



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

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| <b>Name(s)</b><br>Christina Zhu  | <b>Project Number</b><br><b>S1423</b> |
| <b>Project Title</b><br><b>The Effect of Concentration of Fluoride in Saliva on the Remineralization of Hydroxyapatite</b>   |                                       |
| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>What is the effect of the concentration of fluoride in saliva on the remineralization of hydroxyapatite? My objective is to find the optimal concentration of fluoride to restore minerals to teeth without causing fluorosis.</p> <p><b>Methods/Materials</b><br/>A. Demineralize teeth by placing in 3M HCl.<br/>B. Place 3 teeth in 3 separate beakers with calcifying solutions (containing calcium, phosphate, and carbonic acid) with no fluoride (control group) for 30 minutes.<br/>C. Acid-base titration of phosphate ion with nitric acid.<br/>D. EDTA titration of calcium ion.<br/>E. Repeat steps B-D with 1.6 ppm, 21.6 ppm, and 41.6 ppm sodium fluoride.<br/>F. Independent variable: concentration of fluoride; dependent variable: amount of calcium and phosphate ions taken up by teeth; 3 trials each for 0 ppm, 1.6 ppm, 21.6 ppm, and 41.6 ppm fluoride.</p> <p><b>Results</b><br/>As the concentration of fluoride increased, the concentration of calcium ion remaining decreased, meaning more calcium ion was taken up by the teeth. At 0 ppm and 1.6 ppm fluoride, calcium was actually lost from the teeth, while calcium was restored to the teeth at 21.6 and 41.6 ppm fluoride. The phosphate ion titrations were unclear and inconclusive. Fluorosis was observed as white spots, more common on dentin than on enamel, at 21.6 ppm and 41.6 ppm fluoride. At 1.6 ppm, teeth were white, but did not show signs of fluorosis. At 0 ppm fluoride, demineralization from the HCl was still evident as faint pink/orange erosion.</p> <p><b>Conclusions/Discussion</b><br/>Fluoride does indeed have an effect on the remineralization of the hydroxyapatite mineral in teeth. In this experiment, the optimal concentration of fluoride was 1.6 ppm, because remineralization was visible from the lack of pink/orange erosion, and fluorosis did not occur. At certain concentrations, fluoride is beneficial, but higher concentrations can cause fluorosis.</p> |                                       |
| <b>Summary Statement</b><br>The experimenter sought to discover the optimal concentration of fluoride in saliva to restore minerals to teeth.  |                                       |
| <b>Help Received</b>   |                                       |