



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Nitish Lakhanpal	Project Number S1421
Project Title Turmeric: The Miracle Spice? A Study on the Anti-mutagenic Effects of Turmeric	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to examine the anti-mutagenic effect of turmeric or <i>Curcuma longa</i>, a ubiquitous spice of the Indian sub-continent whose use is thought to be responsible for the low cancer rate in the region. Specifically, is the effect of a known mutagen (4-nitro-o-phenylenediamine or 4-NOPD) - as measured by the number of revertant colonies of <i>Salmonella Typhimurium</i> (<i>Salmonella</i>) - mitigated due to the presence of turmeric?</p> <p>Methods/Materials Materials: Incubator; Thermometer; 9 glucose-minimal salts agar plates; 10 top agar tubes; Histidine dependent <i>Salmonella</i> in gel form; Histidine; Tryptic soy broth; Sterile Water; Isopropyl Alcohol; Parafilm; 4-nitro-o-phenylenediamine - 100 micrograms/mL (4-NOPD 100) and 200 micrograms/mL (4-NOPD 200) concentrations; Turmeric extract in water; Turmeric extract in alcohol. Adapted Ames test protocol: Melt top agar tube (3 mL), cool to 45° C, and pipette .3 mL of histidine and .15 mL of <i>Salmonella</i> culture (prepared earlier) into tube. Pipette 1 mL sterile water into tube and mix thoroughly. Pipette .2 mL of the mixture onto agar plate, making a small lake - repeat five times in separate areas. Seal plate and incubate for 48 hours at 37° C. Repeat preceding steps eight times, pipetting .2 mL each of the following into a top agar tube each time, in place of water: turmeric (water); turmeric (alcohol); 4-NOPD 100; 4-NOPD 200; 4-NOPD 100 and turmeric (water); 4-NOPD 100 and turmeric (alcohol); 4-NOPD 200 and turmeric (water); 4-NOPD 200 and turmeric (alcohol). After 48 hours, count the number of revertant colonies on plates.</p> <p>Results The number of revertant colonies due to 4-NOPD when either turmeric (water extract) or turmeric (alcohol extract) were present was much lower than with 4-NOPD alone. Further, the number of revertant colonies was almost zero for the negative controls while the positive controls showed many colonies, consistent with expectations.</p> <p>Conclusions/Discussion The data supported all four hypotheses. Turmeric appears to possess anti-mutagenic properties - we found that its presence mitigated the effect of a known mutagen. Turmeric (alcohol extract) had a stronger effect than turmeric (water extract) - the very small number of colonies indicate that the mutagen's effect was neutralized. The results indicate that turmeric has the potential to be used as a natural treatment for cancer or to prevent its onset.</p>	
Summary Statement This project examined the anti-mutagenic effect of turmeric or <i>Curcuma longa</i> . Specifically, I studied whether the presence of turmeric mitigates the mutagenic effect of a known mutagen on <i>Salmonella Typhimurium</i> .	
Help Received Parents helped with transportation and with buying materials.	