



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Daryl L. Chang	Project Number S1703
Project Title Modeling Transformed E. coli Growth at Different Ampicillin Concentrations	
Abstract Objectives/Goals This experiment aimed to a) determine the ampicillin concentration at which maximum transformed colony growth occurs; b) develop a model relating ampicillin concentration and transformed bacteria growth; and c) develop a model relating ampicillin concentration and satellite growth. Methods/Materials The experiment involved three separate trials. First, I poured culture plates of 10, 50, 100, and 200 ug/mL ampicillin. After transforming E. coli with pGLO plasmids, I spread 20 uL of the bacteria onto each plate and incubated them at 70°F for 72 hours. I then took pictures of each plate and used Photoshop to analyze the area of the transformed colonies and satellite colonies. Finally, I calculated the ratios and used regression analysis to produce the mathematical models. Results Maximum transformed colony growth occurred at 100 ug/mL ampicillin, with the average colony occupying 0.4% of the plate. The growth of transformed bacteria growth varied linearly with ampicillin concentration up to 100 ug/mL and was modeled by the equation $T=0.004[\text{amp}]-0.001$. Satellite growth was modeled by the equation $y = -11.8 \ln[\text{amp}] + 122.3$, with satellites occupying 97% of the plate at 10 ug/mL and 59% at 200 ug/mL. Conclusions/Discussion The mathematical relationships determined in this experiment can be generalized for all transformed bacteria. These models can determine the optimum antibiotic concentration quickly and accurately, and thus maximize transformed colony growth. They can be used in science research when growing new kinds of recombinant bacteria, or in industrial production of transformed bacteria to maximize secretion of products like insulin or human growth hormone. In all cases, larger and faster-growing transformed colonies will be the result.	
Summary Statement Modeling and determining the ampicillin concentration at which transformed E. coli attains a maximum growth rate.	
Help Received Poured agar culture plates with the help of Dr. Starr of the Tech Museum of Innovation. Used lab equipment at the Tech Museum.	