CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S1323

Project Title
Does Exposure to a Magnetic Field Affect the Transformation Rate of Escherichia coli? Second Year Study

Abstract

Objectives/Goals
The objective of my experiment is to determine whether or not a rotating magnet affects the transformation of E. coli in becoming resistant to ampicillin. Based on my previous study, a stationary magnet inhibits the transformation of the bacteria (to a degree). I believe the rotation of the magnet around the E. Coli cells will increase the inhibition of the transformation and growth rates.

Methods/Materials
I constructed a device out of wood blocks and PVC pipe that held up the magnet and a counterweight on opposite sides of a beaker containing vials of pGAL/Control buffer and cells. I set up 3 controls and 3 experimental groups. The first control group included 5 agar plates containing merely X-GAL and no E. coli cells. There was also an experimental group of 5 that had this type of plate exposed to a magnet. The second control was a group of 5 agar plates, containing X-GAL and ampicillin, plated with E. coli and control buffer. This too had an experimental counterpart which was 5 plates containing agar and magnetized cells and control buffer. The last control was 5 agar plates containing X-GAL and Ampicillin with E. coli cells and pGAL DNA, while the experimental group being compared to this contained 10 agar plates containing X-GAL and ampicillin with magnetized E. coli cells and pGAL DNA. I later placed them in the incubator at 37 C for about 20 hrs. Then I counted the number of white and blue colonies on each plate.

Results
There was a significant decrease in the transformation of E. Coli on the plates that had Cells exposed to the magnet. On average, the plates that contained cells that had been exposed to the magnet produced a yield of 556 transformed blue colonies, while the plates containing cells that had not been exposed to the magnet reduced an average of 681 transformed cells. All the plates used as the control 2 batch that were exposed to the magnet contained white colonies averaging 151. All the plates in the control 2 batch not exposed to the magnet contained white colonies averaging 190.

Conclusions/Discussion
My data proved to support my hypothesis. I think that the metal ions found in the calcium chloride (the E. coli was treated with calcium chloride and temperature changes to increase the permeability of the cell membrane) were attracted to the magnet. This may have made it harder for the DNA to enter the cells, lowering the rate of transformation.

Summary Statement
My project is about the effect of a rotating magnet on the transformation and growth rate of E. coli, providing evidence that the magnet does affect both factors.

Help Received
My project advisor supervised me as I conducted my experiment.