CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
J2203

Project Title
Not So Nano

Abstract

Objectives/Goals
The objective of the experiment was to find the effects of silver nanoparticles of various sizes on the CO2 production and cellular respiration of yeast cells.

Methods/Materials
Hot plates, Distilled water, 400 mL beakers, 1 L beaker, 200 mL beaker, Electric balance, Stirring rods, Weigh boats, Thermometer, 125 mL Erlenmeyer flasks, Vernier CO2 sensor and Logger Pro software, Gloves, Silver nitrate solution, Sodium citrate solution, Sugar, Budding Yeast, Goggles, Sharpie, Parafilm, Aluminum foil, Graduated cylinders, Timer

Results
To test the effect of the nanoparticles on eukaryotic cells and their processes of cellular respiration, active budding yeast will be used. To measure the effect of the nanoparticles on the yeast, the CO2 production will be measured within the reaction chamber in parts per million before and after the nanoparticles are added. If the nanoparticles slow down the increase of CO2, then the nanoparticles are disrupting the cell#s cellular respiration process. In measuring the amount of CO2 in the reaction chamber the effects of the silver nanoparticles can be pinpointed.

Conclusions/Discussion
My hypothesis proved to be correct in this experiment. The silver nanoparticles that are less than 20 nm in diameter had the most effect on the yeast#s cellular respiration. In testing the CO2 levels in parts per million, it was clear that the silver nanoparticles of the yellow, amber color were the most effective at slowing down the increase of CO2 levels of the yeast cells# respiration. Furthermore, I observed the effects of the silver nanoparticles in and of themselves and it is clear that they are extremely toxic to eukaryotic cells. In addition, by checking the silver nitrate and the sodium citrate that synthesized the particles I was able to pinpoint that silver as a whole has some antimicrobial effects.

Summary Statement
After measuring the CO2 production of yeast cells with the addition of silver nanoparticles, I found that silver nanoparticles about 20 nm in diameter had the most fatal effects on the yeast cells' respiration.

Help Received
The head of the advanced science program at Fairmont Preparatory Academy taught me how to use the software and synthesize the nanoparticles. She also allowed for me to use the high school's lab and lab equipment.