



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Aislin Warkentin</b>	<b>Project Number</b> <b>J1918</b>
<b>Project Title</b> <b>What Is the Best Way to Disinfect a Toothbrush?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> The objective of this study was to determine the best way to disinfect a toothbrush. I compared five different disinfection techniques (salt water, mouthwash, ultra-violet toothbrush sanitizer, hot water, and 3% hydrogen peroxide) to determine which disinfection method killed the most bacteria on a toothbrush.</p> <p><b>Methods</b> I brushed my teeth with 10 new toothbrushes for 4 days. Toothbrushes (2 each) were labeled for the 5 disinfection methods (salt water, Crest ProHealth Mouthwash, ultra-violet toothbrush sanitizer, hot water, 3% hydrogen peroxide). I used sterile swabs soaked in distilled water to swab toothbrushes and transfer bacteria to LB agar plates. I then used sterile inoculating loops to spread bacteria over the agar plates using the four-quadrant streaking technique. I labeled these agar plates B1-B10 (before disinfection toothbrushes 1-10). I then disinfected each toothbrush for 5 minutes according to its assigned disinfection method. I used the same techniques to swab the toothbrushes after disinfection using new agar plates labeled A1-A10 for after disinfection. Each toothbrush had a before disinfection and after disinfection agar plate. All agar plates were sealed with tape and placed in an incubator for 48 hours (Kaiser Permanente Lab) to allow bacterial growth. After incubation, I took pictures of all agar plates and used the pictures to count the number of bacterial colonies that formed. I used the before and after disinfection counts to determine the % reduction of bacteria for each disinfection method for comparison.</p> <p><b>Results</b> Trial #1 showed hydrogen peroxide and mouthwash both eliminated 100% of bacteria, hot water reduced bacteria by 71%, UV toothbrush sanitizer 31%, and salt water 16%. Trial #2 showed hydrogen peroxide and mouthwash again eliminated 100% of bacteria, followed by hot water (79%), UV sanitizer (34%), and salt water (12%).</p> <p><b>Conclusions</b> My hypothesis was that the UV toothbrush sterilizer would reduce the most bacteria on a toothbrush, but averaged results for trials #1 &amp; #2 showed Hydrogen Peroxide and Mouthwash (Crest ProHealth) both reduced the most bacteria (100%), followed by hot water (75%), UV Toothbrush Sanitizer (33%), and Salt Water (14%). Brushing teeth with clean toothbrushes may help to decrease illnesses and/or dental diseases. Cleaning toothbrushes may also be beneficial for people with suppressed immune systems by decreasing their exposure to large amounts of bacteria found on toothbrushes.</p>	
<b>Summary Statement</b> This research project showed that the best way to disinfect a toothbrush is to soak it for 5 minutes in either hydrogen peroxide 3% or mouthwash (Crest Pro Health). Both methods showed no bacterial growth after disinfection.	
<b>Help Received</b> Charleane Salvador-Abat, M.S., CLS / Kaiser Permanente Lab - Charleane provided supervision in the lab & taught me how to streak an agar plate. Kaiser Permanente allowed me to use their lab, some supplies (gloves, inoculating loops, etc.), incubator, and disposed of my agar plates in their biohazardous waste	