# CALIFORNIA STATE SCIENCE FAIR
# 2015 PROJECT SUMMARY

**Name(s)**

James C. Bowden

**Project Number**

**J1603**

**Project Title**

## Antibiotic Resistance by Repeated Exposure

**Abstract**

**Objectives/Goals**

This study investigated the development of antibiotic resistance in the bacteria E.coli and S.epidermidis from natural mutation caused by repeated exposure.

**Methods/Materials**

Of the many materials used to conduct this study, the key materials used for this experiment were TSA, nutrient agar, E.coli culture and S.epidermidis culture (screened for contamination), ampicillin, Ultrapure water, and sterilization tools such as 70% isopropyl alcohol.

After all of the materials had been gathered, the TSA was mixed with water and autoclaved to kill any bacteria, and a quality control was run on the cultures of E.coli and S.epidermidis along with the agarose itself. Media was poured into the plates, and after the gel had solidified, the bacteria were inoculated along with Luria broth into the plates and labeled. Ampicillin solution-soaked filter paper disks were put into the plates and the plates were incubated for 24 hours, and then refrigerated until next use. The inhibition zones were measured and recorded, and then bacteria from the edges of the inhibition zones were picked up with a swab, and inoculated on a new plate. This process was repeated for each of 5 exposures. At the end of the experimental process, everything used was either thrown out in the bio-hazard trash or autoclaved.

**Results**

Over the course of 5 exposures to ampicillin, both bacteria did indeed gain resistance to the antibiotic gradually. However, the S.epidermidis gained resistance faster than the E.coli. The inhibition zones of the E.coli plates on average were reduced by 10.9 mm from exposure 1 to 5, while the inhibition zones of the S.epidermidis plates on average fell by 20.5 mm from exposure 1 to 5. The E.coli did not reach full resistance, while about 78% of the S.epidermidis cultures were fully resistant by exposure 5.

**Conclusions/Discussion**

The data supported the hypothesis in that it confirmed that repeated exposure does lead to antibiotic resistance in E.coli and S.epidermidis, but opposed the prediction that E.coli would develop resistance first. The results propose that lower concentrations of antibiotic make it easier for bacteria to develop resistance, and that an unknown factor such as the resistance methods or capability to produce biofilms of S.epidermidis in turn made it more resistant.

**Summary Statement**

This project studied the effects of repeated exposure to ampicillin on the antibiotic resistance of bacteria E.coli and S.epidermidis, and determined that repeated exposure does cause an increase in antibiotic resistant bacteria.

**Help Received**

Used lab equiment at Pierce College under the supervision of Karin Steinhauer