



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Laura A. Huppert	Project Number S1310
Project Title Do Livestock Antibiotics Affect Soil Bacteria?	
Objectives/Goals The purpose of this experiment is to determine how antibiotic use in cattle feedlots affects the soil bacteria of that environment. My hypothesis was that soil bacteria collected from farms using antibiotics would have more resistance to these substances.	
Abstract Methods/Materials Four different locations that provided a spectrum of grazing and antibiotic use were compared, including a site that had never been grazed, an organic cattle farm, a commercial cattle farm that spot-used antibiotics, and a cattle company that was a heavy antibiotics user. The soils collected at each site were diluted by a factor of 10 E-5, 10 E-6, and 10 E-7 grams / mL saline solution. Two replicates of each dilution were plated on tryptic soy agar medium, one with the antibiotic oxytetracycline, and the other without antibiotic. Antibiotic resistance was assessed by comparing the number of bacterial colonies on plates with and without antibiotic. Also, organic carbon and soil moisture content were determined for site characterization.	
Results After monitoring bacteria growth, it was found that bacteria from the heavy antibiotic-using farm appeared the most resistant to oxytetracycline. The difference in the number of bacterial colonies between the antibiotic-positive and antibiotic-negative plates was relatively small for that site, with 52.2% of bacteria resistant, unlike the large difference in bacteria growth between treatments for the other sites.	
Conclusions/Discussion This experiment suggests that the degree of antibiotic use is related to bacterial resistance to that antibiotic. If antibiotics are used only mildly at a site, such as for spot treatment of sick cattle, no resistance develops. However, if the antibiotic is used more heavily, the soil bacteria at the farm can become resistant to the antibiotic. This is significant because antibiotic resistance can lead to greater difficulties in treating livestock and human bacterial infections.	
Summary Statement This project examines whether soil bacteria are resistant to oxytetracycline at cattle farms that use varying doses of this antibiotic.	
Help Received Margaret Torn and her lab assistant Deb Williard of Lawrence Berkeley National Laboratory allowed me to use their equipment and answered any specific questions that I asked. However, I individually designed, conducted, and analyzed the results for this project.	