



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Christopher R. Barry	Project Number J1404
Project Title The Prevention of Crown Galls (Plant Cancer) in Plants	
Abstract	
Objectives/Goals HYPOTHESIS: I think that if I add antioxidants and nutritional supplements to the soil of germinating plants, then some, if not all of the plants will develop a resistance to crown galls (plant cancer), caused by Agrobacterium tumefaciens.	
Methods/Materials PROCEDURE: I planted my sunflower and bean seeds. Since the sunflower seeds didn't germinate, my experiment was done only on the bean seeds. I had a total of six pots. They included a pot for each plant watered with beta-carotene, lycopene, vitamin E, vitamin C, all of these nutrients combined, and my control, water only. I watered once every day with a solution of 150mL of water and a pulverized antioxidant. The only time I didn't water was when the soil remained moist from the previous day. For several weeks I followed this procedure, noting the growth of the plants. When the stalks were tall and strong enough, I exposed the plants in all six pots to the Agrobacterium. I did this by using the hypodermic needle to scrape away a small portion of the outer layer of cells on the stalk. I dipped one of the sterile swabs in the vial of Agrobacterium, and swabbed the open wound with the culture. I then watched for the formation of crown galls. MATERIALS: I used potting soil, 6 clay pots, sunflower and bean seeds, and an indoor plant light. I used a vial Agrobacterium tumefaciens, the sterile cotton swabs, and a hypodermic needle. I bought vitamin C tablets, the vitamin E capsules, the beta-carotene tablets, and the lycopene tablets. Household items used include a Pyrex measuring cup, a hammer (to pulverize the tablets), a spoon, paper towels, tap water, a fine finishing nail (to pierce the vitamin E capsules), and a camera to record visually the progress of my project.	
Results RESULTS: Crown gall growth was found in some plants. In addition, the type of antioxidant or vitamin supplement affected the rate of growth of the plant.	
Conclusions/Discussion CONCLUSION: My hypothesis was correct since some of the plants developed crown galls. These include the plants watered with lycopene, the plants watered with vitamin E, and the control plants. Galls didn't develop on the plants watered with beta-carotene, the plants watered with vitamin C, or on the plants watered with all of the nutrients. In addition, the most rapid plant growth was with the lycopene, beta-carotene, and vitamin E.	
Summary Statement My project studies the use of certain antioxidants in the prevention of cancer (caused by Agrobacterium tumefaciens) in germinating and developing bean plants.	
Help Received 4. My mother, Coleen Barry, who spent many hours assisting me and driving me to various locations to procure the necessary items needed for my project. She also taught me how to do footnotes on my research paper.	