



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

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Project Title The Effect of Temperature on the Decay of Ascorbic Acid	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals It is imperative that humans receive the recommended daily value of ascorbic acid (vitamin C), but individuals are receiving a reduced amount because vitamin C decomposes through time. The purpose of this experiment was to determine the effect of temperature on the ascorbic acid (AA) rate of decay in oranges, vitamin C tablets, and orange juice. If the AA content of these samples are tested individually in 3 temperature environments (heated, cold, and room temperature) then the environment that causes the greatest amount of AA decay can be determined.</p> <p>Methods/Materials The concentration of AA was measured in 3 sets of oranges, orange juice, and vitamin C tablet solutions. The concentration of AA was determined by comparing the reaction of the sample to a solution of vitamin C having a known AA concentration, the control. To measure the AA concentration of a liquid, 5 drops of the liquid was placed into each of the 3 wells in a microplate. Two drops of a liquid starch solution was added to each of the 3 wells. An iodine solution was added, one drop at a time, to each well until the starch indicator in the liquid turned and stayed blue for at least 15 seconds. The samples were placed into the 3 temperature environments. The AA concentration of each sample was measured every 24 hours for 6 days.</p> <p>Results The AA in the samples placed in the heated environment decomposed at the highest rate. The total average AA rate of decay in the heated environment for 18 days of experimenting was 10% loss/day. The ascorbic acid in the sample placed in the refrigerated environment decayed at the lowest rate. The total average AA rate of decay in the refrigerated environment was 3% loss/day. Of the 3 materials tested, the vitamin C tablet solution had the highest AA rate of decay, and the orange juice had the least. The total average ascorbic acid rate of decay in the vitamin C solution for 18 days of experimenting was 8% loss/day. The total average ascorbic acid rate of decay in the orange juice was only 3% loss/day.</p> <p>Conclusions/Discussion The vitamin C tablet solution retained the least AA, and the orange juice retained the most AA. Samples placed in the heated environment had the greatest AA rate of decay, and the samples in the cold environment had the lowest AA rate of decay. The findings of this experiment verify that vitamin C is an unstable chemical compound that is degraded when exposed to elevated temperatures.</p>	
Summary Statement The purpose of this experiment was to determine the effect of temperature (ranging from 2 to 45 degrees Celsius) on the ascorbic acid rate of decay in oranges, vitamin C tablets, and orange juice.	
Help Received	