



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) William C. Mrdjenovich	Project Number J2015
Project Title Sound Hygiene: Is an Ultrasonic Toothbrush More Effective at Killing Bacteria?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this experiment was to find out which toothbrush performs the best by observing bacterial growth rates before and after brushing for multiple age groups.</p> <p>Methods/Materials Working with 3 test subjects, ages (13, 50, and 59) using 9 prepared Petri dishes per experiment each trial included 3 full experiments. Each experiment collected morning samples before eating or brushing and exposed 1 Petri dish per subject. Each subject then brushes with assigned toothbrush and 2 oral collections were taken and 2 Petri dishes per subject are exposed to post-brushing collections. Each experiment was observed and digital photos taken every 24 hours for 3 days. The experiment repeats 2 more times rotating the brush selection between test subjects so each trial collects data on each subject using each brush. 3 full trials were completed. OpenCFU(c) software was used to count colonies and provided data for comparison. 81 sterile cotton swabs and sterile Petri dishes with nutrient agar; 1 closable container to store exposed Petri dishes in darkness; 1 Emmi-Dent# Ultrasonic toothbrush with 3 heads; 1 tube of Emmi-Dent# Nanobubble toothpaste; 1 Sonicare# toothbrush with 3 heads; 1 manual (hand-held) toothbrush ; 1 tube of Colgate toothpaste; High resolution digital camera, computer, and colony counting software; Gloves for hand protection, tape to seal Petri dish and Sharpie to label.</p> <p>Results The Emmi-Dent(R) ultrasonic toothbrush was least effective at killing bacteria while the Sonicare(R) toothbrush, that used vibrations, killed the most bacteria. The Emmi-Dent(R) ultrasonic on average had a 9.17% colony loss, the Sonicare(R) toothbrush on average had a 21.08% colony loss, and the Manual toothbrush on average had a 10.07% colony loss.</p> <p>Conclusions/Discussion The Sonicare(R) toothbrush was the most effective at killing bacteria for each age group. By safely increasing intensity of the Emmi-Dent(R) ultrasonic toothbrush it might be able to destroy more bacteria. Combining the Emmi-Dent(R) ultrasonic toothbrush with vibration would make a more effective toothbrush. It was also noticed that each test subject had a different toothbrush that was most effective for them. The Manual toothbrush worked best for the 50 year old, the Emmi-Dent(R) ultrasonic toothbrush worked best for the 59 year old and the Sonicare(R) toothbrush worked best for the 13 year old.</p>	
Summary Statement This project compares an ultrasonic toothbrush against an electronic toothbrush using vibration and one that is hand-held to investigate how effective ultrasound is at killing bacteria.	
Help Received Science Teacher: Mrs. Elaine Gillum provided support during this experiment and helped the researcher decide on what direction to pursue. Jamie Curtis (mom) and Charles Mrdjenovich (Dad) both participated in this experiment as test subjects and purchased required materials.	