Antibacterial Efficacy of Selected Hand Sanitizer Products Available in Local Market in Kandy, Sri Lanka

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This study aimed to evaluate the antibacterial efficacy of selected locally available hand sanitizers. Seventeen products were characterized by sterility testing and in vitro kill curve assay using *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 25923, and *Pseudomonas aeruginosa* ATCC 27953. Approximately 1.5 x 10^8 CFU/ml bacterial suspensions were mixed with equal volumes of sanitizers and viability was assessed for 30 minutes. The reduction of culturable bacterial load on hands of 10 volunteers who were trained on hand hygiene using sanitizers were assessed using thumbprint method. According to label information 11 products contained isopropyl alcohol (IPA) 75%-80% v/v, one product contained 1% IPA with 20% "herbal extracts", another product contained undisclosed quantity of IPA. Two products contained ethyl alcohol (ETA) 75% v/v, one product was labeled as "contains IPA and ETA 75% v/v". The remaining product was labeled as "contains alcohol". Three products did not have registration from the National Medicines Regulatory Authority (NMRA). All but the product containing 1% IPA with 20% "herbal extracts" was sterile. This product was contaminated with *Pseudomonas* spp ($7.1X10^4$ CFU/ml), and therefore, excluded from the kill curve and thumbprint experiments. It was not registered with NMRA, but labeled as produced by "ISO 9001-2015 certified company." In the kill curve assays, 10 out of 16 products completely inactivated *E. coli* immediately, while 4 products needed 1 minute, and one product needed 5 minutes exposure to achieve complete inactivation. Thirteen products completely inactivated *S. aureus* immediately, while one product needed 1 minute, and one product needed 5 minutes exposure to achieve complete inactivation. Fifteen products completely inactivated *P. aeruginosa* immediately. The remaining product labeled "containing 75% v/v ETA and kills 99.9% germs" failed to inactivate all three bacteria tested, even after 30 minutes exposure. This product was not registered with NMRA. In the thumbprint method, only 13 out of 16 products reduced at least 50% of culturable bacteria on the hands (range 60% - 90%), despite label claims of nine products indicating "kills 99.9% germs". The lowest performing product (~10% efficacy) was the product that failed kill curve assay. The other two low performing products included the product containing undisclosed quantity of IPA and the product labeled as "contains IPA and ETA 75% v/v". The findings highlight the need for stringent regulation of the quality of the hand sanitizers in the local market.

Keywords: Antibacterial efficacy, Hand hygiene, Hand sanitizers, Kill curve assay, thumbprint method