CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J0411

Project Title
Can Liquid Crystals Be Absorbed by Organisms and Be Used as a Biological Stain to Measure Thermal Activity?

Abstract

Objectives/Goals
The purpose of this project is to investigate the use of Liquid Crystals (LC's) as a method for biological staining. The unique properties of these pigments cause them to change colors at different temperatures. This project addresses two questions: 1) Can LC's be absorbed into cells as a new staining technique, 2) Can this provide us with information on heat sensitive processes occurring in cells.

Methods/Materials
1) Obtain LC supplies & solvents. 2) Research & test which solvents will dissolve LC's. Water, alcohols, & other organic solvents will be tested. 3) Make cultures & slides of Paramecium, Euglena, & rabbit psoa muscle fiber. 4) Stain each sample using the LC's in varied concentrations. 5) Analyze results of the following a. Analyze absorption of LC's into Paramecium and Euglena & if possible analyze the phototaxic response. b. Action of ATP in muscle fiber contraction in Rabbit Psoa muscle fiber. 6) Use other techniques for loading macromolecules into the cytoplasm of cells including hypoosmotic shock, scrape loading, & agitation in cold. 7) Manipulate the temperature conditions to see if the dyes change colors within the stained cellular samples. 8) Determine if thermal activities can be monitored with absorbed liquid crystals. 9) Analyze the data, & research professional scientists & data bases to determine if there could be any uses for these new staining processes. 10) Aseptic technique will be used and proper disposal will be followed.

Results
The liquid crystals are mostly non-polar in nature. T-butyl alcohol was the only solvent that we tested that could dissolve the LC's & mix with water. An 86% t-butyl alcohol/water mix was the most dilute solution possible for basic osmotic transfer of the LC's. This concentration was too high for the Paramecium and Euglena to survive. The rabbit muscle fiber coated in LC's did change color when ATP was added. LC absorption by ingestion was inconclusive. Other techniques for loading LC's s into the cytoplasm will be tested.

Conclusions/Discussion
The non-polar nature of LC's makes the process of loading them into cytoplasms difficult via osmosis due to the polar nature of water. It was difficult to control light & heat with microscopes being used to measure the thermal activity of the organisms. Indirect lighting sources may be more suitable for future investigations.

Summary Statement
Liquid Crystals were tested to see if they could be used to stain organisms & measure their thermal activities.

Help Received
My father supervised the project. He helped to gather necessary materials and equipment and supervised experiments in his classroom. My mother helped in typing and putting together of the project board.