CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lauren C. Biedenharn

Project Number
S1401

Project Title
Survivor: The Cricket?

Abstract

Objectives/Goals
Can crickets take on fruit oils, even though they eat fruit? Which fruit oil is more toxic to crickets? What kills faster, oil sprayed on or oil through food? To answer this question I did multiple tests on crickets, fruits, and their oils. I placed two crickets in 12 test tubes. The first test tubes contained fruit slices, the next contained cricket meal with fruit oil of the same fruit slices, and the last 4 test tubes contained pure fruit oils which I sprayed onto the crickets. After leaving the crickets in their tubes for a few days, I observed them, and found that, the orange slice kept the crickets alive the longest, but its oil in the food and spray killed quickest. I also found that the fruit oils directly sprayed onto the crickets killed much faster than the oils in the food.

Methods/Materials
12 cricket or fruit fly opened tubes; 12 cotton balls; A slice of Orange, Lemon, Lime, and two Green Olives (stuffed or un-stuffed); Orange, Lemon, Lime, and Green Olive Oils; Sprayer; Cricket Meal (you can use oatmeal or a piece of bread);24 crickets (2 crickets for each tube, more crickets are fine.
Procedure: 6. Next add two crickets to each tube.
7. On the #fruit slice# and fruit oil/food# section place a cotton ball in the opened top so the crickets cannot escape but can still breathe.
8. In the #Fruit Oil/Spray# section, now spray one oil per tube, and observe each test tube after you spray two or three small sprays. Be sure to put the cotton ball on top.

Results
Time of First Dead Cricket:
Fruit Slices Fruit Oils/Spray Fruit Oil/Food
Orange < 4 Days(88 hours) Instant Contact (1 second) > One Day(30 hours)
Lemon 3 Days(72 hours) Almost Instant Contact (5 seconds) < Two Days(40 hours)
Lime > 1 Day(32 hours) 1 Minute Two Days(48 hours)
Olive 8 Hours 5 Minutes < Three Days(55 hours)

Conclusions/Discussion
After all my tests were complete I founded that the orange slice appeals most to the crickets and keeps them alive longest, but the orange oil in both spray and food kill fastest. Second was Lemon, the Lime, and lastly Olive for quickest killing of oil, but visa versa on slices. I also founded that direct spraying killed much faster than oils through food. I also researched that the crickets die of these oils because they suffocate them and the fruit acids also contribute to the death of crickets.

Summary Statement
I tested how toxic different fruit oils were to crickets and found directly sprayed on Orange oil killed fastest, next lemon, then lime, and lastly olive oil.

Help Received
My Mother- She purchased all the items for this experiment with me; Mrs. Rader- she supplied me with the tubes; My Brother- He helped catch the crickets and place them into their tubes

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Tierney R. Burke

Project Number
S1402

Project Title
Incidence of Mercury Exposure in Childhood Vaccination Schedules Exceeding Federal Safety Guidelines

Abstract

Objectives/Goals
Mercury and other heavy metals can adversely affect the nervous, immune, gastrointestinal, and endocrine systems. Thimerosal is a neurotoxic, organic mercury compound which has been used as a vaccine preservative to prevent bacterial and fungal contamination. Today, children have more total vaccinations and have them closer together in life than ever before in history. In this study, doses of mercury from thimerosal-containing childhood immunizations were calculated for test subjects, and compared to U.S. Federal Safety Guidelines for the oral ingestion of methylmercury.

Methods/Materials
Vaccination records of 56 subjects born after 1981 were collected in conjunction with the weight at the time of immunization. Mercury content was determined from manufacturer product inserts and the Physician Desk Reference. Subject mercury dose was computed for birth, 2 months, 4 months, 6 months, 15 months, and 60 months. Results were compared to the Environmental Protection Agency maximum permissible limit of 0.4 microgram per kilogram weight per day.

Results
At birth, 55% of the subjects received mercury levels above the EPA limit (range 2.7-12.8 mcg Hg/kg). At 2 months, 95% received levels above the EPA limit (4.5-17.9 mcg Hg/kg). At 4 months, 96% received levels above the EPA limit (3.2-10.6 mcg Hg/kg). At 6 months, 93% received levels above the EPA limit (1.3-9.2 mcg Hg/kg). At 15 months, 89% received levels above the EPA limit (1.8-5.4 mcg Hg/kg). At 60 months, 50% received levels above the EPA limit (1.0-1.9 mcg Hg/kg). 98% of the subjects received three or greater bolus mercury doses above the EPA limit before 24 months of age.

Conclusions/Discussion
In 1991, Hepatitis B vaccine was added to the schedule. As a result, the number of thimerosal containing vaccines in the first 18 months of life increased to 11, and the amount of mercury expose grew to 237.5 micrograms. The infant mercury exposure from a single doctor visit are 5-20 times the minimum safe level as determined by the EPA and FDA. The hypothesis that mercury exposure exceeding safety guidelines has increased over the past 20 years was supported in the population sampled. For further analysis, mercury levels in a larger population should be studied in relationship to the incidence of neurodevelopmental disorders as 6 of the subjects in the study are diagnosed with medical problems that possibly are related to unsafe mercury exposure.

Summary Statement
The recommended routine childhood immunization schedule exposes infants to cumulative doses of ethyl-mercury that exceeds some federal safety guidelines established for oral ingestion of methyl-mercury.

Help Received
Thomas Blake instructed me on the use of the graphing program to create the 3-D graphs.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Sara M. Carman

Project Number
S1403

Project Title
Magnetized Melanogaster

Abstract

Objectives/Goals
The objective is to determine if magnetic fields cause mutagenic effects in Drosophila melanogaster. I believe that magnetic fields will not cause a mutagenic effect in Drosophila melanogaster.

Methods/Materials
A culture of 200+ wild-type Drosophila flies are placed in an enclosure wrapped with electric wiring (a solenoid)that produces a magnetic field stronger than that of Earth. Magnetized wild type males will be crossed with non-magnetized virgin Muller-5 females producing the F1 generation. A control group using only non-magnetized flies will be crossed in the same manner, male wild type with female Muller-5 fruit flies. The F1 generation will be back-crossed to produce the F2 generation. The F2 generation will be studied for phenotype results of 1:1:1:1.

Results
The experimental cultures produced 877 F2 flies. The phenotypic results are 246 Red/Bar-eye females; 236 White/Bar-eye females; 193 White/Bar-eye males; 202 Wild-type males. The control cultures produced 1020 flies. The phenotypic results are 273 Red/Bar-eye females; 251 White/Bar-eye females; 227 White/Bar-eye males; 269 Wild-type males. A phenotypic ratio of 1.2 : 1.1 : 1 : 1.2 resulted. A total population of 1897 flies represents a valid number of individuals in a population for genetic study.

Conclusions/Discussion
Experimental phenotypic results show 246 Red/Bar-eye females; 236 White/Bar-eye females; 193 White/Bar-eye males; 202 Red/Normal eye males. The experimental group produced a phenotypic ratio of 1.3 : 1.2 : 1 : 1. This ratio is very close to the 1:1:1:1 that was predicted by the Punnett Square was fulfilled. The presence of the male wild type fruit flies in the experimental group, expressing the normal eye shape and typical bright red color of the eye, refutes the possibility that a mutation exists. Placing a culture of fruit flies in an induced magnetic field and manipulating specific backcrossing in an F1 generation did not produce any mutagenic effects in the F2 progeny. The data supports my hypothesis that magnetic fields will not cause a mutagenic effect in Drosophila melanogaster.

Summary Statement
To provide evidence that magnetic fields will not cause a mutagenic effect in Drosophila melanogaster.

Help Received
Mr. Skaggs provided me with more information to understand fruit fly genetics; Mr. Lum provided me with information to build and caluclate the strength of my solenoid; my mom helped me culture the fruit flies and took pictures for my display board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Grace K. Chan

Project Number
S1404

Project Title
Chondrocyte Response to Mechanical Injury

Abstract

Objectives/Goals
Cartilage tissue serves several important functions from support to cushioning of joints. Because cartilage is important in everyday articulation of the joints, I wanted to see how mechanical injury would affect the apoptotic rates of the cartilage chondrocytes. This study was designed to understand the conditions where apoptotic are the greatest.

Methods/Materials
The tissue explants are "scraps" from another experiment
-Obtain 12, 5mL "punch" outs of explants of human cartilage tissue; -Wash each explant individually with PBS(Phosphate Buffer Solution)and then place them into wells containing the media[supervisor]; -Clean the Instron; -Place explant on the Instron; -Injure each explant with the Instron; -Run preload test; -After obtaining initial heights, record them, then multiply these numbers by 40%,50%,or 60% to get the amount that the height needs to be compressed by; -Run compression test; -Record the final heights of each explant; -Place them into the prepared wells that are stored in the incubator for 48 hours; -Explants are removed and stained with calcein AM and counterstained with Propidium Iodide, supervisor; -Images taken at low power on light microscope & higher magnification on the confocal microscope(supervisor); -Viability test on Adobe Photoshop or Microsoft Paint(count all the live cells and the dead cells).

Results
note:40% compression resulted in apoptotic levels very similar to the shams. The results show that there is a definite correlation between the amount of load placed on the cartilage explant and the apoptotic levels of that explant. More specifically, as the amount of load placed on a cell increases, the apoptotic levels within the tissue also increase.

Conclusions/Discussion
The results show that injured cartilage has a higher rate of apoptosis than thecontrol cartilage. The high apoptotic levels indicate the inability of aggrecan and collagen II. Aggrecan supplies compressive stiffness to the cartilage tissue through the hydration of its GAG chains, and type II collagen provides the majority of the tensile strength for the ECM.Load and stress on cartilage chondrocytes activates caspase-12 pathways which sets off a chain reaction that ultimately leads to apoptosis of the cell. this info. can be applied to mediums such as glucosamine, and caspase inhibitors in tissue regeneration.

Summary Statement
The purpose of this study is to see the affects of mechanical injury on chondrocytes.

Help Received
Mother helped to drive me around, received guidance from Dr. Peter Chan and Dr. Juan Hermida. Used lab equipment under the supervision of Dr. Shantanu Patil, Nick, and received help in obtaining laboratory letterheads for the tissue certification forms from Jackie.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Ketan Chopra

Project Number
S1405

Project Title
Can We Use a Biological Agent to Control a Plant Disease?

Abstract

Objectives/Goals
To find out if we can use a biological agent, such as a bacterium, to control some plant diseases.

Methods/Materials
Materials:
a. One bag of 50 pound bleached sand
b. Two packs of turfgrass seeds
c. Peter#s Liquid Fertilizer
d. A dozen Petri dishes
e. Dollar Spot Inoculum
f. Growth Medium (Potato Dextrose Agar)
g. Water
h. 10 six-inch plastic pots

Procedure:
1. Take ten 6-inch diameter plastic pots and fill to the top with bleached sand.
2. Sprinkle 0.25 grams of turfgrass seeds and water it from the top.
3 Add 10 mL of Peter#s Liquid Fertilizer every week.
4. After the seedlings germinate, continue fertilizing till they are two weeks old.
5. Two weeks after germination, clip the grass with a pair of scissors.
6. Obtain a fungal inoculum of dollar spot from a laboratory and apply five grams to all the pots.
7. Cover the pots with a plastic bag for two days.
8. After two days (in two days the disease should spread) apply 15 mL of the bacteria inoculum to 3 pots.
9. Apply 5 mL of fungicide (DACONIL) to three pots.
10. Leave three pots untouched.
11. Visually look at the pots for disease development every day after application for two weeks.

Results
Under the controlled conditions, the bacterium successfully controlled the plant disease.

Conclusions/Discussion
Based on the experiments, we can see that the disease can be controlled by using a bacterium under controlled conditions. In the real world, we use harmful pesticides to help conquer plant diseases. But if we simply use these harmless bacteria, it would help our environment a great deal.

Summary Statement
My project is about how we can use a biological agent, such as a bacterium, to control a plant disease.

Help Received
Used lab equipment in Dr. Mitra's lab.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Nathalie Gaudefroy; Melody Wang

Project Number

S1406

Project Title

Effects of Cooking Processes on Vitamin C Levels and Anti-Cancer Properties

Abstract

Objectives/Goals

To determine how various cooking processes (such as microwaving, steaming, and boiling) effect the ascorbic acid levels and anti-cancer properties of green bell pepper and which method has the highest percent inhibition.

Methods/Materials

We had 3 test groups: 100g boiled pepper(for 15min.), 100g microwaved pepper(for 15min.)and 100g steamed pepper(for 15min.). Our control: 100g raw pepper.10 peppers were cut,the white interior and seeds were removed, then randomly mixed. We blended our control and test groups with 50ml of water then filtered out each pepper mixture into a flask.

Experiments conducted: titration process,(to develop an equation which indicates amount of ascorbic acid/test group)and a sea urchin assay(determines which test group would have the highest percent inhibition). Our base for the titration was made mixing 0.6g Iodine crystals, 0.6g Potassium iodide, 50 ml Ethanol, and 50 ml water. For our solution we used:10 mg ascorbic acid and 5 mL of starch solution,(2.5 teaspoons cornstarch and 50ml boiling water).

Extracts were evaporated under a vaccum then sperm and eggs were collected from sea urchins (by injection of potassium hydroxide)fertilized embryos formed by mixing sperm and eggs. The same dose of extracts were added to fertilized embryos and put into a water bath.

1 mL of the control was taken(to see if embryos completed first division and were in the 2-cell stage) and number divided and undivided cells were counted from each 1 ml test group.

Results

According to our graphs the raw test group reached 100% inhibition with the least amount of pepper,(0.5g/ml), where as boiled was the least potent; one would need to consume about 4 times more of boiled peppers than raw peppers. There was a direct correlation between the amount of AA (mg) and amount of iodine needed to react with each pepper extract. Microwaved pepper ended up having the least amount of water (0 mL), whereas the steamed, raw, and boiled test groups all retained 25 mL. Steamed test group retained more nutrients than boiled, because around 30% of water-soluble vitamin C was lost compared to 70%.

Conclusions/Discussion

Our raw data exemplifies our hypothesis and theory are correct: there is a direct correlation between cooking processes and vitamin C levels. It's best to not cook a pepper in order to maintain the most ascorbic acid, and anti-cancer properties.

Summary Statement

We had to undergo a series of tests which enabled us to determine the most effective cooking process for retaining vitamin C and anti-cancer properties of green bell peppers.

Help Received

Laura Mydlarz, our mentor, helped us organize our procedures and data. Under her supervision, she let us use her lab in UCSB as our workplace for these tests. She also infused us with her knowledge on the subject of percent inhibition and other terms.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Christine Haas

Project Number
S1407

Project Title
Buckeye's Biggest Battle: The Effects of a Natural Toxin on Adult Mosquitoes

Abstract

Objectives/Goals
The purpose of this experiment was to determine the effects of a natural toxin from buckeye seeds on adult mosquitoes. I live in Wonder Valley, which is open range, where mosquitoes are a problem, and which has no mosquito abatement. In addition, this experiment was conducted to determine if the buckeye toxin would be an effect treatment for mosquito nets.

Methods/Materials
I used buckeye because it's native to Wonder Valley; the livestock tends to leave it alone.
After creating the buckeye toxin, I measured different strengths for my experiments.
In Experiment #1, Impregnated Filter Paper Assay, I made 3 samples for each strength and the Control. I used 20 mosquitoes in each sample.
For Experiment #2, the buckeye spray, I used 6 samples to create the 100% and the Control.

Results
Experiment #1 # Impregnated Filter Paper Assay
The 50%, 75%, 100% toxins had no effect on the adult mosquitoes.
Experiment #2 # Spraying Buckeye Toxin
In 1 hr, 85% of the mosquitoes in the 100% containers were dead. Within 24 hrs, 92% of the mosquitoes were dead.

Conclusions/Discussion
In conclusion, the results from the Impregnated Filter Paper Assay show that buckeye will not be effective for uses such as mosquito netting. However, my second experiment shows buckeye has potential as an adulticide spray.

Summary Statement
The use of buckeye seeds to "naturally" replace chemical pesticides in the fight against adult mosquitoes.

Help Received
Used lab equipment at Clovis East High School (under supervision of Ms. Akondo) and at U.C. Kearny Research Mosquito Lab (under supervision of Mrs. Christiansen). Mother helped assemble board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Jane A. Halahan

Project Number
S1408

Project Title
Does the Percentage of Calcium Carbonate in Bird Eggshells Change with Different Environments?

Abstract

Objectives/Goals
The purpose of this experiment is to determine if environmental effects are threatening the strength of eggshells. DDT, PCBs, and Dioxin are all threats to eggshell strength; however, my project will only research one of these effects, DDT.

Methods/Materials
I will test eggshell strength using the titration process to calculate the amount of calcium carbonate in eggshells from free-range and caged birds. These birds will include quail and chickens. The percentage of DDT can be determined using one of several specialized tests, however, these are beyond the scope of this experiment. Eggshell strength will be measured by using an acid/base titration to find the percentage of calcium carbonate in eggshells. The titration will use Hydrochloric acid to convert all the calcium carbonate to calcium chloride. Using this technique the percentage of calcium carbonate in the eggshell can be determined. These measurements will be made on free-range eggshells, caged eggshells, and quail eggshells.

Results
The results are that quail eggshells have the highest percentage of calcium carbonate at 69.63%. The free-range chicken eggshells only have 63.75% calcium carbonate, where as, caged chicken eggshells were found to have 69.58% calcium carbonate.

Conclusions/Discussion
My hypothesis is correct in that caged chicken eggshells were stronger than the free-range chicken eggshells. There is speculation as to whether the quail eggshells were from a caged or free-range environment.

Summary Statement
The purpose of this experiment is to determine if environmental effects are threatening the strength of eggshells.

Help Received
My father and I researched chemicals, equipment, and laboratories. We then purchased the chemicals and equipment. My mother helped me in egg-preparation such as boiling the eggs, removing the eggshells, and grinding the eggshells into a fine powder.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Megan Harris

Project Number
S1409

Project Title
Bonds Away: A Study of the Effects of Ammonium Thioglycolate and Sodium Hydroxide on the Disulfide Bonds in Human Hair

Abstract

Objectives/Goals
Millions of people across the world use chemicals to alter their hair. These chemicals damage the hair structure and make it weaker by reducing ,or eliminating, the disulphide (S-S) bonds within the keratinized amino acids of which each strand is built. This project compares the difference between the strength of hair treated with Ammonium Thioglycolate (ATG), which reduces S-S bonds, and Sodium Hydroxide (NaOH), which eliminates them, through the carefully controlled observation of 80 separate hair samples when treated with both chemicals.

Methods/Materials
This 6 week project consisted of 720 separate hair strands organized into 80 groups and 240 subgroups with each group containing hair from a separate individual, thereby controlling the variables. Each 9 hair group was organized and labeled by securing both ends between two sheets of thick adhesive plastic. Each group was then separated into 3 subgroups of 3 hairs with each subgroup labeled and measured by durability in Newtons as either; ATG treated, NaOH treated, or control (not treated). The ATG and NaOH groups were then compared to their control and each other and this information was used with the combined results of the 80 individual groups to reach a conclusion.

Results
Hairs treated with ATG were on average (mean) -.53138, or about one half Newton weaker than untreated hair. Hair treated with NaOH was on average even weaker at -.6935or about -.7 Newton difference between the two. Overall ATG treated hair was .12613 Newtons stronger than hair treated with the NaOH.

Conclusions/Discussion
These findings supported the initial hypothesis which states...
Hair when treated with Sodium Hydroxide, which eliminates the disulfide bonds in amino acids, will have a decrease in the overall structural integrity of keratin structures more than those treated with Ammonium Thioglycolate which simply reduces these bonds.

Summary Statement
The elimination of disulfide bonds reduces the integrity of keratin structures more than the reduction of these bonds.

Help Received
Little sister and mother helped record some measurement information. Father and Mother assisted in some chemical treatments. Transportation for the purchase of materials and financial aid from parents.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Niree A. Hindoyan

Project Number
S1410

Project Title
Tell Tale Heart: The Effect of Varying Percent Solutions on the Heart Rate of a Daphnia

Abstract

Objectives/Goals
The purpose of this project was to identify the effect of sucrose, salt and caffeine on a Daphnia's heart rate. These experiments determined the affect these variables had on the increase or decrease of the water flea's heart rate. Experimentation involved placing Daphnia species onto depression slides and testing them with drops of different concentrations of sucrose, saline, and caffeine solutions (measured in ppm). Average heart rates were measured by multiplying the number of beats in 10 seconds by 6 to get the beats/minute. The results of the experiment showed that high concentrations of sucrose, salt, and caffeine drastically increased the Daphnia's heart rate. As the concentrations were diluted, the heart rate of the Daphnia decreased, reaching closer to the original heart rate. The results of the increasing of heart rate for sucrose and caffeine solutions supported the hypothesis, yet the results of increasing heart rate as a result of salty environments proved the hypothesis wrong.

Summary Statement
My project is to see whether percent solutions of sugar, salt, and caffeine have an affect on the heart rate of a Daphnia.

Help Received
Teacher, Ms. Heather Jones, helped order products and kept track of my experimentation; Teacher, Dr. Quinn helped with measurements; Parents as well as sister helped revise final draft; Classmates and friends helped with the timing portion of my project;

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Vu A. Hong

Project Number
S1411

Project Title
Electromagnetic Vector Fields on Plant Growth

Abstract

Objectives/Goals
The project I chose this year is an integration of my science fair projects from the past two years. The problem I was faced with in the GSDSEF 2002 was the number of variables that came up such as my incapability at that time to keep the temperature constant for both the control and test pots. Using the difficulties from previous years, the problem I came up with was, #The Effect of Electromagnetic Vector Fields on Various Plants in a Fixed Environment.# I decided to grow radishes, corn, lima beans, and mung beans.

Methods/Materials
The first thing I had to do was come up with a fixed environment. I set the temperature control to a fairly warm 28˚c. If the temperature of the soil read above the set temperature, the control would send a feed back to the input of the PLC. The PLC programming would then output a signal to the solid state relay to turn off the power supply of that pot.

Results
In the end, the plants that were grown in the heater pot, not the electromagnetic pot grew higher consistently.

Conclusions/Discussion
The conclusion that I can make from this is that the radish seeds from my project two years ago only grew so high because of the warmer temperature. Another conclusion I can make is that since I programmed the electromagnetic coil to turn on and off every 2 seconds to create more stimulation; plants do not respond well to either electromagnetic shock or stimulation.

Summary Statement
The project is about plant growth in a controlled electromagnetic field.

Help Received
My previous teachers helped me recognize variables from previous projects that I would have to control for this year's project.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Joyce Kwan; Thoa Nguyen

Project Number
S1412

Project Title
M.I.R.T-H Multiple Insect Repellent Tomato- Hirsutum

Abstract

Objectives/Goals
We researched and found that there is an Ecuadorian tomato that could repel better than bug repellents. With this information, we plan to test with more locally found tomatoes with common bugs around the house. Hence from this experiment, we hope to find a safer alternative for bug repellent with DEET.

Methods/Materials
aprons, beakers (100, 250, 600), blender, bunsen burner, cages, crickets, German cockroaches, goggles, grape tomatoes, hot plate, hot plate dish, hot plate tongs, Lycropersicon hirsutum f. glabratum seeds, Mill worms, Petri dishes, screen, stirring rods, test tube, thermometer, Walgreens bug repellent
Evaporation-1.Get all the juice out of the tomato, cutting it into small pieces and pushing repeatedly before straining. 2.Put the hot dish full of tomato juice on plate. 3.Use the hot plate to boil the juice to 150°C. 4.record the volume of the distillate. Set to cool.
Testing for results. 5.Put the compound onto a napkin; put it into cages, containers, or jars with the insetc, all in their separated cages. 6.Observe the time that this effect lasts and the insect's reaction to the compound. 7.Repeat trials.8.We will follow the steps 5-7 but this time, DEET will be substituted for the compound. 9.Compare the compound, control, and DEET.
Control-1.Set insects into the cage or jar with just the napkin.
2.Observe how long until the insects touch napkin.
Growing the Lycopersicon hirsutum f. glabratum- 1.Three 500 ml plastic containers are in use. Place three seeds in each one. 2. Water twice daily with 100 ml water in each pot.

Results
The crickets did not seem to be greatly effected by the grape tomato compound. Though it lasted longer than the control, it did not last nearly as long as the DEET . The tomato compound repelled the crickets for at least 10 minutes at every trial. The roaches seemed to not have liked the tomato compound.

Conclusions/Discussion
The HPLC#s results showed the toxicity level was low, and they were organic and safer than DEET. DEET#s graph showed that it was unstable and had a high level of toxicity that was hazardous to us. The oily compound is not absent from the grape tomato, but it seemed that not as much is there as in the Ecuadorian tomato as proven by the elapse time it repelled the insects. Our grape tomato did not even last half as long as the DEET product. Even though the grape tomato had not been a long repellent, it is still far much safer than DEET.

Summary Statement
The purpose of this project is to find a safe bug repellent that can be found locally and in turn will be an alternative to bug repellent with DEET.

Help Received
Mrs. Evans helped by lending us her equipment. Dr. Clyde Sorenson gave us the tomato seeds.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lusha W. Liang

Project Number
S1413

Project Title
The Antioxidant Effect of Vitamin E on Plant and Animal Tissues

Abstract

Objectives/Goals
The objective of this experiment is to study the effectiveness of vitamin E on the reduction of oxidation of plant and animal tissues by an oxidizing solution in a controlled environment.

Methods/Materials
I soaked one rose petal in oxidizing solution (H(2)O(2)) and soaked another in oxidizing solution but stirred in water soluble vitamin E gels. A rose petal was also submerged in H(2)O, another in H2O with vitamin E, one in H(2)0 and starch, and the last in H(2)O(2) and starch. I then observed the damage of each rose petal underneath the microscope, took a picture, and estimated the percentage of damaged areas. The same was done for fresh salmon tissue. The color changes was measured quantitatively using the HSV color wheel.

Results
At most, the rose petal soaked in vitamin E and H(2)O(2) solution was 58.7% less damaged than the rose petal soaked in H(2)O(2) alone. The presence of vitamin E in an oxidized solution reduced the effect of H(2)O(2) by about 29% for the salmon fish tissues. The presence of starch also had an effect of reducing the amount of damage from the oxidizing solution.

Conclusions/Discussion
Since the human body is such a complicated system with an extremely large number of variables, scientists carrying out studies lasting a few years still have difficulty in isolating the antioxidant effects of Vitamin E. The results of my experiment demonstrate the effectiveness of Vitamin E as an antioxidant in an controlled environment. The rose petal submerged in the solution containing vitamin E and H(2)O(2) was less affected by H(2)O(2) than the rose petal submerged in H(2)O(2) only. Plant and animal tissues in a solution of starch and H(2)O(2) were less affected by oxidation than the plant and animal tissues without starch, but more damaged than the plant and animal tissues with vitamin E and H(2)O(2). Therefore, the properties of Vitamin E were a factor for less damage on the rose petals and salmon tissues. The majority of my hypothesis was proven. However, I understimated the effect that the presence of starch would have on reducing the effect of oxidation.

Summary Statement
The objective of my experiment is to establish a simple and controlled environment in which the effect of Vitamin E on the reduction of the oxidation of plant and animal tissues will be clearly measurable.

Help Received
My father helped to edit the report and buy the supplies required for the experiment.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Patrick R. Mullens

Project Number
S1414

Project Title
Organic Pest Control: Broccoli Extract Controls Root Knot Nematodes

Abstract

Objectives/Goals
The objective of the project was to see if broccoli extract could control damage to cowpea plants by root knot nematodes.

Methods/Materials
Cowpea seeds were planted in growth pouches. A 5% broccoli extract solution was made by combining water and chopped broccoli. This was incubated at 30 C for 5 days and then diluted and added to nematodes for the various treatments. Meloidogyne incognita eggs were extracted from tomato roots and allowed to develop into juveniles. The treatments, each with four replicates, contained 0, 0.5, 1, 2, or 4% broccoli extract and approximately 1700 root knot juveniles per plant. Eleven days after planting, the plants were inoculated with these treatments. The number of root knot galls per plant was counted 1 week after inoculation. Nematodes were also put into the various concentrations of extract and checked for motility after 10 minute, 30 minute, 60 minute and 24 hour periods.

Results
The motility counts showed that the broccoli extract was harmful to nematodes. The 0 and 0.5% concentrations showed very little change over time, but the final 24 hour count of the nematodes in the 1, 2, and 4% extract solutions showed large decreases in motility. Nematodes in higher concentrations of broccoli extract caused fewer root knot galls than the those in lower concentrations or the treatment without broccoli extract. The average number of galls for the 0% concentration was over 120, and the average number of galls for the 4% concentration was under 40.

Conclusions/Discussion
The experiment showed that broccoli extract is an effective means of controlling root knot nematode damage in cowpea plants in growth pouches and also showed that increasing broccoli extract concentration decreases motility of root knot nematodes.

Summary Statement
Broccoli extract was used as an alternative to nematicides to minimize root knot nematode damage to cowpea plants.

Help Received
Lab equipment at UCR was used under the supervision of Teresa Mullens; I received advice about using broccoli extract from Dr. Antoon Ploeg; Dr. Philip Roberts let me use growth chamber space and nematode cultures from his greenhouse.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Melinda Ng; Jim Yu

Project Number
S1415

Project Title
Pseudoestrogen Affecting the Gender of Fish

Abstract

Objectives/Goals
The objective is to determine whether high doses of nonylphenol will affect the sexes of the offspring of guppies.

Methods/Materials
Nonylphenol was extracted from saran wrap through boiling, microwaving, and soaking. Boiling and microwaving provided the highest doses of nonylphenol so then those tests were done to fill up two 10-gallon tanks, one from microwaving and the other from boiling saran wrap in water. Then one was left as a control, one had 6ppm/Liter of nonylphenol, and the last one had 8ppm/liter of nonylphenol. Guppies were then introduced into the tanks with 2 males and 4 females. They mated and the offspring were raised separately and then after about a month, their sexes were distinguished.

Results
The more nonylphenol that the guppies were exposed to, the more female babies there were. In the control batch of guppies, we had 16 females to 14 males which gives us a percentage of 53.33% females. In the tank, which contained low nonylphenol, we had a female to male ratio of 21 to 16 giving us a 56.76% of females. In the tank with high nonylphenol, there were 23 out of 37 female guppies, presenting us with 62.16% female babies.

Conclusions/Discussion
Nonylphenol is secreted from heating saran wrap. It is an estrogen mimic that is hazardous to human health leading to breast cancer, low sperm count, mental retardation, premature death, etc. Despite these kinds of consequences, there are no warning label that tells consumers the possible effects of nonylphenol when used a certain way. There is no public awareness that educates people about the harm that could lead to numerous possible health risks in humans.

With our experiment, it showed that nonylphenol feminizes the fish population with higher doses of nonylphenol. This can lead to an environmental disaster because factories leak out nonylphenol into streams and causes more female fishes in that stream. If there are only female fishes in an enclosed area, the fish population can decrease dramatically. Thus, affecting many species that count on fish as food and that in turn will alter the food web leading to a disaster far greater than we can imagine.

Summary Statement
Our project examines the affects of nonylphenol in the male to female ratios in guppies.

Help Received
Dr. Cheryl Moody helped measure the amounts of nonylphenol in tested water; Dr. Sarah Palmer helped brainstorm ideas; Mr. Greg Martinez gave us lab equipment; Used Lawrence Livermore Lab's facilities.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Tiffany A. Ornelas

Project Number
S1416

Project Title
The Cardiovascular Effects of Ephedra on a Cyprinid Fish

Abstract

Objectives/Goals
To find detrimental effects of ephedra on goldfish and how these effects translate to larger vertebra organisms like human beings. Also, find the dosage of Children#s Supedrine(nasal decongestant including chemical form of ephedra)that cause increase heart/breath rate & dramatic long-term effects.

Methods/Materials
Baseline study, goldfish are tested absent of drug to find normal heart rate & tested after being put in a plastic cup of water with 5cc of suphedrine. I place a fish in each cup and weigh each fish using scale to find the weight. Using microscope to count the cells passing a chosen spot on the fin for 30sec, I measure the heart rate of each fish before/after given suphedrine. I place a fish inside a cotton ball with its fin exposed, and place it on microscope. I measure breath rate by counting the times the operculum opens/closes in 15sec and multiply it by 4 for breath/min. I put 4cc of suphedrine in each cup w/dropper.

Results
The heart rate of the fish sped up after given suphedrine since the effects of ephedra are attributed to alkaloid ephedrine, which produces central nervous system stimulation & rise of blood pressure. The max dosage that fish can take is 4cc of suphedrine since 5cc is an overdose. Weight has little effect to end results since graphs of the correlation of weight & heart/breath rates don#t reveal any pattern. The base line experiment results in death of 20 fish, but the four extras labeled 1cc, 2cc, 3cc, & 4cc lived since 4cc of suphedrine is the max amount that fish can take. For primary experiment, another 20 fish were tested with 4cc & lived.

Conclusions/Discussion
The effects in the experiment could be used to design future research of larger vertebra as comparative study. These effects could be shown in future study measuring possible longterm detrimental effects to the heart of humans. Other areas to explore could be testing effects of ephedra on other species similar to humans to see relation of over-the-counter drugs on them. Investigating the areas that the FDA produce to extract ephedra from any supplement would lead to ultimate findings as to benefits and dangers of it. Based on the info, it#s believed that ephedra should be regulated. With number of harmful side effects & deaths caused, one should take serious precaution as to taking a product with the ingredient and how much.

Summary Statement
To find the detrimental effects of ephedra on goldfish in order to translate those effects for the benefit of human beings.

Help Received
My parents helped me time the heart and breath rates; my physics teacher, Mr. Lum, gave me advice as to how to go about the experiment and planted the idea of using goldfish as my tests; and biology teacher, Mrs. Houseman, who allowed me to borrow the triple-beam balance and microscope.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Lauren M. Palumbi

Project Number

S1417

Project Title

The Effects of Runoff Toxic Levels on Strongylocentrotus purpuratus Embryos

Abstract

Objectives/Goals

The objective of this project is to assess the potential biohazard of runoff toxins. I measured the effects of Culpic Chloride, Zinc Chloride, and Lead Nitrate on the early development of sea urchins by utilizing bioassay techniques.

Methods/Materials

Methods

13 test tubes, Compound microscope, Fertilized embryos of the sea urchin species Strongylocentrotus Purpuratus, Solutions of Culpic Chloride at 3.15 x 10(-7) molar, 3.15 x 10(-6) molar, and 3.15 x 10(-5) molar, Solutions of Zinc Chloride at 3.82 x 10(-6) molar, 3.82 x 10(-5) molar, and 3.82 x 10(-4) molar, Solutions of Lead Nitrate at 1.69 x 10(-7) molar, 1.69 x 10(-6) molar, and 1.69 x 10(-5) molar, KCl solution, Syringe, Observation dishes for microscope, Plastic pipettes, A clock or stopwatch

Procedure

In holding with bio-assay procedure, sea urchin eggs were placed in a test tube of each dilution of the chemicals, including 3 controls. The eggs were then examined under a microscope at 1 hour, 4 1/2 hours, 5 1/2 hours, 17 hours, and 24 hours. The number of embryos dividing and their various stages of development was recorded.

Results

Of the three chemicals used to test toxicity, Lead and Copper were the ones to have the most drastic effect. Copper seemed to create the most disruption in the health of the embryos. This proves that increasing levels of Copper and Lead in runoff water could potentially prove to affect sea urchin populations and therefore disrupt other species dependent on them.

Conclusions/Discussion

The values used in this experiment were taken from the First Flush Report of 2000. Since that time the amount of Copper in the water has risen from 3.15 x 10(-7) molar to 4.7 x 10(-6) molar. In about another five years the amount of copper could rise to 1.5 x 10(-5). That is roughly 953 ppb (parts per billion). It would take about 12 years at an annual increase of 2.2 x 10(-6) molar of copper to reach the most concentrated experimental copper value of 3.15 x 10(-5) or 2002 ppb. All of these values greatly surpass the background concentration of copper in sea water which is 3.1 x 10(-8) molar or 2 ppb.

Summary Statement

The purpose of this project is to asses the potential hazard of runoff water to local marine species and thier reproductive functions.

Help Received

Research done and lab equipment used at Hopkins Marine Station, Monterey. Equipment used under supervision of Dr. Stephen Palumbi. Assistance with board provided by Dr. Julie Alipaz, Katherine Gibson, and Chris Patton.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Joseph A. Policarpio

Project Number

S1418

Project Title

Mus musculus (The Common Mouse) on the Weight Gaining Supplement Muscle Milk

Abstract

Objectives/Goals

In this investigation the objective was to determine if Muscle Milk had a significant effect on the weight or running speed of a mouse.

Methods/Materials

After constructing a cage, the twelve mice were obtained for two months and half were fed Muscle Milk. All mice were given sufficient food and water. All mice's weight, running speed and food and water intake were monitored for a period of eight weeks.

Results

After the two months, the average weight gained by mice on Muscle Milk (mice #1-6) was 21.8 g, while the average gain by mice off Muscle Milk (mice #7-12) was 15.4 g. The average speed of mice #1-6 (mice on Muscle Milk) was 396.24 mm/sec, while the average speed of mice #7-12 (mice off Muscle Milk) was 679.81 mm/sec.

Conclusions/Discussion

In conclusion, Muscle Milk caused weight gain but slowed running speed in the mice tested.

Summary Statement

Testing the effectiveness of Muscle Milk on mice's weight and running speed.

Help Received

Dad helped build cage; Mother and Brother helped record data and clean cage, materials provided by Petco.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Kavita Renduchintala

Project Number
S1419

Project Title
The Effect of Curcumin on B-Cell Leukemia

Abstract

Objectives/Goals
Turmeric is a bitter and pungent herb found primarily in Southeast Asia. Curcumin, turmeric extract, is known for its anti-cancer, anti-oxidative, anti-viral, anti-arthritic, anti-bacterial, and other effects. B-Cell Leukemia, a form of leukemia under the sub-categories of acute lymphocytic and chronic lymphocytic leukemia, can be detected through a test which looks for marker proteins on B-lymphocytes. The objective of this study was to determine if curcumin has the ability to induce apoptopis in B-Cell Leukemia cancer cells.

Methods/Materials
This study consisted of 4 separate procedures. The first procedure involved creating the cancer cell medium by using amino acids, vitamins, penicillin streptomycin glutamine, and fetal calf serum to create an environment for the cancer cells to proliferate in. The second procedure was the creation of the curcumin. Curcumin was mixed with Dimethyl Sulfoxide to create a liquid solution. The third procedure involved the lab setup. 6 test tubes were obtained and each was used for a different concentration (in micromolar) of curcumin.The concentrations used were 0, .625, 1.25, 2.5, 5, 10. The cell solution and cancer cell medium were also added to these test tubes proportionately. The last procedure involved obtaining results using a Becton-Dickson FACscan Flow Cytometer.

Results
The results proved that curcumin is effective in preventing the proliferation of B-Cell Leukemia cancer cells. The lower concentrations of curcumin were less effective in preventing the proliferation of the cancer cells than the higher concentrations.

Conclusions/Discussion
In this study, the apoptopic death was indicated by the flipped phospholipid phophatidylserine. Propidium iodide was unsuccessful in determining apoptopic death in some trials because the phagocytic cells hadn't broken the cancerous cells into fragments. Annexin V was used to stain the cancerous cells that were in an early form of apoptosis. Researchers indicate that this is the first time the effect of curcumin has been tested on B-Cell Leukemia. This study proved that curcumin has an ability to induce apoptosis in the B-Cell Leukemia cancer cells. A recent article in the Science magazine discusses curcumin's ability to suppress cystic fibrosis and lung disease. Clearly, curcumin can be used in the future for medical-related research and possible prevention of diseases.

Summary Statement
This project explored the apoptopic death induced by curcumin on B-Cell Leukemia by using Propidium Iodide and Annexin V to examine the death of the cancer cells.

Help Received
Used lab equipment at University of California, Irvine, under the supervision of Dr. Sastry Gollapudi.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Emma S. Richter

Project Number
S1420

Project Title
Caffeine: An "Astro-pharmaceutical" Defense for DNA?

Abstract

Objectives/Goals
To determine whether caffeine's chemical structure could be used to protect DNA against UV-induced damage, thereby reducing cancer risks to astronauts on Mars missions and individuals on Earth.

Methods/Materials
The experiment involved testing four groups of samples of amplified fish DNA (approx. 650 base pairs). One set of caffeinated and uncaffeinated samples were exposed to UV; another such set was not. These sets were run through electrophoresis and then analyzed.

Results
1. Electrophoresis results were inconclusive. In one test, the sample with caffeine exposed to UV "lost" the DNA; in the other test, the analogous sample had DNA, but there was no visible break in the DNA.

2. I learned that my idea was interesting to other scientists and that I could use DNA damage reporter cells containing LacZ under the control of a p53 promoter to test a variety of substances for UV absorption (DNA protection).

Conclusions/Discussion
Although my hypothesis may not have been demonstrated (because my assay and equipment did not allow me to detect DNA breaks of less than 20 base pairs), I now have a better understanding of how I could design and run measurable tests in cells. Thus, my idea of testing chemical compounds for use as "astro-pharmaceuticals" could be a long-term goal, and the start of a career and maybe an industry, in support of manned space exploration and reducing the threat of skin cancer on Earth.

Summary Statement
To test whether caffeine, because of its chemical structure, can shield DNA from UV-induced damage.

Help Received
Marina Ramon, UCSC Ecology and Evolutionary Biology Lab, was my Designated Supervisor and oversaw lab work; Guidance was provided by Dr. Fred Hausheer, of BioNumerik Pharmaceuticals, Dr. Douglas Brash, of the Yale Genetics Department, Dr. Ned Sharpless, of UNC School of Medicine.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Cindy Bich; Diep Vu

Project Number
S1421

Project Title
The Effect of Triclosan on Artemia

Abstract

Objectives/Goals

This project is designed to determine if triclosan, an antibacterial agent found as the active ingredient in common household items such as toothpaste, antibacterial lotion, and soap, affects the size in length of Artemia (commonly known as seamonkeys) over time. Triclosan is washed down the drain and goes into Sewage Treatment Plant water. In this experiment, Artemia are hatched from cysts and raised under concentrations of 1000, 2000 3000, and 4000 micrograms per liter. A control of 0 micrograms per liter is also set up.

Under constants of temperature, amount of food, concentration of salt, and degree of light, I predicted that by increasing the amount of triclosan that Artemia are exposed to, their lengths would decrease. Since Artemia are so small as to be measured in micrometers, they are hard to identify. Thus fifteen of them are randomly selected from each concentration. Pipets were used to suck them out of their concentrations. They were placed in droplets in depression slides that were then put under a video microscope. Along with Motic 1.3 software, the video microscope took pictures of Artemia and measured their lengths from eye to tail.

The results were uncalled for; under concentrations of 2000, 3000, and 4000 micrograms per liter, Artemia cysts did not even hatch. They did survive, however, in 1000 micrograms per liter. The difference in Artemia#s size between that concentration and the control sample was obvious to my naked eye. The difference showed, too, in the actual measurements. Not only did increasing amounts of triclosan stunt Artemia#s growth but it inhibited it completely. There is no great concern now for actual amounts of triclosan ocean water is much smaller. However, species living in unfiltered lakewater may be victim to an antibacterial we as humans wash down the drain as we wash our cars.

Summary Statement

The effect of an antibacterial agent on brine shrimp.

Help Received

Teacher got my board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Geoffrey H. Woo

Project Number
S1422

Project Title
The Effects of Piezoelectric Ultrasound on the Transportation of Molecules across Membranes

Abstract

Objectives/Goals
In this project, cavitation and pressure created by ultrasonic acoustic waves were hypothesized to increase the transfer rate of molecules even if they normally would not cross membranes. By increasing the wattage levels controlling these mechanisms, the rate was thought to be directly increased. The goal of the experimentation was to determine if piezoelectric ultrasound was an effective mechanism for driving particles under biological conditions.

Methods/Materials
Ultrasound was applied to a variety of different sized molecules, forcing them through a selection of membranes with biological pore sizes. The transfer rates for different molecules were determined by measuring the amount of resulting fluids under various wattage levels for three minutes. By comparing un-powered particle transfer to transfer with various levels of acoustic power, the efficacy and trends of ultrasound-induced acceleration of particle movement could be observed.

Results
The results of the experiment showed that ultrasound was able to increase the transfer rate of fluids in all cases and also forced specific molecules through membranes when normally it was not possible. The rate of transfer for larger molecules leveled off at higher wattages while the rate for smaller molecules continued linearly. Additionally, piezoelectric ultrasound increased particle movement, even in wattage levels below the cavitation threshold.

Conclusions/Discussion
The experiment showed that piezoelectric ultrasound is effective but has limits in accelerating particles across membranes. Moreover, the pressure from acoustic waves, not cavitation, was found to be the main mechanism for particle acceleration. This is significant since sustained cavitation generates great amounts of heat, thus causing unintentional membrane damage. Ultrasound was shown to be a potentially efficient and non-invasive tool for driving nutrients or medicine into a biological system.

Summary Statement
Ultrasound generated by piezoelectric transducers was determined to be a potentially effective and non-invasive tool for driving molecules across membranes into biological systems.

Help Received
Used lab equipment at UCLA under the supervision of Dr. Putterman

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Melissa A. Mueller

Project Number
S1499

Project Title
Is Gentamicin-Induced Apoptosis in HEI-OC1 Auditory Cells Mediated by LIGHT and LTBR?

Abstract

Objectives/Goals
Gentamicin is an antibiotic used to treat a wide variety of bacterial infections. It causes hearing loss by inducing apoptosis, "programmed cell death," in inner ear sensory cells. An important step of the complex sequence of apoptosis involves caspase-3, one of the members of a family of intracellular cysteine proteases. Upon activation, caspase 3 emits 405 nm wavelength light. The amount of light released indicates the number of cells dying and can be measured with a microplate reader. Although the damaging, irreversible side effects of gentamicin are known, the mechanisms of gentamicin-induced apoptosis are not. The object of my experiment was to investigate the pathway by which gentamicin induces apoptosis in inner ear sensory cells. More specifically it was designed to ascertain whether or not this pathway involves LIGHT and LTBR (receptor). To test my hypothesis that LIGHT and LTBR mediate the pathway, I used a decoy receptor (DCR3) in hopes of inhibiting the binding of LIGHT to LTBR.

Methods/Materials
The experiment was conducted with HEI-OC1 Auditory Cells, a cell line previously developed from the inner ear sensory cells of mice. These cells are sensitive to the proapoptotic activity of ototoxic drugs and thus they provide an ideal in vitro model system for ototoxicity screening. Three groups of these cells were grown and later incubated, one with gentamicin, one with gentamicin and DcR3, and the third with nothing (control). Then a Colorimetric CaspACE Assay was performed. Absorbance at 405 nm was measured using a computer-controlled microplate reader with DeltaSoft 3 ELISA software.

Results
As measured by the microplate reader and as seen by the caspase-3 activity, there was approximately the same amount of apoptosis of cells incubated only with gentamicin and of cells incubated with gentamicin and the decoy receptor, DcR3. The decoy receptor had no substantial effect on the amount of cell death.

Conclusions/Discussion
The results of this experiment suggests that the LTBR signaling pathway is not the major apoptotic pathway involved. Either the LTBR signaling pathway takes no part in the ototoxic side effect of gentamicin or it is working simultaneously with one of the other pathways that mediate gentamicin-induced apoptosis and is the less predominant pathway. This is a significant step toward discovering the exact mechanisms that control gentamicin-induced apoptosis.

Summary Statement
My project is an attempt to learn more about the pathway by which the antibiotic gentamicin induces apoptosis in auditory cells and to determine if this pathway is mediated by LIGHT and LTBR.

Help Received
I used lab equipment at the House Ear Institue under the direction of Federico Kalinec, Ph.D., and Gilda Kalinec, Ph.D., who also provided the cell line. My mother frequently drove me to the lab.