



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

Name(s) Anjini Karthik	Project Number J1719
Project Title Green Pharmacy: The Antimicrobial Effect of Spices and Herbs	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals We are currently facing a major medical crisis: antibiotics are becoming less effective as bacteria are developing resistance to them. I wanted to find if natural alternatives like spices and herbs may help by killing food-borne pathogens. My project tested if spices and herbs had antimicrobial properties, and if they did, how effectively they "cleaned" our food. I hypothesized that each spice or herb would partially inhibit bacterial growth, and the amount of inhibition would depend on the spice or herb.</p> <p>Methods/Materials I had ten spices and herbs: garlic, turmeric, black pepper, red pepper, cinnamon, cumin, oregano, coriander, ginger, and onion; I had a positive control of ampicillin and a negative control of sterile distilled water. I used the Kirby-Bauer disk-diffusion method to test my hypothesis. I swabbed E. coli on nutrient agar and placed filter paper disks impregnated with the test agent on it. Then I incubated all the plates and measured any zones of inhibition the next day. On my third trial I also tested three different dilutions of garlic. For my fourth and fifth trials, I tested the following combinations: garlic and oregano; garlic and turmeric; and onion and ginger. I added plain garlic as an additional control.</p> <p>Results Individually tested, garlic had the highest amount of inhibition, even after dilutions. It was followed by oregano, then cinnamon. Turmeric, black pepper, cumin, coriander, onion, and ginger all exhibited average inhibition, and red pepper showed the least. Combined, garlic and oregano had higher inhibition compared to garlic alone, while garlic and turmeric's combination had less. Ginger and onion combined had the least inhibition. For all trials, sterile distilled water had no inhibition, while ampicillin had complete inhibition.</p> <p>Conclusions/Discussion Since spices and herbs are plants, which can be infected by microbes, they have antimicrobial compounds called phenols. Almost every plant contains these, and that's why they all exhibited some inhibition, though in different amounts. Garlic had the highest inhibition because it has the special antimicrobial compound allicin in addition to other common phenols. This can help us in the real world in two ways: by eating spices and herbs, we are reducing our chances of infection from food-borne pathogens. If we don't get sick so often, we can reduce our use of antibiotics, keeping them effective.</p>	
Summary Statement My project intended to test if spices and herbs had antimicrobial properties, and if they did, then how effective they were, and to conclude if these could provide us the "green pharmacy", the natural alternative to antibiotics.	
Help Received I acknowledge my parents for driving me to the lab and my science teacher, Mrs. Nguyen, for her help and guidance throughout this project. I thank the Tech Museum for letting me use their Wet Lab, and lastly, a special thanks to Barry Starr, the microbiologist who supervised me in the lab.	