

EXECUTIVE SUMMARY

BACKGROUND AND MOTIVATION

Hand washing has been promoted for decades as an effective strategy to prevent the spread of infectious disease (Larson *et al.*, 2003). It does not only assist in minimizing the risk of person-to-person transmission in hospital environments but also plays an important role in preventing the spread of disease via water and food and during food preparation. A number of studies have been conducted to determine the role of various factors on the efficacy of hand washing (Montville *et al.*, 2002). Factors that have specifically been addressed in poor developing communities include the initial level of contamination, the type of rubbing agent used (soap, mud or ash), the source of the water used for rinsing and the procedure followed during the drying of the hands (Hoque *et al.*, 1995). The degree to which the quality of the water used for hand washing contributes towards hand hygiene has not previously been addressed. This is a very important issue for households and health care facilities that do not have access to safe water.

OBJECTIVES OF THE PROJECT

The scope of this project was to investigate the extent to which the quality of water used for hand washing affects the outcome of the hand washing process. The specific aim of the study was:

- To determine whether water of varying quality in combination with the use of soap and drying could result in a reduction of the level of bacteria on the hands of volunteers.

RESEARCH APPROACH

The study was conducted in the laboratory to ensure the easy comparison of treatments. The hands of participants were initially spiked with *E. coli* and were thereafter subjected to different washing procedures using water of different quality. Three washing procedures were followed. The first only involved washing (rinsing) the hands and the second procedure involved washing the hands with a normal bar of body soap and rinsing it afterwards. The last procedure was identical to the second procedure but it was followed by drying of the hands on paper towel. Each experiment was repeated 10 times.

The hand washing procedures were repeated 4 times using water of different quality. For the study normal tap water, tap water spiked with *E. coli* to a level of 10^3 CFU / ml (Medium), tap water spiked with *E. coli* to a level of 10^6 CFU / ml (High), and naturally contaminated water collected from a stream in a rural area of the Limpopo Province, were used. The level of bacteria on the hands of the participants was determined using the modified glove-juice technique and the Colilert system for the enumeration of *E. coli*. An Anova one-way of analysis was performed to determine differences between treatments at the 5% level of significance.

SUMMARY OF MAJOR RESULTS AND CONCLUSIONS

None of the procedures using highly polluted water (10^6 *E. coli* / ml) for hand washing resulted in an improvement (decrease) of the bacterial load on the hands. When drying was applied, the level of bacteria was similar to that of the untreated control whereas for the other two treatments the bacterial levels even increased.

Overall there was very little difference between the outcomes of the different treatment procedures when moderately spiked water (10^3 *E. coli* / ml), natural water from a rural stream, or tap water were used. All the procedures involving the use of water with moderate to low levels of contamination showed a significant improvement when compared to the control. The use of soap did not decrease the bacterial load substantially when compared with only rinsing the hands. In all cases the procedure that included the drying of the hands showed the largest reduction in the bacterial load. This procedure resulted in at least a two log reduction in the bacterial load on the hand of participants.

This study showed that hands with a high bacterial load can be washed with water of even moderate contamination levels but that highly polluted water would not be suitable. Little difference was noted between the procedure of only rinsing the hands with water and that of washing the hands with soap. The best reduction in bacterial levels on hands was achieved when the full procedure of washing with soap followed by the physical drying of the hands was followed.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future research should address the issue of whether the suitability of water to be used for hand washing is dependant on the bacterial load of the hands to be washed.