CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J1802

Project Title
How Clean ARE Your Hands?

Abstract

Objectives/Goals
My objective was to determine which of five hand cleaning agents (water, bar soap, antibacterial soap, hand sanitizer, or isopropyl alcohol) would be the most effective at removing bacteria from human hands via washing.

Methods/Materials
First, a control group was established: the subject washed his hands with each of the five cleansers; after each washing, the subject touched the agar in a specifically labeled Petri dish. Within the control group, there was a control dish in which the subject touched the agar without washing his hands. Four other groups were created in which common environmental bacteria was introduced; after each washing, but before touching the agar, the subject would, in turn, touch someone else#s hand, his eyes, a cell phone or a sandwich. Again, each group had a control dish in which the subject did not wash hands but handled the object then touched the Petri dish. After 7 days, the percentage of each Petri dish filled with bacteria was determined based on the equation Area of a circle = Pi x r2. Then, the average percentage of the Petri dishes covered by bacteria, grouped according to each hand cleanser, was calculated and compared.

Results
Antibacterial soap was the most effective in removing bacteria, with an average of 20.21% of its Petri dishes covered in bacteria. The least effective cleaner, hand sanitizer, had 23.97% coverage, 3.78% less than antibacterial soap. The control group, in which hands were NOT washed, had less bacterial coverage than the water and hand sanitizer groups.

Conclusions/Discussion
The data suggests that, when it comes to removing bacteria from hands, there is not a significant difference between one cleanser and another, or even between washing or not washing hands. The former conclusion indicates that the consumer needs to be aware of advertising hype. For example, as the hand sanitizer seems to add rather than remove bacteria from one's hands, the consumer using this product will have a false, even dangerous, sense of security. The latter conclusion, that washing or not washing one#s hands makes little significant difference, seems counter-intuitive; more experimentation needs to be done on this matter. Perhaps a study could be conducted with five families, who are each assigned a different hand cleaner, and one 'control' family, who doesn't wash at all; these families could be tracked over a period of two months to see how often they get sick.

Summary Statement
My project is about the bacteria-removing capabilities of water, bar soap, antibacterial soap, hand sanitizer and isopropyl alcohol.

Help Received
Father helped to convert hand-drawn graphs to computerized graphs and helped with formatting report.