

Greater San Diego Science and Engineering Fair
2017 PROJECT SUMMARY

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Project Title: Antibiotics VS. Nanoparticles: A Year 2 Study

Objectives/Goals: The goal is to determine which of three combinations being tested will be the most effective in preventing the bacterial growth of E. coli, to find a successful alternative to antibiotics.

Hypothesis: It is predicted that the triple combination of neem extract, silver and carbon nanoparticles combination will kill and prevent the growth of at least 95% of the E. coli bacteria. It is believed that the double combination of silver nanoparticles and neem plant extract will kill and prevent the growth of at least 90% of the E.coli. It is hypothesized that the combination of the neem extract and the carbon nanoparticles will prevent the growth of at least 85% of the E. coli bacteria.

Methods/Materials: Methods such as diluting bacteria, preparing flasks, and transferring bacteria into flasks are necessary in order to conduct this experiment successfully. In addition, many materials will also be needed. Notebook and writing utensils, and safety equipment are basics. Neem leaves, Ethanol, filter, mixer and vacuum drier are needed for the neem plant extract. One liter of distilled water, 25 ml of lauria broth Powder, 1 ml of agar, Three different colors of tape to mark the flasks, syringe, mixing stick, and diluted bacteria (10x) are needed to prepare the flasks. A shaker (this is where the flasks will be for 24 hours), spectrophotometer (to calculate how much bacteria is left in each of the flasks, and cuvettes (for the spectrophotometer, in order to help get the results) are needed in order to obtain the results.

Results: With 3 mL of the neem and silver combination, the amount of bacterial growth prevented was 99%, a very significant number. Using 3 mL of the carbon and neem, the amount of bacterial growth prevented was 94%. When using 3 mL, the amount of bacterial growth prevented was 93.2%, which was an increase from the previous amount prevented for the triple combination.

Conclusions/Discussion: The silver nanoparticles and the neem extract combination was concluded to be the most effective of the three combinations. The second most effective of the three combinations was the carbon and neem combination, and the least effective of the three was the triple combination. However, these combinations were determined to be successful alternatives to antibiotics, when using the right amounts. For using 3mL of the silver and neem combination, the hypothesis was correct: at least 90% of the bacterial growth was prevented. The hypothesis was also correct for using 3mL carbon and neem combination: at least 85% of the E. coli bacterial growth was prevented. However, the hypothesis for the triple combination was shown to be wrong: 3mL of the combination did not prevent at least 95% of the bacterial growth; it prevented 93.2%.

Summary Statement: To find a more effective alternative to antibiotics, this project tested three combinations, and found that silver nanoparticles and neem was the most successful combination.

Help Received: Father helped provide materials and workplace; Mrs. Gillum helped with the project idea and looked over my research paper.