

Greater San Diego Science and Engineering Fair 2015 PROJECT SUMMARY

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Project Title: Understanding the Oligodynamic Effect: How Metals can Kill Bacteria

Abstract

Objectives/Goals

The purpose of this experiment was to look for correlations of the properties of metals and their antibacterial strength. This experiment looks into the oligodynamic effect. This effect is little studied and relates to how certain metals kill bacteria on contact. Certain metals such as copper are more oligodynamic than others, and this may be due to an oxidation process. Finding trends between the properties of the metals such as conductivity and reactivity may help understand the mechanisms of the effect.

Hypothesis

It was hypothesized that overall, *S. epidermidis* will be killed 2.5 times more efficiently than *E. coli*. In order from the most efficient to the least efficient metal, it will be first silver, then copper, then zinc, then aluminum, then nickel, then tin, then titanium.

Methods/Materials

Two types of bacteria, *E. coli*, and *S. epidermidis*, were tested. They were grown on agar plates in an incubator. Eight types of metals were tested. They were titanium, aluminum, zinc, nickel, tin, copper, and silver. The metals were cut into 2.5 cm squares.

Results

In order from most to least effective, the metals were copper, silver, tin, titanium, nickel, aluminum, and zinc. The kill rate of copper was much higher than any other metal. The copper removed over 90% of the bacteria growing under the plate. Zinc apparently encouraged growth the most. Between the two bacteria, neither was majorly more susceptible to the metal.

Conclusions/Discussion

There were not obvious patterns among the properties of the metals in both conductivity and reactivity. Much of the data for all the metals was similar. Only copper and zinc stood out distinctly, the two outliers. This data from this experiment reinforces evidence about the antibacterial properties of copper. Information is added of bacteria interaction with zinc.

Summary Statement

This project involved testing the reaction of different metals when placed on bacteria in order to study the oligodynamic effect.

Help Received

Parents helped conceive idea and make board. Mentor Dr. Tai Wei Ly provided the lab to test in and equipment to test with as well as invaluable guidance.