hand, between the fingers, and the lower third of the forearm for 30 seconds (to ensure that the evaluations covered the recommended times and allowed for proper lathering and coverage of all hand surfaces based on American Society for Testing and Materials, ASTM), and then groups 1 & 2 only, rinsed their hands under tap water tempered to $40 \pm 2^\circ\text{C}$. Then, second bacteria recovery procedure was performed on all participants as described above.

Data analysis

For all groups, log counts from the left and right hands of each subject were averaged separately, for both pre-treatment and post-treatment. The number of CFUs on each plate was converted to log₁₀ and mean log₁₀ CFUs per plates were determined for each test article. Anti-bacterial activity of the product was expressed in per cent reductions or logarithmic reduction in viable organisms and was calculated using the following formula: $\text{Log}_{10} \text{Reduction} = \text{Log}_{10} \text{CFU (control)} - \text{Log}_{10} \text{CFU (treated)}$. As some of the test plates contained no surviving CFU, '1' was added to the CFU per plate counts at all the data points to allow mean log₁₀ CFU per plate to be calculated. Data were analysed using appropriate statistical methods.

Results

As shown in table 1, the exact number of bacterial reductions from hands is presented in logarithmic units. Data suggest that although the most reduction in bacterial recovery was observed in group 1 ($P < 0.01$), when ALHS was used, however, use of KGHC was able to reduce the number of recovered bacteria significantly compared to the other groups, when either LHS (group 2) or no treatment was applied (group 4). In addition, it is noteworthy that despite the fact that the least number of bacteria were recovered in group 1 compared to the all groups, but, the difference between bacterial recovery in group 1 (ALHS) compared to group 3 (KGHC) was not statistically meaningful ($P > 0.5$).

Table 1. Effect of test articles on the reduction of hand microbial contamination

Groups	Reduction (Log ₁₀ count)	
	<i>Escherichia coli</i>	<i>Staphylococcus aureus</i>
G1: anti bacterial liquid hand soap (ALHS)	3.83	0.8
G2: Non-anti bacterial liquid hand soap (LHS)	1.08	0.24
G3: Kimmerling Group Hand Cream (KGHC)	3.40	0.6
G4: No treatment	0.25	0.05

Conclusion: These data show that the Kimmerling Group Hand Cream (KGHC) reduced microbial contamination (*E.coli* and *S. aureus*) significantly better than a nonantimicrobial soap. The fact that KGHC was also compared with one of the most effective antimicrobial hand soap in the market indicates the high potential of KGHC to be used in further trials as an effective antimicrobial agents to reduce the microbial contamination and related diseases.

Notes: These data were obtained in a laboratory setting and not under clinical conditions, so the test situation is a limitation.