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MEASURING THE EFFECTIVENESS OF FINGERTIP WASHING

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Introduction

The Hospitality Institute of Technology and Management conducted an inoculated finger washing experiment to evaluate the effectiveness of ordinary hand washing compared with the double hand wash.

Method

High levels of an indicator organism, *Serratia marcescens*, were placed on the thumb and first and second fingers of the hands of three people. One-tenth milliliter (0.1 ml) of a solution containing 20,000,000 to 100,000,000 *S. marcescens* per ml. was placed on the fingers and thumb. The subjects then washed their hands using selected experimental procedures in order to evaluate the reduction of *S. marcescens*. The population of *S. marcescens* was measured at each step by rubbing together and rinsing the thumb and first two fingers in 10 ml of phosphate buffer.

Results and Discussion

The first hand wash procedure tested (Table 1, Item 1) was a simple 13-second hand wash, whereby the hands were soaped, lathered, and during the lathering, rinsed underneath a faucet of flowing water. There was a reduction of 325 to 1 (a 99.7% reduction). The volume of water used for rinsing the hands, not the time of the wash, was the critical reduction factor.

Table 1. Log Reduction Values of Bacteria on Fingertips and Thumbs as Affected by Washing Method

Treatment	Average Log Reduction Value	Lowest Log Reduction Value	Highest Log Reduction Value	Standard Deviation
1. Soap, lather, rinse (<i>Serratia</i>)	-1.7779	-0.958	-2.5978	0.8199
2. Brush, wash (<i>Serratia</i>)	-4.6299	-3.5544	-5.7054	1.0755
3. 2nd wash, (<i>Serratia</i>)	-5.2874	-4.4294	-6.1454	0.8580
4. Brush (<i>Serratia</i>)	-5.6835	-5.2144	-6.1526	0.4691
5. Wash, no brush (APC)	-2.5188	-1.4304	-3.6072	1.0884
6. Brush, wash (APC)	-0.4077	0.0505	-0.8659	0.4582
7. 2nd wash (APC)	-0.5161	-0.0803	-0.9519	0.4358
8. Brush (APC)	-2.1492	-1.3376	-2.9608	0.8116

When the hands were washed according to the double hand wash procedure using a fingernail brush and soap, the total time was about 20 seconds for the entire washing process, including the

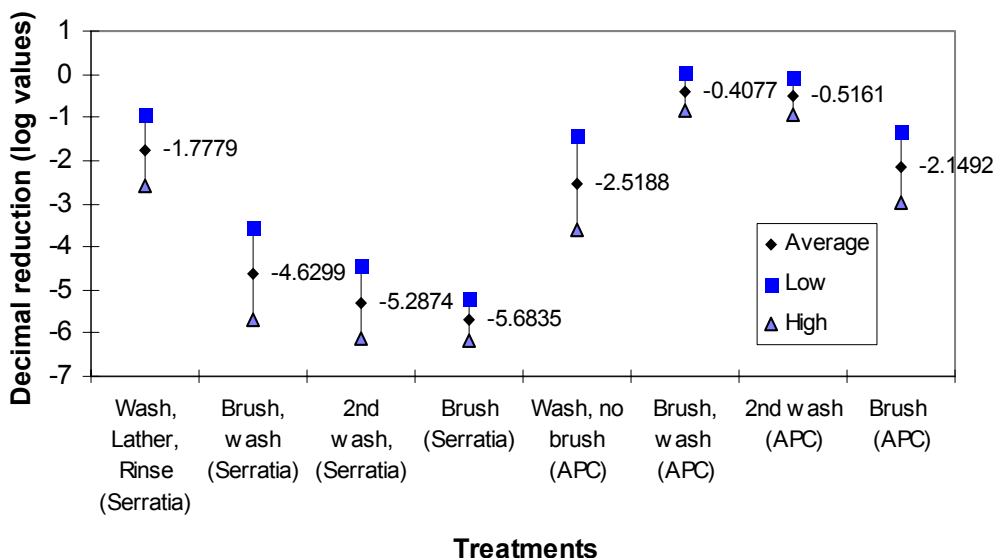
time necessary for soap removal. The first wash with the nailbrush (Table 1, Item 2) reduced the *S. marcescens* indicator organism by a factor of 62,000 to 1 (a 99.998% reduction), or 200 times more than the simple, single hand wash without a nailbrush. The second hand wash without the nailbrush (Table 1, Item 3), which took approximately 13 seconds, reduced the indicator organism from 120,000 to 1 (a 99.999% reduction), or 320 times more than a simple hand wash.

In order to determine the residual population of *S. marcescens* remaining on the fingernail brush, the brush (Table 1, Item 4) was rinsed in 10 ml of phosphate buffer. Compared with the population reduction on the fingers, there was a reduction of 418,000 to 1 (a 99.9998% reduction) on the brush. This points out that the nailbrush will have fewer residual microorganisms than the fingertips. Those residual microorganisms remaining on the brush could be transferred to the next person using the nailbrush. However, there will be another 99.98% reduction when that person uses the nailbrush for hand and fingertip washing. Therefore, the potential for transfer of microorganisms by the nailbrush is minimal. Doorknobs, soap dispenser levers and paper towel dispenser levers probably have a greater potential for cross-contamination than the common use of a nailbrush for hand washing.

The normal resident microflora (skin bacteria) of the hands were also measured as aerobic plate count (APC) each time the fingers were rinsed in the phosphate buffer. No matter how many times the hands were washed, a population of skin bacteria ranging from 10,000 to 1,000,000 per ml. were recovered from the subjects' fingers and thumbs (Table 1, Items 5, 6, and 7). This confirms findings of previous hand wash studies of the past 50 years that it is virtually impossible to remove all microorganisms from the skin. Table 1, Item 8 indicates the log reduction of aerobic plate count on the nailbrush.

The data from this fingertip washing study are shown in the Figure 1.

Figure 1. Effectiveness of Fingertip Washing



hands.xls
chart 2(2)

Conclusion

The double wash method using a nailbrush on the first wash provided an average reduction of 194,000 to 1 or a -5.2874 log reduction. This is greater than a 99.999 reduction.