

Investigation of Prolonged Activity of FiteBac Germicidal Hand Gel

Objectives:

1. To investigate the antibacterial effect of *FiteBac Germicidal Hand Gel* on hands undergoing repeated hand wash procedures with a non-antimicrobial liquid soap.
2. To describe differences between bacterial cultures after prolonged exposure to *FiteBac Germicidal Hand Gel* and cultures obtained from untreated hands (baseline).

Materials and Methods:

Potential volunteers were initially screened for any visible skin disorders or dermatitis of the hands. Subsequently, baseline hand fluid samples were collected from each volunteer at the beginning of each test day. Resultant microbial colonial growth from the fluid served as control data for each test. Volunteers donned sterile latex gloves, followed by aseptic addition of 10 mL sterile trypticase soy broth (TSB) into each glove. The TSB was palpated against the skin by massaging both hands for one minute. The experimental fluid (i.e., glove juice) was pipetted from each glove and collected in sterile a glass vile. Hands were subsequently washed with a liquid non-antibacterial soap in tepid water for 15 seconds and dried. A dime-sized amount of the *FiteBac Germicidal Hand Gel* (Kimmerling Holdings Group) was then applied to one hand, with the other hand functioning as a “soap-only” control. Immediately after application of the hand gel, a new pair of sterile latex gloves was donned and worn for one hour. Glove juice specimens collected from the soap-only and *FiteBac Germicidal Hand Gel*+soap-treated hands were collected in the same manner as described above for the control samples. These specimens were processed microbiologically as follows: 0.3 mL of a 1:10 dilution of the control (Group 1), soap-only (Group 2), and *FiteBac Germicidal Hand Gel*+soap (Group 3) exposed TSB preparations were each plated on tryptic soy agar with 5% sheep blood and then incubated at 37°C for 24 hours. The resultant bacterial growth was gram stained and analyzed using a Nikon Eclipse E200 microscope.

Results:

No hand dermatitis problems were found to develop with any of the volunteers during the course of the study. With regard to the microbiological assays, a total of 14 glove juice procedures were completed and assayed. Baseline cultures (Group 1) yielded high bacterial counts (6,000-36,000 cfu/mL) and also showed a highly diverse pattern of colony morphologies on the agar plates (Figure 1). Microscopic observation of gram stained samples demonstrated a variety of bacterial types, including an abundance of gram-positive cocci, gram-negative rods, few gram negative-cocci, and gram-positive rods (Figure 2). Glove juice cultures from hands treated only by undergoing a brief wash procedure with liquid soap (Group 2) demonstrated a lower colony count (1,600-23,100 cfu/mL) than the control samples. This was expected, as the historical primary purpose of hand washing is to mechanically remove surface microorganisms. Similar types of bacterial morphologies were observed here as found with Group 1, with only slight decreases in colony diversity (Figure 3). Microscopic observation of these cultures demonstrated primarily gram positive cocci and small amounts of gram positive rods, gram negative rods and cocci (Figure 4).

Culture findings with fluid specimens taken from hands exposed to *FiteBac Germicidal Hand Gel*+soap (Group 3) also showed fewer bacterial colonies (2,200-21,000 cfu/mL) than the numbers calculated for control cultures. In addition, unlike the control and soap-only samples, the combination of a non-antimicrobial soap wash plus application of *FiteBac Germicidal Hand Gel* resulted in microbial growth patterns, which were far more homogeneous in their colonial morphology. Virtually all of the bacterial colonies small, white, rounded, and raised (Figure 5). Gram stain preparations of these colonies demonstrated the presence of gram positive cocci in irregular clusters, which was indicative of *Staphylococcus* species (Figure 6). Multiple staphylococcal species, including *S. epidermidis* and *S. aureus*, are predominant bacterial components of the normal skin microflora. The white appearance of the bacterial colonies is consistent with *S. epidermidis* representing the majority of organisms cultured. It is also important to note here that the antimicrobial effects of the *fiteBac SkinCare Germicidal Hand Softening Gel*+soap treatment found for Group 3 specimens were reversible within 24 hours, as the skin microflora returned to normal, control levels within 24 hours. This was interpreted as a positive finding, in that the normal microflora comprise an important innate host defense against external pathogens.

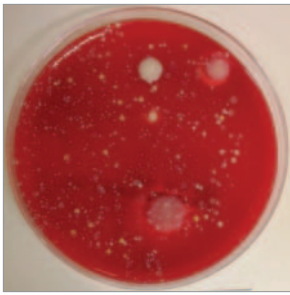


Figure 1: Bacterial growth cultured from a 1:10 dilution of Group 1 glove juice. Note the high colony count and the diverse pattern of colony morphologies.

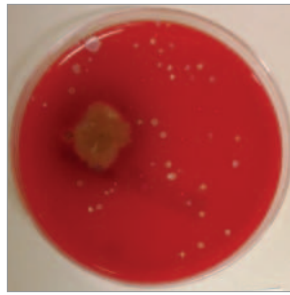


Figure 3: Bacterial growth cultured from a 1:10 dilution of Group 2 glove juice. Note a lower colony count from the Group 1 culture and the diverse pattern of colony morphologies.

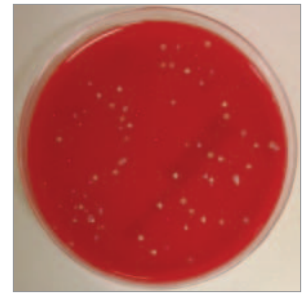


Figure 5: Bacterial growth cultured from a 1:10 dilution of Group 3 glove juice. Note a lower colony count than the Group 1 culture and the homogeneity of colony morphologies.

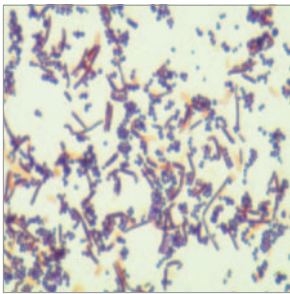


Figure 2: Gram stain of representative microflora collected from the cultured Group 1 glove juice seen in Figure 1. Note the presence of both gram-positive and gram-negative bacteria, with gram-positive cocci in irregular clumps occurring as the dominant forms.

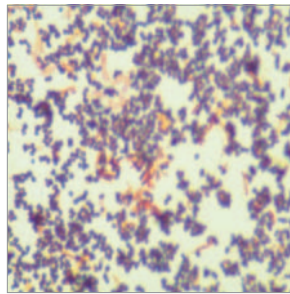


Figure 4: Gram stain of representative microflora collected from the cultured Group 2 glove juice seen in Figure 3. Note the predominate presence gram-positive cocci in irregular clumps along with smaller quantities of gram positive rods, gram negative cocci and rods.

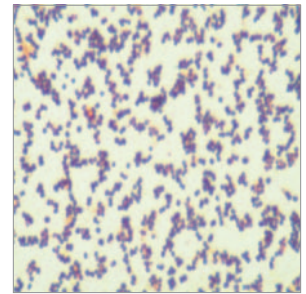


Figure 6: Gram stain of representative microflora collected from the cultured Group 3 glove juice seen in Figure 5. Note the homogenous presence gram-positive cocci in irregular clumps.

Discussion:

FiteBac Germicidal Hand Gel was shown to exert an immediate antimicrobial effect on a variety of bacteria cultured from healthy skin, yet did not disrupt re-establishment of normal skin flora. A number of bacterial species, as represented by gram-negative rods and gram-negative cocci, were undetectable on the hands of volunteers who had used *FiteBac Germicidal Hand Gel* after washing with soap and water.

All infection control recommendations stress the importance of proper hand hygiene (formally hand-washing). The primary purpose of hand-washing is the mechanical removal of transient microorganisms from the skin. These are organisms that colonize the outer skin surfaces and are acquired by direct contact with patients, contaminated instruments, and environmental surfaces. When hand hygiene procedures are used, the less-adherent transient bacteria are readily removed, along with many components of the normal resident flora. This latter group of microorganisms routinely colonizes epidermal tissue and is distinguished from transient skin flora (Table 1). Normal skin bacteria are found on external surfaces, in deeper layers of the epithelium, and provide the host with important innate immune protection against many disease-causing (i.e. transient) organisms. Fortunately, when the normal microflora is disrupted by hand hygiene practices, these bacteria can rapidly re-establish themselves at the same skin sites. While the use of *FiteBac Germicidal Hand Gel* demonstrated an immediate effect on demonstrable skin flora, the normal bacterial components were re-established on the hand sites in 24 hours.

Table 1. Types of Skin Microflora

Resident flora	Transient flora
<i>normal body flora</i>	<i>potentially pathogenic</i>
located on skin & in deeper skin layers	acquired by direct contact
provide immune protection	outer skin layers
if disrupted, re-establish at same site	more easily removed

Conclusions:

FiteBac Germicidal Hand Gel demonstrated an immediate effect on demonstrable skin flora on hands undergoing repeated hand wash procedures with a non-antimicrobial liquid soap. The normal bacterial components were re-established on the hand sites in 24 hours.