Name(s)
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Project Number
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Project Title
Eliminating Escherichia coli: The Effect of Nanosilver Particles on Escherichia coli Growth

Abstract

Objectives/Goals
The objective of this experiment was to discover the effect of different concentrations of nanosilver solution (500,000 µg/L; 50,000 µg/L; 5,000 µg/L; 500 µg/L; and 0 µg/L) on Escherichia coli growth (or lack thereof, measured as the zone of inhibition in millimeters).

Methods/Materials
During the experiment, which consisted of three trials, the concentrations were first prepared using serial dilution; then, paper disks were soaked in the concentrations and lowered into the inoculated petri dishes. The petri dishes were then transferred to the incubator set at 37°C. For four days, the zones of inhibition for each petri dish were observed, and the results were recorded. Seven days after setup was completed, 10% bleach was sprayed in the petri dishes, which were then sealed and left to soak for eight hours before disposal in the dump.

Results
On average, when the disk was soaked in the highest concentration of nanosilver solution (500,000 µg/L), the zone of inhibition in the petri dish was widest, followed by each lower concentration, with the control group displaying no zones of inhibition.

Conclusions/Discussion
The nanosilver solution's potency increased with its concentration, so the hypothesis was fully supported. This was because nanosilver particles destroy the sulphur and phosphorus bonds in E. coli, harming functions leading to the death of the bacterium. Nanosilver particles are small enough to be completely absorbed by the bacteria, causing the bacteria to burst. The highest concentration of nanosilver solution gave way to the widest zone of inhibition because a higher concentration means more nanosilver particles in the same amount of liquid; the greater the number of nanosilver particles, the more quickly the ambient bacteria will die. Nanosilver thus is a viable solution to E. coli outbreaks. Even the lowest concentration tested yielded a zone of inhibition, demonstrating that such a seemingly low level of nanosilver solution is, though effective, still potent. The EPA has not regulated a safe level of nanosilver, which is harmful to not only the environment but also to our cells when ingested. The project calls for the EPA to take action in setting a standard for nanosilver levels in the environment.

Summary Statement
As measured by the zone of inhibition's width, it was found that higher concentrations of the antimicrobial nanosilver prevented the growth of Escherichia coli most effectively.

Help Received
I executed the project's methods myself, with my science teacher offering guidance, especially in proper disposal techniques. She provided me with a work space and an incubator with which the experiment was conducted.