



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Varun R. Mandi	Project Number J1604
Project Title The Ancients' Answer to E. coli	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine which form of a natural, Ayurvedic cure, amongst cinnamon, garlic, pomegranate, and wasabi, is most effective against E. coli bacteria.</p> <p>Methods/Materials I boiled 23 gms of nutrient agar powder, in 1000 mL of water and poured the agar liquid into 40 petri dishes. I prepared the natural antimicrobial solutions, by adding 75 mL of bottled water to each natural product, (garlic, cinnamon, wasabi, pomegranate), and blended them to get 4 separate solutions. I placed a filter paper circle in each of the solutions, and let them soak for 10 secs. I then dipped a sterile cotton swab in the E. coli bacteria vial, and rubbed the swab over the agar surface in a triangular pattern. Next, I placed the soaked paper circles, in the center of the bacterial triangle and pressed down gently. I then covered, labeled and placed the petri dishes in the incubator, upside down for 2 days to allow bacteria to develop. After every 2 days, I recorded the distance from each side of the bacterial triangle to the centre of filter paper (3 side measures were recorded per dish). 10 petri dishes for each of the 4 natural solutions were used.</p> <p>Results Cinnamon solution proved to be the most effective natural cure to E. coli infection. On avg, the zone of inhibition with cinnamon measured 11.68 mm. With the garlic solution, an avg zone of 7.54 mm was formed to prevent bacterial growth, making cinnamon the most effective. The pomegranate solution measured an avg of 5.17 mm, making it third most beneficial and wasabi solution proved to be the least effective with an avg of 4.52 mm. The avgs were measured every alternate day and collected over a span of 6 experimental days.</p> <p>Conclusions/Discussion My hypothesis that cinnamon solution would be the most effective against E. coli, due to the cinnamaldehyde chemical was supported. Initially, cinnamon showed the most effectiveness, and tapered off towards the end. Through out the experiment garlic maintained an overall resistance and came 2nd. This knowledge possessed by ancient, herbal doctors proves extremely useful in today's world, given the recent E. coli O157:H7 breakouts, which killed many and caused trillion-dollar losses in trade. Residents of rural and remote areas who cannot afford antibiotics, now have herbal alternatives. Therefore, even though cinnamon is most effective, there are other natural ingredients which may be beneficial during an E. coli infection.</p>	
Summary Statement To determine which form of a natural, Ayurvedic cure, amongst cinnamon, garlic, pomegranate, and wasabi, would be most the effective against E. coli bacteria.	
Help Received ScienceTeacher (Ms Christina Fisher) provided tips and encouragement; EnglishTeacher (Mrs. Elena Diaz) instructed how to write research report and annotated bibliography; Mother helped with transport and obtaining supplies, as well as inspiration; fellow Classmates helped to accomplish tasks such as taking	