



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Anchit Narain</b>	<b>Project Number</b> <b>J0516</b>
<b>Project Title</b> <b>Enzyme Catalyzed Reactions: What Affects Their Rates?</b>	
<b>Objectives/Goals</b> To test the enzyme count in raw and cooked vegetables as a means to determine which of the two is healthier for human consumption.	
<b>Abstract</b> <b>Methods/Materials</b> 1. Five 100 mL beakers were labeled with their specific temperatures of 0, 10, 20, 30 and 40°C and each contained 80 mL of 1% Hydrogen Peroxide. In a blender, 50 grams of fresh peeled potato, 50 mL cold water and crushed ice were blended together to act as a sufficient 100% enzyme solution. Five other 100mL beakers were labeled with the same temperatures and contained 100mL of the fresh peeled potato catalase. These beakers were either heated or cooled to reach their specific temperatures.  2. The catalase was experimented at the five different temperatures. 5 cut cotton disks, each 1cm in diameter were individually dipped in the catalase mixture for two seconds and then transferred into the 1% hydrogen peroxide beakers. The time taken for each cotton disk to rise to the top of the beaker was recorded on a chart. This was done for each of the five disks (at each temperature).	
<b>Results</b> As the temperature increased, so did the speed with which the cotton moved to the top of the beaker. However, beyond a certain temperature, the heat started to break down the enzymes, thus denaturing them. At 40 Deg.C, there were no movement as the enzyme had denatured. The rate of reaction increased from the 80% potato catalase mixture during the 100% catalase mixture trial. Also, hydrogen peroxide concentration contrasted the results. At 10% H <sub>2</sub> O <sub>2</sub> , the chemical reactions were too fast to record. At 1% H <sub>2</sub> O <sub>2</sub> , the enzyme denatured at 40°C, began to slow down at higher temperatures, and the speeds were between 8-23 seconds. This supported my hypothesis because after 20°C, the fastest period of acceleration, the speed began to decline.	
<b>Conclusions/Discussion</b> In conclusion, I state that the ideal cooking temperature to keep the most enzymes intact is 20°C. However, this would mean that that eating raw food is healthier than eating cooked food. Temperature and the concentration of the substrate molecules affect enzyme acceleration. The hypothesis that too much additional temperature could harm enzymes is therefore correct. To lead a healthier lifestyle, eat raw vegetables as they keep the most enzymes intact.	
<b>Summary Statement</b> The project describes the effect of temperature on enzyme activity	
<b>Help Received</b> Used lab equipment at Granite Ridge Intermediate School under supervision of Ms. Lindstrom; Father helped upload application form	