CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Vivian C. Yang

Project Number
J1739

Project Title
Which Soft Drink Is the Best to Support Dental Bacteria to Grow?

Abstract

Objectives/Goals
Previous studies showed that soft drinks are harmful to the teeth because of their high sugar content and acidity that may cause the enamel of the tooth to erode. However, whether soft drinks could also support the growth of harmful dental bacteria remains unclear. In this study, I tested the following hypotheses: (1) the common soft drinks can support human dental bacterial growth in the test tube; and (2) the sugar content in the soft drinks is highly correlated with its ability to support dental bacteria growth.

Methods/Materials
The human dental bacteria were obtained using clean toothpicks, which were placed in the test tubes containing 5 ml of the soft drink (Coke, Diet Coke, Coke Zero, Pepsi, Fanta, Dr.Pepper and Gatorade) supplemented with 2 ml of Luria Broth (LB) (containing the essential nutrients) to mimic the dental environment. The tubes were shaken in an Incubator-Shaker at 37oC for 24 hours. The bacteria culture was then diluted 1:1000 in LB solution, and 0.1 ml of the diluted culture was spread onto an LB agar plate. The plates were placed in a 37oC incubator for 24 hours to allow the bacteria to grow into visible colonies. The number of the colonies was counted and the original bacteria concentration was calculated. The bacteria count for each soft drink culture was then correlated with the nutritional values and measured PH of the soft drink.

Results
The study showed that Gatorade is the best to support dental bacteria growth in the test tube condition (2.95 million/ml), followed by Coke (1.87 million/ml), Pepsi (270K/ml) and Diet Coke (60K/ml). Coke Zero, Fanta and Dr.Pepper did not support any bacteria growth. The correlation analysis revealed that sodium is the only factor that is highly correlated with the ability of the soft drink to support dental bacteria growth in the test tube.

Conclusions/Discussion
This study confirmed my hypothesis that certain soft drinks can support human dental bacteria growth in the test tube. It also revealed a surprising result that the sodium rather than the sugar content in the soft drinks is highly correlated with its ability to support dental bacteria growth. Future studies should directly test the possibility that sodium addition to the soft drinks can enhance their ability to support dental bacteria growth in the test tube. Such studies may help to develop future "tooth-friendly" soft drinks for all of us.

Summary Statement
The study reveals that certain soft drinks can support human dental bacteria growth in the test tube and the sodium rather than the sugar content of the soft drinks is highly correlated with its ability to support dental bacteria growth.

Help Received
My father taught me lab techniques, Dr. Xiao-Hong Lu at UCLA helped me in the correlation studies, and I used lab equipment at UCLA under the supervision of my father and Dr. Lu.