



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> Nathalie Gaudefroy; Melody Wang	<b>Project Number</b> <b>S1406</b>
<b>Project Title</b> <b>Effects of Cooking Processes on Vitamin C Levels and Anti-Cancer Properties</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> To determine how various cooking processes (such as microwaving, steaming, and boiling) effect the ascorbic acid levels and anti-cancer properties of green bell pepper and which method has the highest percent inhibition.</p> <p><b>Methods/Materials</b> We had 3 test groups: 100g boiled pepper(for 15min.), 100g microwaved pepper(for 15min.)and 100g steamed pepper(for 15min.). Our control: 100g raw pepper.10 peppers were cut,the white interior and seeds were removed, then randomly mixed. We blended our control and test groups with 50ml of water then filtered out each pepper mixture into a flask. Experiments conducted: titration process,(to develop an equation which indicates amount of ascorbic acid/test group)and a sea urchin assay(determines which test group would have the highest percent inhibition). Our base for the titration was made mixing 0.6g Iodine crystals, 0.6g Potassium iodide, 50 ml Ethanol, and 50 ml water. For our solution we used:10 mg ascorbic acid and 5 mL of starch solution,(2.5 teaspoons cornstarch and 50ml boiling water). Extracts were evaporated under a vaccum then sperm and eggs were collected from sea urchins (by injection of potassium hydroxide)fertilized embryos formed by mixing sperm and eggs. The same dose of extracts were added to fertilized embryos and put into a water bath. 1 mL of the control was taken(to see if embryos completed first division and were in the 2-cell stage) and number divided and undivided cells were counted from each 1 ml test group.</p> <p><b>Results</b> According to our graphs the raw test group reached 100% inhibition with the least amount of pepper,(0.5g/ml), where as boiled was the least potent; one would need to consume about 4 times more of boiled peppers than raw peppers. There was a direct correlation between the amount of AA (mg) and amount of iodine needed to react with each pepper extract. Microwaved pepper ended up having the least amount of water (0 mL), whereas the steamed, raw, and boiled test groups all retained 25 mL. Steamed test group retained more nutrients than boiled, because around 30% of water-soluble vitamin C was lost compared to 70%.</p> <p><b>Conclusions/Discussion</b> Our raw data exemplifies our hypothesis and theory are correct: there is a direct correlation between cooking processes and vitamin C levels. It's best to not cook a pepper in order to maintain the most ascorbic acid, and anti-cancer properties.</p>	
<b>Summary Statement</b> We had to undergo a series of tests which enabled us to determine the most effective cooking process for retaining vitamin C and anti-cancer properties of green bell peppers.	
<b>Help Received</b> Laura Mydlarz, our mentor, helped us organize our procedures and data. Under her supervision, she let us use her lab in UCSB as our workplace for these tests. She also infused us with her knowledge on the subject of percent inhibition and other terms.	