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BETWEEN LATHER AND PURIFICATION: A COMPARATIVE STUDY INTO THE FLUX OF BACTERIAL BURDEN AND HETEROGENEITY WITHIN ITS SURGICAL REVERBERATIONS

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Background. SSIs primarily caused by surgical staff unsanitary are most caused by pathogens like *S. aureus* and *E. coli* which are the most two common SSIs, pose significant challenges to healthcare systems, impacting patient recovery, leading to serious, sometime fatal complications and increasing healthcare costs. Effective hand hygiene is a cornerstone of preventing these infections, necessitating the evaluation of various sanitizing agents' efficacy in surgical settings.

Aim. This study aims to optimize hand hygiene protocols for combating key surgical pathogens, focusing on identifying the ideal chemical mix in precise concentrations and volumes for pre-surgical bacterial eradication. It improves surgical outcomes and patient safety with better infection control.

Materials and Methods. *S. aureus* and *E. coli* were cultured on Brain-Heart agar and incubated at 35–37 °C. The study evaluated both non-alcohol-based (“Asept”, “Oktiseptas”) and alcohol-based sanitizers (65 %, 73 %, 80 % ethanol), alongside antibacterial (“Chemi-pharm”) and regular (“Margarita”) soaps. A mixture of 3 ml Sodium-Lauryl-Sulfate and non-alcohol-sanitizer, and of 0.33 g sterile activated charcoal with antibacterial soap, were prepared. Bacterial cultures were adjusted to 0.5 McFarland standard, diluted 20 times, and then 3 ml of this diluted suspension was mixed with each hygiene product, vortexed for 30 s, and then 10 µl were inoculated into Brain-Heart-agar with a spreader and incubated. After 24 hours of incubation, colony counting assessed the efficacy of each product. The experiment had three phases, each using bacteria cultured from the previous stage with varied sanitizer concentrations, product types, and volumes to thoroughly evaluate their effectiveness against bacterial growth, including a control group with no product exposure for comparison.

Results. The antibacterial activity of various sanitizers was tested against *S. aureus* and *E. coli* in a three-round experiment. In experiment round 1, antibacterial soap eradicated *S. aureus* entirely (100 %, n=0) and left a small number of *E. coli* colonies (99.7 % effectiveness, n=6). Both alcoholic and non-alcoholic sanitizers completely inhibited the growth of both bacteria (100 %, n=0). 3 ml Regular soap allowed for a significant growth of *S. aureus* (47.4 %, n=1000) and *E. coli* (64.71 %, n=600). Warm

water resulted in *E. coli* (41.2 %, n=1000) and *S. aureus* growth (36.8 %, n=1200). The control samples of *S. aureus* (0 %, n=1900) and *E. coli* (0 %, n=1700). For experiment round 2, the average reduction of bacterial colonies on three agar plates was significant. Alcohol-based sanitizers maintained a 100 % reduction for both *S. aureus* and *E. coli* (100 %, n=0). Normal soap resulted in a large number of colonies for *S. aureus* (51.9 %, n=943) and *E. coli* (66.1 %, n=565). Warm water facilitated *E. coli* colony formation (37.7 %, n=1039) slightly more than *S. aureus* (35.7 %, n=1259). Control plates counts for *S. aureus* (0 %, n=1959) and *E. coli* (0 %, n=1669). In experiment round 3, at a concentration of 4.5 ml, regular soap reduced *E. coli* colonies to (87.4 %, n=211) and *S. aureus* colonies to (55.8 %, n=865); at 6 ml, the reduction was to (92.9 %, n=118) for *E. coli* and (61.1 %, n=762) for *S. aureus*. The "Asept" non-alcoholic solution was almost completely effective against *E. coli* (99.9 %, n=1) and entirely against *S. aureus* (100 %, n=0). "Oktiseptas" and varying concentrations of alcohol-based-sanitizers completely inhibited the growth of both bacteria (100%, n=0).

Conclusion. The study found high-concentration alcohol-based sanitizers (65 %, 73 %, 80 % ethanol) highly effective against *S. aureus* and *E. coli*, essential for surgical hygiene. Antibacterial soaps, especially those with triclosan, showed significant efficacy, suggesting their use pre-surgery. A dual-step hand antisepsis protocol using triclosan soap and alcohol sanitizer is advised for best results. Non-alcohol sanitizers also proved effective, providing an alternative when alcohol is contraindicated, potentially reducing surgical site infections and boosting patient safety.

Keywords. Surgical site infections; hand hygiene; *Staphylococcus aureus*; *Escherichia coli*; infection control.