



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> <b>Julia Hennrikus; Christina McKoane</b>	<b>Project Number</b> <b>J1815</b>
<b>Project Title</b> <b>Which Mouthwash and Ingredients Are Most Effective at Inhibiting Oral Bacteria?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Determine which mouthwash/ingredients and concentrations are the most effective at inhibiting oral bacteria.</p> <p><b>Methods/Materials</b> We melted Nutrient Agar, collected our saliva and injected 0.25ml of saliva into each tube. The mixed agar/saliva was poured into sterile Petri dishes. Color-coded discs were dipped into 1 of 6 mouthwashes and placed on the surface of the agar plus a water control. The plates were observed at 24, 48, 72 hrs. At 72 hours the clear zone around each disc was measured. We performed 3 trials with newly bought mouthwashes, a total of 30 experiments, and found the average zone of bacterial clearance for each mouthwash.</p> <p><b>Results</b> Peroxyl is the most effective mouthwash at inhibiting oral bacteria, 19.5 mm average zone of bacterial clearance. Scope and Listerine tied for 2nd place with an average zone of 12.6mm and 12.8 mm. Crest was 3rd with an average zone of 9.4mm. Act performed poorly with an average zone of 7.8mm and AntiPlaque performed the worst with an average zone 4.2mm. Bacteria grew over the water disc 100% of the time.</p> <p><b>Conclusions/Discussion</b> Peroxyl, the only mouthwash with H<sub>2</sub>O<sub>2</sub> did not perform well in the 1st trial, zone of inhibition 6.9mm, similar to antiplaque with a similar alcohol concentration but performed exceedingly well in the 2nd and 3rd trials, 28.3mm inhibition zone, when the expiration dates were 1½ yrs, rather than ½ yr. We conclude that our 1st bottle of Peroxyl was old and spontaneously converted to H<sub>2</sub>O and only its alcohol 6% was effective in the first trial. (H<sub>2</sub>O<sub>2</sub>) + light/heat → 2H<sub>2</sub>O + O<sub>2</sub>. Scope and Listerine have the highest alcohol content, 15% and 21.6%, Anti-Plaque 8.7%, so it appears that for alcohol to be effective, it must be 15% or higher. Crest performed fair with only cetylpyridinium 0.07%. Scope and ACT also had cetylpyridinium, but no conc. listed, so at a lower concentration than Crest. Cetylpyridinium 0.07% is fair at inhibiting growth, but at higher concentrations it stains the teeth brown. The performance of Listerine is due to the high alcohol content and possibly a minor contribution from Thymol. Sodium benzoate and benzoic acid are major components in ACT and AntiPlaque which performed poorly. They do not appear to be major contributors to bacterial inhibition, perhaps because they need very acidic conditions, pH 3.6 to be effective, whereas our mouths' pH is 6.2-7.0. Sodium lauryl sulfate, found only in AntiPlaque also does not appear to be a very strong bacterial inhibitor.</p>	
<b>Summary Statement</b> We measured the diameters of bacterial clearance on nutrient agar around discs soaked in different mouthwashes to determine which mouthwash and its ingredient is most effective at inhibiting oral bacteria.	
<b>Help Received</b> mother helped type report and order nutrient agar supplies	