CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
J1311

Project Title
The Wonders of Antibiotics

Abstract

Objectives/Goals
The objective of this experiment was to determine the effect of various antibiotics on three types of bacteria in vitro.

Methods/Materials
Seven types of antibiotic discs (Cephalothin, Chloramphenicol, Kanamycin, Neomycin, Novobiocin, Tetracycline, and Vancomycin) were tested on three bacteria cultures (Bacillus cereus, Escherichia coli, and Micrococcus luteus). Twenty-one petri dishes were used to cover all combinations of antibiotics and bacteria. Three milliliters of each bacteria subculture (prepared with nutrient broth) was pipette into 7 sterile petri dishes and mixed with warm, liquefied nutrient agar. Each petri dish was divided (with a marker) into four equal sections. In one section a blank disc was used as a control variable and 3 identical antibiotic discs were placed in the remaining sections. After 48 hours of incubation at 37 degrees Celsius, the inhibition zones around each disc were measured.

Results
The results show that Cephalothin was most effective against both E. coli and M. luteus, followed by Chloramphenicol, Tetracycline, Novobiocin, Vancomycin, Kanamycin, and Neomycin. On the other hand, Tetracycline appeared to be the most effective on B. cereus, followed by Novobiocin, Chloramphenicol, Cephalothin, Vancomycin, Kanamycin, and Neomycin.

Conclusions/Discussion
Antibiotics are selected for use against specific diseases and bacterial infections based on their mode of action, broad/narrow spectrum, bactericidal/bacteriostatic, etc. In fact, most of the results from my experiment can be explained due to these characteristics of the antibiotics that I used. The antibiotics in my experiment mainly fall into three categories in terms of their mode of action. Cephalothin and Vancomycin interfere with the bacterial cell wall; Kanamycin, Tetracycline, Chloramphenicol, and Neomycin interfere with protein synthesis; and Novobiocin interferes with DNA synthesis. Antibiotics can also be classified as bactericidal (antibiotics that destroy bacteria) or bacteriostatic (antibiotics that inhibit the growth of bacteria). Kanamycin, Neomycin, Cephalothin, and Vancomycin are bactericidal, while Tetracycline, Chloramphenicol, and Novobiocin are bacteriostatic.

Summary Statement
The comparison of the inhibition zones in this experiment demonstrated that various antibiotics respond differently to the same bacteria, and that the order of effectiveness of the antibiotics on E. coli and M. luteus is identical.

Help Received
My instructor, Mr. Francis Lee, suggested my usage of statistics as another way of looking at my data. He also taught me several techniques to use when I was carrying out this experiment, such as a method that was an improvement over the common streaking method of bacteria on petri dishes.