CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J0415

Project Title
DNA Extraction from Plant and Animal Cells

Abstract

Objectives/Goals
The objective was to determine if it is easier to extract more DNA from animal cells than from plant cells. My hypothesis is that it is more difficult to extract DNA from plant cells due to their stiff cell wall that is not found in animal cells. The amount of DNA extracted from plant cells should increase by adding the enzyme cellulase, which breaks down plant cell walls.

Methods/Materials
I weighed out 10 grams of each of the seven different plant and animal sources that I obtained. I followed a laboratory procedure at Humboldt State University that involved blending each sample, adding buffer solution, detergent, neutralizing solution, and after centrifuging it, isopropanol, to extract the DNA. I made two samples for each source and repeated the procedures for both sets of samples. For each plant source one sample was treated with cellulase and the other sample had no cellulase added.

Results
More DNA was consistently extracted from plant cell samples treated with cellulase. An average of 187% (ranging from 120-300%) more DNA was extracted from plant cells with cellulase added than without. More DNA was extracted from chicken liver than any of the plant sources, even those treated with cellulase. Much less DNA was extracted from shrimp cells compared to chicken liver cells (16%) or any of the plant cells (40%).

Conclusions/Discussion
My observations are consistent with my hypothesis. More DNA was extracted from plant cell samples treated with cellulase than those treated without. This is due to the action of the enzyme cellulase in breaking down the cellulose of plant cell walls. The amount of DNA extracted from animal cells depends on the type of animal tissue being used. The shrimp sample probably resulted in less DNA than chicken liver due to the fact that muscle cell was included, which has a large cell size and less DNA per cell than other types of tissue such as a concentrated organ like chicken liver. Additionally many plants have more than one copy of each chromosome per cell (polyploidy) which could be why more DNA could be extracted from plant cells when compared to some animal cells such as shrimp.

Summary Statement
My project is to see if it is easier to extract more DNA from animal cells than from plant cells and if adding the enzyme cellulase to break down the cell wall increases the amount of DNA extracted from plant cells.

Help Received
Dr. Jacob Varkey of Humboldt State University taught me a lot and supervised my lab work; Michele Kamprath, my science teacher encouraged me and gave feedback; S. Sandige of GATE taught calligraphy; my parents talked with me about my research, criticized my writing, and gave me my DNA.