



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Namrata Nair	Project Number J1609
Project Title The Effect of Different Metal Nanoparticles on the Growth of E. coli	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this project was to find out which metal nanoparticle--silver, copper, or gold--could kill the most E. coli bacteria.</p> <p>Methods To conduct the experiment, a paper disc coated with either the silver, copper, or gold nanoparticle liquid was placed in the center of each Petri dish inoculated with E. coli. After 24 hours, the diameters of the zones of inhibition were measured; the zone of inhibition is the clear circle around the disc where bacteria does not grow due to the diffusion of the nanoparticles.</p> <p>Results The results showed that, as hypothesized, silver nanoparticles killed the most bacteria as the zone of inhibition was the largest. Gold nanoparticles killed the second-most, and copper killed the least. This is because silver cuts off the vital processes a bacterium needs to live, such as cellular respiration. However, gold's elemental properties make it naturally less reactive than other metals, and copper forms a layer of oxide material on its surface quickly, which hinders its antibacterial properties.</p> <p>Conclusions The results of this experiment suggest that silver nanoparticles are among the best choices as an antibacterial product. The results show that gold and copper are also effective against E. coli, even though they are not as effective as silver. Therefore, these nanoparticles, specifically silver, can potentially be used as antibacterial agents in oral products, textiles, wound dressings, biomedical devices, water purification, and as an alternative to antibiotics.</p>	
Summary Statement I tested the effects of silver, gold, and copper nanoparticles on E. coli bacteria, discovering that silver nanoparticles had the most effective antibacterial properties.	
Help Received My science teacher provided me with a bacteria incubator and instructed me on how to use it.	