



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Korbyn Turney	Project Number S2114
Project Title Effects of Silver Nanoparticles on Mortality Rates of Freshwater Microorganisms at the Arcata Marsh	
<p style="text-align: center;">Abstract</p> <p>Objectives Utilizing 12 different concentrations of silver nanoparticles in Arcata Marsh water, determine and measure the effects of silver nanoparticles on the mortality rates of 10 freshwater microorganisms.</p> <p>Methods Sciencebuddies.org provided calculations for creating 5 low concentrations of silver nanoparticles. I adapted the calculations to create 6 high concentrations of silver nanoparticles with 550 PPM colloidal silver. Daily observations were made to determine the effects of silver nanoparticles on Daphnia, Cyclops, rotifer, coleps, chlamydomonas, nematode, and diatoms populations over 3 weeks. An additional procedure developed during the experiment when hypotrichs, gastrotrichs, and vorticella had noticeable population changes. For those microorganisms, fresh Arcata Marsh samples were collected on three Sundays and observations were made to count the organisms in the fresh samples, the control, and in all the silver nanoparticle concentrations to determine the effects of silver nanoparticle environments on hypotrichs, gastrotrichs, and vorticella.</p> <p>Results In concentrations lower than 1 microgram/ml, mortality rates of diatoms, chlamydomonas, and nematodes increased slightly compared to those in the control. Rotifer and coleps mortality rates decreased in all concentrations of silver nanoparticles but stayed stable in the control. Daphnia and cyclops were most sensitive to silver nanoparticles with daphnia exterminated in concentrations at and above 2.5 micrograms/ml, and cyclops eradicated in concentrations at and above 5 micrograms/ml. Gastrotrich populations increased in the middle range concentrations, hypotrich populations increased in the higher concentrations to as high as 670 organisms in a 1 ml sample, and vorticella populations increased in the middle range of the low, and the middle range of the high concentrations.</p> <p>Conclusions This experiment supports that lower concentrations of silver nanoparticles entering the environment through landfill run-off will have little effect on the microorganism mortality rates in freshwater watersheds. Concentrations of silver nanoparticles introduced into the environment through situations including industrial waste will be detrimental to the equilibrium of the microorganisms in freshwater watersheds which will then affect the entire ecosystem and food webs that it supports.</p>	
Summary Statement Low concentrations of nanosilver introduced into freshwater watersheds have little effect on microorganisms while high concentrations akin to industrial waste skew populations of microorganisms which affect whole ecosystems.	
Help Received Perrin Turney helped to identify the freshwater microorganisms. Perrin Turney's input aided in developing the second procedure of the project to evaluate three microorganisms added to the study. Greta Turney helped take photos through the microscope and helped to collect samples and supplies.	