CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Grace M. Dailey

Project Number

35636

Project Title

The Effect of Increasing Colloidal Silver Concentrations in Combination with Vancomycin against B. cereus and E. coli

Preliminary

Abstract

Objectives/Goals

The antimicrobial properties of silver have been recognized and exercised throughout history. But with the discovery of modern antibiotics in the 1940s, the use of silver for wound treatment, Neisseria gonorrhoeae prevention, etc. declined. However, as antibiotic-resistant bacteria become more pervasive and threatening, silver could reemerge as a significant antimicrobial.

This project is designed to compare the efficacy of Vancomycin when combined with colloidal silver (V+CS) at various concentrations versus Vancomycin alone (V) against Bacillus cereus (Gram+) and E. Coli (Gram-) bacteria.

Methods/Materials

Colloidal silver (at 10 ppm) was added via micropipette to blank discs and 30 microgram discs of Vancomycin in various amounts. The V+CS(1) discs along with V(2) discs alone as a comparison, were set on inoculated plates and after 24 hours of incubation, the inhibition zones were measured. A larger inhibition zone indicated a greater efficacy.

Conclusions/Discussion

Colloidal silver, alone, did not create quantifiable inhibition zones. However, the addition of colloidal silver to Vancomycin resulted in larger mean inhibition zone areas for all concentrations in comparison to Vancomycin alone, with one exception(3). A trend appeared as increased amounts of colloidal silver added to Vancomycin corresponded to increased efficacies. The p-values for the higher V+CS concentrations also indicated statistical significance. However, it is critical to determine the minimum inhibitory concentration (the smallest amount required to inhibit bacterial growth) for added colloidal silver that will increase Vancomycin efficacy, so as to prevent agryria, the blue-grey turning of the skin caused by excessive silver use.

(1) Vancomycin discs administered with colloidal silver
(2) Vancomycin discs containing no colloidal silver. All V+CS discs were compared to V discs.
(3) The exception was V+CS (10-24) for Bacillus cereus. (10-24) indicates that 10 microliters of CS were administered onto the V disc 24 hours in advance prior to placement on the inoculated plate. The majority of the other CS additions were administered onto the V discs immediately prior to plate placement.

Summary Statement

My project is designed to see if the addition of colloidal silver to Vancomycin increases its efficacy, for if it does, its addition to existing antibiotics may help to address the growing threat which is antibiotic-resistant bacteria

Help Received

Mr. Ma helped with statistical analysis; The Branson Science Department provided materials; Neighbor helped edit sections; Kind brother allowed me to download the free-trial of Photoshop onto his computer and then use it to measure inhibition zone areas