CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Alexa J. Aranjo

Project Number
S1701

Project Title
The Neurological Effect of Ginkgo biloba on the Mouse Hippocampus

Abstract

Objectives/Goals
Pharmaceutical companies have marketed Ginkgo biloba leaf extracts as a memory and concentration enhancer as well as a treatment for Alzheimer's disease and dementia patients. However, there have been numerous studies with varying results about the benefits of G. biloba. My objective was to determine whether G. biloba affects synaptic plasticity via cytoskeletal protein concentrations.

Methods/Materials
Full mouse brain homogenates were treated with different concentrations of a flavone glycoside supplement. The samples' concentrations of cytoskeletal proteins actin and spectrin were found by Western blotting. Acute hippocampal slices were treated in varying amounts of the supplement, and spectrin concentrations were determined via Western blotting. The actin concentration of G. biloba-treated hippocampal neuron cultures was determined via immunostaining.

Results
The results of the full brain homogenate and the acute hippocampal slices Western blots did not show any statistically significant increase or decrease in actin or spectrin concentrations. Similarly, the actin concentration levels in the hippocampal neuron cultures remained constant.

Conclusions/Discussion
Spectrin degradation and actin polymerization have been implicated in dendritic spine changes associated with long-term potentiation. The uniform concentrations of the cytoskeletal proteins in this project indicate that G. biloba extracts do not enhance synaptic plasticity.

Summary Statement
My project determines the effect of Ginkgo biloba on synaptic plasticity via cytoskeletal proteins.

Help Received
Used lab equipment at the University of Southern California with mentoring by Professor Michel Baudry and Homera Zadran.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Easun P. Arunachalam

Project Number
S1702

Project Title
The Use of Pesticides and Their Impact on the Unintended Targets of Their Application

Abstract

Objectives/Goals
Pesticides such as herbicides and insecticides are commonly used in domestic and agricultural settings to control unwanted vegetation and insect life. The goal of my project was to determine the pesticide (Atrazine, Malathion, or Roundup) that causes the most collateral damage to the vegetation in or around the intended target of the pesticide.

Methods/Materials
During the course of my experiment I conducted a total of 60 separate trials: 30 with mung bean (Vigna radiata) seeds and the other 30 with garbanzo (Cicer arietinum) seeds. These seeds were chosen as test subjects for their versatility, availability, and rapid rate of growth. Each trial consisted of four Petri dishes, each of which contained ten seeds. In each trial, the first dish contained a control population (seeds grown in pure distilled water) and the remaining Petri dishes contained seeds along with a solution of one of the three pesticides: Atrazine weedkiller, Malathion insect spray, and Roundup weed & grass killer. The objective was to determine the chemical that had the greatest detrimental effect on the seed populations. This was measured by counting the number of seeds that germinated successfully in the presence of each pesticide and comparing it against the germination of the seeds grown in the control environment. The total sample size of my experiment was 2400 seeds, which offset anomalies and irregularities to an extent.

Results
The results indicate that the decreasing order of the average toxicity to Vigna radiata and Cicer arietinum was: Roundup > Malathion > Atrazine. The concentration recommended by the manufacturer for the application of Roundup (LD(100)) resulted in a 0% germination rate of both types of seeds. Atrazine and Malathion showed nearly identical rates of germination when applied to Cicer arietinum, but Atrazine produced a greater rate of germination than Malathion when applied to Vigna radiata. All three pesticides tested affected seed germination adversely.

Conclusions/Discussion
My results revealed that my hypothesis was incorrect. RoundUp, not Atrazine, was the most detrimental to germination of seeds - the unintended targets of its application.

Summary Statement
The goal of my project was to determine the pesticide (Atrazine, Malathion, or Roundup) that causes the most collateral damage to the unintended targets of its application.

Help Received
I would like to thank my advisor, Ms. Tuason, for her guidance and support. I would also like to thank my parents for helping me obtain the pesticides and taking pictures for the display board.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Meghana Bhimarao

Project Number

S1703

Project Title

Collapsing Cancer Cells: Exploiting the Elasticity and Natural Frequency of a Cancer Cell's Cytoskeleton

Abstract

Objectives/Goals

For many years, scientists have used biochemical and genetic based methods to analyze cancer cells. This project utilizes civil engineering principles to manipulate the elasticity and natural frequency of the tensegrity model of a cancer cell's cytoskeleton. The project takes a new approach to cancer, and uses biophysics to try and collapse the cancer cell's cytoskeleton without harming the healthy cells. The main goal is to find if applying a load equivalent to that of the cell's natural frequency to the tensegrity structure of the cancer cell cytoskeleton can make the cytoskeleton collapse.

Methods/Materials

This project utilized to modeling programs in order to model the tensegrity structures and find the natural frequency. MATLAB was utilized to model the cancer cell's and normal cell's cytoskeleton. Frame 3DD was used to conduct a modal analysis on the cells' cytoskeletons and to find the natural frequency of the cells. The same three nodes of each cells' cytoskeleton were allowed to move while undergoing modal analysis and experiencing natural frequency; that is the control. The natural frequency of the cancer cell and normal cell's cytoskeleton was found, and applied to the models.

Results

The natural frequency of the cancer cell's cytoskeleton is 131 megahertz. The natural frequency of the normal cells' cytoskeleton is 414.8 megahertz. Both cells collapsed under a load equivalent to their respective natural frequencies.

Conclusions/Discussion

Since the natural frequencies of the cancer cell and normal cell were different, if one applies the cancer cell's natural frequency to a pool of cancer and normal cells, only the cancer cell's cytoskeleton would vibrate intensively and break apart. This is important because it can enable doctors to detect cancer much more easily than by using the current methods of looking at the shapes of the cells. If applied on real cancer cells, this approach could be very significant in the path to cure cancer. This project was general because it used a general model for cancer cells, but in the future, the plan is to conduct the same experiment on specific cancer cells, such as leukemia, lung, and pancreatic cancer cells.

Summary Statement

The project is about finding the natural frequency of a cancer cell's cytoskeleton, then making the cancer cell's cytoskeleton oscillate at its natural frequency in order to make the cytoskeleton collapse, thus killing the cancer cell.

Help Received

Bought modeling programs using grant from COSMOS summer program; father helped connect civil engineering program Frame 3DD and MATLAB program together ; learned MATLAB using online teaching guides of Dr. Ellen Kuhl from Stanford University

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Casey M. Campos

Project Number
S1704

Project Title
How Will Diluted Concentrations of Heated Herbicide Affect the Killing of Plants?

Abstract

Objectives/Goals
The purpose of my science fair project was to discover a less toxic and less expensive way to kill unwanted plants by reducing the amount of herbicide used. People should take interest in this experiment because it suggests that they can reduce herbicide amounts with successful results.

Methods/Materials
I approached this experiment using 200 square feet of Fescue sod and reduced amounts of Roundup herbicide concentrate at 75%, 50%, and 25% of the recommended dosage for one cup. Then, mixing in a thermally insulated sprayer to eliminate heat loss, I added one cup of 200 degree water to dilute the concentrated herbicide. Next, I immediately sprayed the mixture onto the sod test trials using three squirts per trial and an over-spray shield. I repeated this process for each heated herbicide concentration. For my control group, I poured one cup of 200 degree water into the thermal bottle without any herbicide and sprayed the trials. Each variable and the control group had 135 trials for a total of 540 test sections. I observed these variables for ten days, recording daily data for each trial.

Results
The diluted mixture at 75% was 98% more effective than the control trials at killing the targeted grass -- these trials also had significant death of surrounding grass indicating the roots were also killed; similarly, the 50% trial was 94% more effective at killing the targeted grass along with surrounding areas; while the 25% mixture was 25% more effective on targeted grass but lacked death of surrounding areas. The control group was least effective as some grass blades were initially scalded, but by the end of the observation period, had totally rejuvenated and showed no signs of discoloration.

Conclusions/Discussion
My conclusion confirms my hypothesis that herbicide temperature plays an important role in its effectiveness. My project contributes significant data to support that the consumer can save money and put fewer toxins into the environment by reducing the amount of herbicide and mixing it with extremely heated water. By using 200 degree Fahrenheit water when diluting Roundup herbicide, the concentration ratio can be reduced by 50% and still achieve desired results: totally killing targeted plant life. This translates to a minimum of a $500 million annual reduction in the net sales of Roundup, and a 50 million pound annual reduction of the herbicide used in the United States.

Summary Statement
Reducing the recommended dosage of Roundup by 50% and mixing the concentrate in extremely hot water is exceptionally effective at killing plant life while saving the consumer money and minimizing chemicals released into the environment.

Help Received
Father helped roll out Fescue sod; Mother helped with display board and took pictures while I did the procedure.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Alyssa N. Cook

Project Number

S1705

Project Title

The Skeleton as an Endocrine Organ: The Effect of Insulin and L-Sulforaphane on Osteogenesis in MC3T3 Preosteoblasts

Abstract

Objectives/Goals

Diabetes is a devastating disease with formidable impact on personal and societal health. Research has indicated that when osteoblasts are treated with insulin (INS), bone is mineralized, producing osteocalcin which is vital to blood sugar control. The purpose of this study is to investigate insulin#s mechanism of effect on osteogenesis in MC3T3-E1 osteoblasts and the influence of PI3K/Akt cellular transcription pathway blocking agent,L-sulforaphane (SFN), on these cells.

Methods/Materials

A pilot study was first done to determine the effective range INS and SFN in MC3T3s. Baseline cell counts were taken. Treatment with SFN was done at concentrations of 0uM (control), 1uM, 3uM, 5uM, 10uM, and 15uM. Treatments with INS at 0nM (control), 1nM, 3nM, and 10nM were performed separately. Final counts for each treatment type were performed for proliferation and differentiation at 2 weeks. The results indicated a negative response for all concentrations of SFN and a highest positive dose response for INS at 3nM. Results were used to design the Main Project where six different concentrations of SFN from the pilot were tested against 0nM and 3nM INS. Four replicates were done for each treatment type, with controls for each variable. Amount of differentiating cells was measured weekly and compared to controls and baseline. Relative mineralization at endpoint (21 day) for each treatment was determined by Von Kossa stain and extraction of Alizarin Red.

Results

For the Main Project, differentiation was higher in the INS groups with no SFN. The 3nM insulin group had more differentiation than the 0nM insulin group. The additional of SFN to both 3nM and 0nM insulin groups caused a dose-dependent reduction in differentiation. Mineralization and bone formation were also higher in the 3nM INS group compared to the 0nM insulin group. SFN decreased bone formation and mineralization for both INS dosages. No change in proliferation counts were seen from baseline.

Conclusions/Discussion

INS increases differentiation and mineralization in MC3T3-E1 osteoblasts. PI3K/Akt transcription pathway blocking agent SFN diminishes these effects in a dose dependent manner. Increasing INS concentration over the control only partially mitigated this effect. The results support the hypothesis that INS is osteogenic in MC3T3-E1 osteoblasts, and that the mechanism of this osteogenesis is through the PI3K/Akt transcription pathway.

Summary Statement

This novel study is an investigation into the osteogenic effect of insulin, and the ability of a PI3K/Akt pathway blocking agent, L-Sulforaphane, to diminish this effect.

Help Received

Dr. Gardiner provided lab facilities; Jeffery Hoshiko assisted with calculations.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Avenlea Gamble; Alisa Smith

Project Number

S1706

Project Title

How Are Native Mendo Co. Stream Invertebrates Affected by Four Common Pollutants Used in Illegal Marijuana Grow Sites?

Abstract

Objectives/Goals

Our objective was to see how four common pollutants (diesel fuel, pesticides, fertilizer, and fungicides) used by illegal marijuana growers affects the stream organism, Daphnia Pulex.

Methods/Materials

We used: Spring water, Daphnia Pulex, plastic containers, a microscope, slides, pipettes, pesticide (AzaMax: Botanical incecticide, miticide, and nematicide), fungicide (Serenade Garden: Disease control), fertilizer (Grow More), diesel fuel, and rubber gloves.

We did our tests by placing the Daphnia into containers of water mixed with the designated chemical and observing them under a microscope after two thirty minute intervals. For one set of tests, we moved the Daphnia into clean water for an additional 24 hours and then observed what happened to them. For the other set, we left them in the chemical solution for 24 hours straight and then observe their behavior.

Results

Overall, 79 of the original daphnia 160 Daphnia tested in chemicals survived during the duration of the experiment. All 40 of the 'control' Daphnia survived. During short-term exposure to the chemicals, the fungicide killed two of 30 daphnia throughout all five trials. All 30 of the Daphnia exposed to the diesel fuel died, five died when tested with the pesticide, and 19 were killed when tested with the fertilizer.

During the long-term exposure trials, the fungicide killed two of the ten tested Daphnia, nine were killed by the diesel fuel, six were killed by the pesticide, and the fertilizer killed all 10 of the tested Daphnia.

Conclusions/Discussion

All of the chemicals we tested during this experiment affect the Daphnia in some way. The diesel fuel slowed their heart rates and their bodies down before killing them. The fertilizer, on the other hand, simply killed them. Some of the Daphnia's heart rates were sped up far above normal after being exposed.

In a real life situation, the Daphnia that weren't killed from the chemicals probably wouldn't have a good chance of survival. The ones that were slowed down or got stuck in the chemical wouldn't be able to find food, reproduce, or run away from predators. In addition, since the chemicals are so toxic to the Daphnia, we believe that it is possible that this toxicity would pass upwards through the food chain.

Summary Statement

Our project is about the affects of four commonly used chemicals by illegal marijuana growers on the stream organism, Daphnia Pulex.

Help Received

Our teacher helped us order that supplies necessary for the project.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Kaitlyn R. Grayson

Project Number
S1707

Project Title
Attack of the Killer Pesticide!

Abstract

Objectives/Goals
My goal was to determine what common garden plants had the best resistance to a common pesticide and prove what harm could be caused to plant life by applying excessive amounts of pesticide.

Methods/Materials
Materials
1 gallon plastic milk jug with cap, everything cleaned out of both, for mixing chemicals
1.92 cups malathion
14.08 cups water
93 plastic party cups (18 oz)
31 annual Alyssium Plants
31 Iceplants (PBS)
31 perennial Baby Sun Rose (red apple) Plants
10 plastic garbage bags
Worktable
4 Markers of different colors
Funnel
Measuring cups w/ milliliter markings

Results
According to the data, the hypothesis and prediction were both proven correct. This means that certain types of plants may be more effective at resisting pesticide runoff than others and that iceplant saturated with pesticide runoff with 12% malathion, will still be alive in 5 days.

Conclusions/Discussion
According to the data, the hypothesis and prediction were both proven correct. This means that certain types of plants may be more effective at resisting pesticide runoff than others and that iceplant saturated with pesticide runoff with 12% malathion, will still be alive in 5 days. It was the hardiest plant in this study, which means that it can be more easily cultivated in the conventional means than the other plants in this experiment. The broader implications of the results are that use of malathion on plants can be very hazardous to their health as well as our own.

Summary Statement
My project is about how resistant different species of plants are to a common pesticides and the harm done by using it to try and protect the plants.

Help Received
My father helped pour the malathion into the mixing jug due to the toxic fumes.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Tauna Hincker; Miranda Moog

Project Number
S1708

Project Title
Plant Damage.com

Abstract

Objectives/Goals
The goal of our project is to determine if Wifi radiation affects the growth of plants (specifically marigolds, grass, and radishes).

Methods/Materials
We set up two identical growing conditions, including same temperature, light source, and water. But then one of the location would be exposed to Wifi radiation, and the other will have no traceable Wifi in the air. We will then track the growth of the two plants will compare them.

Results
We found that the Wifi did affect the growth of the plants. It stunted the growth of the marigolds significantly, and the others a little bit too. Although we then did a paired T test and found that the differences were not significant.

Conclusions/Discussion
We were very fascinated by our topic, and although we didn't have enough time to do our experiment this year, we would definably like to further our research in the future. And also what it does to humans, to see if it effects plants and humans the same.

Summary Statement
Our project is to test if Wifi radiation affects the growth of plants, speficically marigolds, grass, and radishes.

Help Received
Our science teacher Erin helped proofread.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Siu Kwan D. Ho

Project Number

S1709

Project Title

Surgical Management of Burned Feet Contractures: Reconstructive Release Resulting from Various Surgical Aspects

Abstract

Objectives/Goals

Burn wounds frequently scar and cause long term complications. Burn scars on the feet and toes may contract, and distort the tissue underneath to prohibit natural function. Various treatment techniques are available, yet the procedure undertaken by the patient is chosen by the individual surgeon. By comparing previous manuscripts on the surgical management of this issue, a compilation of data was created and analyzed in order to create a recommendation for treatment of this issue with the best overall result to the burned foot.

Methods/Materials

Articles and manuscripts were found using OvidSP Medline, and collected from University of Michigan#s Taubman Health Sciences Library. Summaries were made on each article. Procedural, patient, and post-operative data was recorded in charts.

Results

By reviewing past medical records at the Shriners Burns Institute from 1986 to 1990, 68 children were documented with regards to the functional and aesthetic results of reconstructive surgery to the foot. Certain complications include gross hyperextension, subluxation of toes, syndactyly, abnormal gait, growth deformities, and a loss in range of motion. Burn patients are recommended to have respiratory and nutritional support, followed by early surgical excision, grafting, and splinting. We are 99% confident that the population proportion of all patients that undergo early excision therapy who require a reconstructive procedure lies between 0.919 and 0.308, while that of patients that undergo conservative therapy is between 0.141 and 0.219. We are 99% confident that the population proportion of all patients that undergo 3 point splints and still require a reconstructive procedure lies between 0.168 and 0.572, while that of patients that undergo conservative therapy is between 0.0144 and 0.286.

Conclusions/Discussion

Early excision therapy for burns is found to lower complication rate in burn scars compared to conservative therapy. Skeletal suspension is not recommended, though the Ilizarov wire suspension apparatus can be used to correct burn scar contractures. Small burn scar contractures can be corrected easily with a z-plasty or flap. It was found that by releasing both the longitudinal and transverse arches, the average interval for a recurrence surgery in prolonged.

Summary Statement

Due to flexibility in medical treatment of burn scar contractures on the foot, this epidemiological study uses statistics to provide a recommendation for the surgical approach to this problem.

Help Received

Dr. Paul Cederna, for giving me the opportunity to stay at the Biomedical Sciences Research Building. Dr. Melanie Urbanchek, for providing me so many chances to gain laboratory experience in my three week stay. Nicole Castagno, for spending the time to instruct me in various lab procedures, such as H&E stains.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
John J. Jankowski

Project Number
S1710

Project Title
Fortifying the Cell's Defenses: The Effects of Fish Oil on Cell Membrane Strength

Abstract

Objectives/Goals
This project is designed to discover if the incorporation of the essential omega-3 fatty acids found in fish oil can help increase the strength of the membrane system of breast tissue cells. This project could add to the growing list of benefits of fish oil supplements.

Methods/Materials
I made six solutions of increasing salinity in 15 ml test tubes and then doused one set of cells with fish oil and let them incubate for 10 minutes. I then placed all of cells in saline solutions. I then let the cells incubate for 10, 20, 30, 45, 60 and 90 minutes and I took pictures at each of these intervals. I then used GNU Image Manipulation Program (GIMP) to measure the cells.

Results
After 60 minutes of incubating, the cells with fish oil added to them were 66.95 Aμm2 smaller on average than the ones without fish oil, at a concentration of 50 mM. At the opposite end of the spectrum, the cells with fish oil added to them were 126.27 Aμm2 larger on average at a concentration of 300 mM. This suggests a model of a cell membrane that resists change less easy and is therefore stronger. Most of the cells had p-values of 0.04 or lower which suggests a significant difference between cells without fish oil and cells with fish oil.

Conclusions/Discussion
The strength of the cell membrane seems to be strengthened significantly by the addition of fish oil. This is helpful to the cells because the majority of functions in a cell depend on the membrane system. Human cells are divided internally by membranes and also have a plasma membrane to separate them from extracellular fluid. Membranes carry out many functions in cells from carrying food to containing waste. The strength of the cell membrane therefore helps these functions by preventing a weak membrane or insufficient membrane. The strength of the cells in the area of breast cancer may have an effect on the spread of prevention of breast cancer, but extensive research is needed in that field if any conclusions are to be made. The strength of the membrane could also help the tissue cells resist infections.

Summary Statement
My project is designed to test the strength of cells after incorporation of fish oil to see potential health benefits

Help Received
Used lab equipment at UC Berkeley under the supervision of Dr. Gary Firestone

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Justin F. Jorge

Project Number
S1711

Project Title
Natural Spider Repellents

Abstract

Objectives/Goals
The purpose of this experiment is to measure the repellency of two natural substances, wasabi and bitter melon, on cellar spiders (phocus phalangioides), and to run statistical comparisons of these measurements against that of a consumer-ready natural spider repellent, StarBrite Spider Away, whose main ingredient is peppermint. My experiment also tests spiders' reaction to spicy and bitter substances.

Methods/Materials
Using curling ribbon, I made a 270 by 270 cm test grid with 64 30 by 30 cm and 8 30 by 60 cm tiles. I made the wasabi repellent by dissolving the wasabi powder in water and mixing it with baking soda. The bitter melon repellent was made by blending the bitter melon and mixing the blend with water. I ran one test with 8 different spiders per repellent including the control. For each test, a repellent was painted onto every other tile of the grid. Water was applied to remaining tiles. I let a spider crawl from the center of the grid and, with a chess timer, recorded the time spent in both liquids within 30 seconds.

Results
For the control, the total seconds spent were 154 in water and 86 in the repellent, with a P-value of 0.0000126. For the bitter melon test, a total of 82 seconds were spent in repellent against 158 in water, with a P-value of 0.0000154. For the wasabi test, the total seconds spent were 135 in water and 105 in the repellent with a P-value of 0.018.

Conclusions/Discussion
Quinine content in bitter melons is thought to be its main source of bitterness. Also, an experiment suggested that it elicits a response from spiders. Isothiocyanates are used as wasabi plants' defense from animals that want to eat them by irritating their eyes. My data suggests that both the wasabi and bitter melon repellents worked as spider repellents (the spiders spent a significantly more amount of time in water) with the bitter melon's results similar to the control, Starbrite Spider Away. My ANOVA test suggests that my own repellents are not significantly different in repelling properties than the commercial repellent.

Summary Statement
My project tests the spider repellency of bitter melon and wasabi to that of a consumer ready natural spider repellent.

Help Received
Statistics teacher supervised me with the statistical analysis of data.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Karley Lassley

Project Number
S1712

Project Title
Which Local Plant Extracts Will Be an Effective Pesticide on Mosquito Larvae and Still Be Safe for Other Aquatic Life?

Abstract

Objectives/Goals
The purpose of my science project is to determine if local plant extracts will kill mosquito larvae and still be safe for other aquatic life. The reason I am doing this project is to find a natural pesticide for mosquito larvae that will not cause harm to other living creatures in our environment.

Methods/Materials
To make my plant extracts for testing I will take plant cuttings (2 cups)from test plants and blend with 30ml water then strain through cheese cloth. For my control I will place 10 mosquito larvae in a container filled with water. In my next test I will place 10 mosquito larvae in a container filled with 15% oleander extract and 85% water. In the next test I will place 10 mosquito larvae in a container filled with 5% oleander extract and 95% water. In the next test I will place 10 mosquito larvae in a container with 15% chrysanthemum extract and 85% water. In the next text I will place 10 mosquito larvae in a container with 5% chrysanthemum extract and 95% water. I will repeat all of these tests using 10 frog eggs in place of the mosquito larvae. I will check and count live larvae/frog eggs every 8 hours for 120 hours to determine toxicity of the plant extracts.

Results
The results of my science project; which local plant extracts will be an effective pesticide on mosquito larvae and still be safe for other aquatic life? were that of the variables used, neither chrysanthemum or oleander extract would be a safe pesticide to use in our ponds to kill mosquito larvae.

Conclusions/Discussion
After completing my project I found that my hypothesis for both oleander and chrysanthemum were incorrect. While both were very effective in killing the mosquito larvae; both substances also damaged the frog egg sacks. I feel further testing needs to be done to find a more environmentally friendly pesticide that will kill mosquito larvae and not harm the other aquatic life in our waterways.

Summary Statement
It is my goal to determine if a local plant extract will be an effective pesticide against mosquito larvae and still be safe for other aquatic life in our waterways.

Help Received
UC Davis supplied mosquito larvae and mosquito information; Mom helped with typing and took pictures

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Alexander J. Lu

Project Number

S1713

Project Title

The Role of the Parabrachial Nucleus in Regulation of Cardiac Sympathoexcitatory Reflexes Evoked by Bradykinin

Abstract

Objectives/Goals

The objective of this study is to characterize the role of the parabrachial nucleus (PBN) in regulating sympathetic cardiac reflexes during myocardial ischemia.

Methods/Materials

In fifteen sinoaortic-denervated, vagotomized, and anestheisized cats, 0.1-3 µg/ml of bradykinin (BK) was applied to the epicardium of the heart to evoke the reflex responses. Then, 50 nL of non-specific glutamate receptor-antagonist Kynurenic acid (Kyn) was microinjected into the PBN followed by three repeated BK applications. Blood pressure and renal sympathetic nerve activity (RSNA) are recorded throughout each experiment. Chicago Sky Blue was microinjected at the Kyn injection site and the brain is removed for histological analysis to confirm our results.

Results

The BK-evoked reflex responses were attenuated by an integrated mean of 48% in mean arterial blood pressure (MAP) and 56% in RSNA 25 minutes after microinjection of Kyn into the PBN. The changes in RSNA confirm our changes in blood pressure because the renal sympathetic nerve innervates the renal artery and kidney, which strongly influences blood pressure. All microinjections were accurately placed into the PBN.

Conclusions/Discussion

The strong correlation between attenuation in RSNA and MAP confirms the significance of the non-specific glutamate blockade in the PBN with relation to regulating cardiac sympathetic response during myocardial ischemia. I concluded that the BK-evoked sympathoexcitatory reflexes are regulated by PBN neurons through the glutamate receptor mechanism.

Summary Statement

My project has found a new pathway regulating cardiac sympathetic reflexes, which will eventually be used to create new drugs to counter life threatening cardiac reflexes during ischemic episodes.

Help Received

I would like to thank the Dr. Liang-wu Fu and Dr. John C. Longhurst for letting me work at their lab under their supervision. All equipment used is property of the UCI Department of Medicine.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Eric M. Machado

Project Number
S1714

Project Title
The Effect of Acai Berries on Tenebrio molitor Immunity

Abstract

Objectives/Goals
The purpose of the experiment was to see whether a diet inclusive of acai berries has an effect on the immune system.

Methods/Materials
This was tested by obtaining six groups of thirty acai berries. Three groups were fed oatmeal and three were fed acai berry powder along with oatmeal. One group of each type of worm, oatmeal-fed and acai-fed, was injected with water, one with E. coli, and one was not injected. The groups of mealworms were then observed for five days and their deaths were recorded.

Results
After the observation was completed, it was determined that the first two comparisons, the two control groups (no injection), and the two water injected groups, did not show a significant difference in life span. However, the third comparison, between the E. coli injected mealworms, did show a statistical difference. Those that were fed acai berry powder died sooner than those fed just oatmeal, and this comparison produced a p value of .032, which passes the two proportion Z-test.

Conclusions/Discussion
After this data collection, I determined that the acai berries must have acted as fuel for bacteria growth, hence the shorter life span for those fed acai berry powder. Therefore, acai berries do not increase immunity, but they actually decrease it.

Summary Statement
The project is testing to see whether acai berries improve immunity.

Help Received
A registered nurse injected the mealworms for me.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Katia A. Mafra Spencer

Project Number
S1715

Project Title
Does SPLAT DMDS Repel Bees?

Abstract

Objectives/Goals
The objective of my experiment was to determine whether beneficial insects, specifically pollinating bees, were also repelled by SPLAT DMDS. This product was developed to keep the Asian Citrus Psyllid (ACP), the vector of the bacteria that causes the deadly Citrus Greening disease, away from citrus plants.

Methods/Materials
I used a choice test to determine the effect of SPLAT DMDS on bees. I used eighteen Petri dishes and nine beehives. At each hive, I created a station, two Petri dishes filled with a vanilla-scented saturated sugar solution, to trigger bee activity and visitation at the Petri dishes. Once bee visitation was consistent, I added the testing product (either a table spoon of Ammonia #as a positive repellent control, or a spoonful of SPLAT # the test substance) to one of the Petri dishes at each station. Every ten seconds, I took a photograph of each station so I would be able to collect my data at the end of the day. To collect my data, I counted the number of bees that visited each dish and then found the average of the bee visitation per treatment.

Results
I found that ammonia has a 95 percent repellency on the bees, whereas SPLAT DMDS reduces bee activity by 36 percent.

Conclusions/Discussion
SPLAT DMDS is a product that is being developed to keep the Asian Citrus Psyllid (ACP), the vector of the bacteria that causes the deadly Citrus Greening disease, away from citrus plants. Citrus greening is a fatal and incurable disease that is devastating the Florida Citrus industry. Freshly applied SPLAT DMDS has a very high dose of the repellent, however in a real field situation it would be sitting there for up to three months emitting DMDS and repelling the psyllid. Because the dose of the DMDS decreases over time, the fresh SPLAT represents the worst case scenario in bee visitation reduction. The repellency of the ACP might be so beneficial to the protection of citrus groves that this small, momentary reduction in bee visitation detected in my experiment would be an acceptable side effect.

Summary Statement
Choice tests demonstrate that SPLAT DMDS, an Asian Citrus Psyllid repellant, has a low repellency on bees.

Help Received
Father was advisor; UCR provided beehives; ISCA Technologies provided SPLAT DMDS samples

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Leslie Magana

Project Number
S1716

Project Title
Cup O' Joe for Vertebrates and Invertebrates: Caffeine's Effect on Fish and Crickets

Abstract

Objectives/Goals
My objective was to see how vertebrates and invertebrates react when exposed to small doses of caffeine. I expect to see heightened activity in fish opercula movement and cricket chirping.

Methods/Materials
3 goldfish, 30 crickets, caffeine pills (Walgreens 'Stay Awake' Caffeine Tables), 2 cricket cages and 3 goldfish bowls, water (2.5 cups), 2 small containers for cricket drinking source, pill cutter, and stopwatch. Separate fish and crickets into separate bowls and cages, respectively. Set one minute on the stopwatch and count how many times the fish opercula moves. Do the same with crickets, but count chirps. Five rounds, a minute each, for each fish and cricket group. In a cup of water, dissolve one-fourth of a caffeine pill. Give half the cup to one fish, after 5 minutes begin to count opercula movement (same five round process). Do this for each fish. Fill the small cricket drink container with 2 teaspoons of the caffeine solution and place in cage. Once crickets have come in contact to the caffeine solution, wait five minutes and count chirps (same five round process).

Results
Rates of fish opercula movement and cricket chirping were higher with caffeine exposure: average of 104.3 opercula flaps/minute (with caffeine) compared to 74 among fish with no caffeine; and an average of 97.6 chirps/minute among crickets exposed to caffeine, compared to 45.9 in the control cricket group.

Conclusions/Discussion
After given caffeine and taking account for standard error, the vertebrates (fish) and invertebrates (crickets) had a significant response to the caffeine. This indicates that my hypothesis was correct--the average rates more than doubled for cricket chirps, while fish experienced an about 25% increase. While caffeine exposure tests were being done, the vertebrates would squirm much faster around in their bowls and the invertebrates would start to excitedly jump and chirp. The results are important because as Americans continue to consume more and more caffeine in their coffee and energy drinks, the effects on small animals can be large if people are not careful with the disposal of the leftover drinks and/or containers that may end up in parks, lakes, and oceans, the places animals like fish and crickets depend on as habitats.

Summary Statement
An experiment on the effects of caffeine on fish and crickets.

Help Received
Brother helped with Microsoft Excel graphing; mom helped with board; science teacher helped with data analysis.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Lyndsey Marsh; Elizabeth Mazeika; Tanya Treshinsky

Project Number

S1717

Project Title

It's a Rat Race: The Effect of 5-Hour Energy Drink

Abstract

Objectives/Goals

Our experiment investigates the impact of an energy drink that claims there is no crash. We decided to test the claims of 5-Hour Energy Drink.

Methods/Materials

Materials: 1. 3 mice (1 control mouse, 2 experimental mice); 2. Wooden maze; 3. Timer; 4. Eye dropper; 5. Treat for end of maze (to encourage them to go forward); 6. A bottle of 5-hour energy drink; 7. Gate to prevent backwards movement.

Procedure

**** WARNING MICE WILL NOT BE FED BEFORE THEY RUN (so that they go for the treat) ****

1. Give each mouse .1mL of 5-hour energy via an eyedropper in their mouth. Wait 10 min between each new mouse. 2. Put 5 unsalted sunflower seeds at the end of maze to give the mice a reason to run. 3. Put a mouse in the maze at start. 4. Put plexi-glass cover on top of maze in case of mice jumping or climbing out of maze. 5. Time mice as they run through maze. 6. Record each time. 7. Test mouse every hour for 6 hours (the mice will rotate every 10 minutes). 8. Do steps 1-5 for each mouse. 9. Repeat steps 1-6 every testing.

Control Mouse!

****WARNING MICE WILL NOT BE FED BEFORE THEY RUN ****

1. Put treat at the end of maze to give the mice a reason to run. 2. Put a mouse in the maze at start. 3. Time mouse as they run through maze. 4. Record each time. 5. Test mouse every hour for 6 hours. 6. Do steps 1-5 for each mouse. 7. Repeat steps 1-6 every testing.

Results

We discovered that although the mice had energy when in the cage, their times decreased when set into the maze and told to run. As the test wore on they fell asleep in the cage. Sometimes they would refuse to move and just sit in a corner for up to five minutes when we stopped the test. Our test mouse, Satan, ran an average of 01:33.6. Our two test mice were Tequila and Jersey Mike. Tequila had the average of 00:41.0. Jersey Mike had the average of 01:00.4.

Conclusions/Discussion

From our results we have concluded that energy drink did not help them perform better when running in the maze. All the energy drink did was made them overactive when in the cage, until exhausted, they fell

Summary Statement

We tested the validity of the no crash claim of 5-hour Energy Drink.

Help Received

Mother looked over report; Father helped build maze

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Jorie A. Moore

Project Number
S1718

Project Title
Investigating the Effectiveness of Indigenous Plant Solutions in Inhibiting Leaf Gall Insect Development

Abstract

Objectives/Goals
The goal of this project is to determine the effectiveness of indigenous plant extracts on the development of petiole gall aphids without harming the environment.

Methods/Materials
200 petiole galls from the poplar cottonwood tree were collected. Three different indigenous plants were tested; jimson weed, stinging nettle, and tobacco plant. There was a control with water and a control consisting of extract from the cottonwood tree. After seven days of being sun-tead, the pesticides and controls were sprayed on split open petiole galls within containers. The aphids were observed for one day. Afterwards a field test with the same variables was conducted to test the effectiveness in the natural environment. The trees were sectioned off where the different variables were to be sprayed without opening or disturbing the petiole galls. The results were observed over one day.

Results
After one day of testing the controls in the lab and field test were 100% of the aphids alive. The field results are: stinging nettle- 42% alive, jimson weed- 74% alive, tobacco- 56% alive. The lab results are: stinging nettle- 86% alive, jimson weed- 50% alive, tobacco- 90% alive.

Conclusions/Discussion
All of the pesticides were effective in both the lab and field tests but all of the pesticides were more effective in the field test. Jimson weed was the most effective pesticide in the lab test and stinging nettle was the most effective in the field test. Tobacco was the least effective in the lab test with 90% survival rate while having a 56% survival rate in the field test. Overall the pesticides were effective, more so when tested in the petiole gall aphids# natural environment than in the lab test with direct contact.

Summary Statement
In my project I found that certain indigenous plant solutions are effective method of controlling pests in the environment without compromising the health of the ecosystem.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Suchith R. Nareddy

Project Number
S1719

Project Title
Longevity and Diet: Studying the Relationship between Caloric Intake, Dietary Manipulation, and Life Span in Drosophila

Abstract

Objectives/Goals
The objective of my project was to observe the quantitative effects that caloric restriction, rapamycin and resveratrol supplementation, and intermittent starvation had on lifespan in Drosophila Melanogaster.

Methods/Materials
1 Live Drosophila Melanogaster Culture
18 Drosophila Culture Vials w/foam stoppers for each
18 Plastic Vial Nettings
1 Liter Drosophila Media
1 Liter Distilled Water
100% Purified Trans-Resveratrol
100% Purified Rapamycin
1 Dissection Scope
1 100mL Vial Fly-Nap# Solution
5 Anesthetic Wands

Results
The flies that were given 75% of recommended calories lived approximately 12.5% longer than the flies fed the control diet. The flies supplemented with resveratrol lived approximately 15% longer than flies fed the control diet. Flies that were given 75% of recommended calories AND supplemented with resveratrol live approximately 20% longer than flies fed the control diet. Intermittent starvation was found to have an effect very similar to a 75%-calorie diet. Resveratrol supplementation was also found to have a greater effect in the last 5 days of life rather than the first 5 days. Each of the aforementioned findings were found to be statistically significant using a one-tailed student's t-test.

Conclusions/Discussion
Diets that contain lower amounts of calories may have positive effects on lifespan in organism. Resveratrol, found in the skin of grapes, may also have a significant effect in lengthening the lifespan of organisms. Since these two methods seem to have an additive effect, it seems to suggest that they elongate lifespan through seperate mechanisms. Since the resveratrol supplementation was more effective later in life than earlier, resveratrol seems to prevent natural breakdown of the body rather than provide a strengthening effect.

Summary Statement
Manipulating the diets of flies in order to test the effect each diet has on the fly's lifespan

Help Received
Parents paid for board to be made at Kinko's. Mr. Garabedian (ap bio teacher) allowed me to use back of classroom for lab space.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Ilakya Palanisamy; Kartiga Selvaganesan

Project Number

S1720

Project Title

Nanotechnology in Cancer Therapy: A Proposed Model of Using Thermosensitive Liposomes in Effective Drug Delivery

Abstract

Objectives/Goals

The objective was to create a liposomal model where drug release from the liposomes could be efficiently controlled.

Methods/Materials

Liposomes encapsulated with ampicillin and gold nanoparticle were created, then centrifuged and separated from the excess ampicillin and fluid. All samples of liposomes were then exposed to lasers for varying times from 0 to 30 seconds. The resulting supernatants were tested on bacteria,and sizes of inhibition zones were measured and recorded. Specialized equipment such as round bottom flasks and blow dryers were used for the creation of liposomes.

Results

The longer the liposomes were exposed to the laser, the more ampicillin was released. When values were statistically analyzed using the unpaired T-Test, the data was proven to be statistically significant, with a p value of .0008.

Conclusions/Discussion

Adding gold nanoparticles to liposomes and exposing these to a laser allows drug release to be efficiently manipulated by a human. Heat released by gold nanoparticles after absorption of light caused increased bilayer permeability at the gel-to-liquid crystalline phase transition temperature, resulting in ampicillin release. This model of liposomes will allow doctors to vary the amount of drug release for the most effective treatment regimen.

Summary Statement

Our project proposed a novel method for efficiently controlling the release of drugs from liposomes- a drug carrier used in cancer therapy.

Help Received

Father helped order the materials

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Nicholas M. Paz

Project Number
S1721

Project Title
Coral Reef Pollution: The Effects of Tricaine Methane Sulfonate on Seriatopora Coral

Abstract

Objectives/Goals
The purpose of the experiment was to find if the fish sedative tricaine methane sulfonate (or MS-222) is toxic to Seriatopora coral and what chances a specimen would have of being harmed by it at a specific concentration.

Methods/Materials
For my project, I used a 30-gallon salt water tank, 4 "turbo" algae grazing snails, 130 coral fragments (yet only 80 were experimented on), two pieces of live rock, over 100 mL of MS-222, a 5-chambered plastic container, a Canon DSLR camera with a 100 mm macro lens, 1 mL syringe, refractometer, and aquarium-keeping paraphernalia. Prior to experimentation, the coral specimens adjusted to life in the 30-gallon salt water tank. The specimens were photographed individually and divided into five populations of ten specimens; population 1 (the control population) was exposed to a concentration of 0.5 ppm, population 4 was expoed to a concentration of 1 ppm and later to a concentration of 8 ppm (two weeks after the first exposure), and population 5 was exposed to a concentration of 2 ppm. One specimen from each population was submerged in the 5-chambered tank (that contained the MS-222 solutions) for the duration of a minute, after which the specimens were removed, rinsed with salt water, and placed back in the tank. This process was repeated for the remaining specimens and after a period of three weeks, they were photographed and categorized into nearly dead, partially bleached and healthy. A chi-squared goodness of fit test was used on the numbers of healthy corals in the populations.

Results
I found from the chi-squared goodness of fit test that the numbers of healthy corals between populations 1 and 4 were statistically different.

Conclusions/Discussion
The tricaine methane sulfonate caused severe tissue loss in many of the corals (mainly the ones in population 4), which in some cases led to secondary infection by microbes such as cyanobacteria. Also, the fact that the chemical was statistically harmful to the corals at a high concentration suggests that in a real-life situation, wild or aquarium corals could be harmed by a spill or overdose.

Summary Statement
The goal of my project was to find if tricaine methane sulfonate, a commonly-used fish sedative, is harmful to Seriatopora coral.

Help Received
Father helped take pictures, set up tank, and time coral exposure; aunt and uncle trained me for interviews/discussion; M Wandell from the Cal Academy of Sciences supplied coral; L Kormos from Academy of Sciences helped with initial concept, methods, and MS-222 source; biology teacher helped

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Annalise Smith

Project Number
S1722

Project Title
The Hair Dye You Choose....

Abstract

Objectives/Goals
My objective was to learn if; Permanent, Demi-permanent, or natural(Henna)hair dye has a more damaging effect on the strength and stretch of hair.

Methods/Materials
I used four identical samples of hair. I left sample one for the control,sample two dyed with Permanent dye, sample three with Demi-Permanent dye and sample four with Henna hair dye. I then tested five strands of each sample by tying one end of the strand around a nail situated at the top of a board which had a ruler down the side. The other end of the hair I tied to a small basket. I marked where the basket's edge came to on the ruler and measured its descent as the hair stretched. To make the hair stretch I placed pennies into the basket. When the hair broke I counted all the Pennies in the basket to determine how much weight the strand could hold.

Results
The Henna sample held 80% of the number of pennies that the control sample held, the Demi-Permanent sample held 87% and the Permanent sample only held 60%. The Henna stretched 71% of what the control stretched,the Demi-Permanent stretched 69%, and the Permanent stretched only 50%.

Conclusions/Discussion
My conclusion is that Permanent hair dye was the most damaging for the strength and stretch of the hair. Demi-Permanent was more damaging than Henna for stretch but for strength Henna was more damaging.

Summary Statement
My project is about determining if Natural (Henna), Demi-Permanent or permanent dye is more damaging to hair.

Help Received
My hair dresser,Tenisha helped me get materials, My mother helped edit my writing, Dad helped with my board.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Emily To

Project Number

S1723

Project Title

An Analysis of the Microencapsulation Efficiency of Novel Chitosan Microcapsules as Vehicles for Drug-Delivery Systems

Abstract

Objectives/Goals

Orally administered drug-delivery systems in treatments of diseases are highly favored because of cost-effectiveness and dosage control. However, the viability of the administered drug is very low because of the environmental damages inflicted by the body. Extreme pH levels, heat, and the immune system all pose as hazards to a standard drug-delivery system. The method of microencapsulation, encapsulating a drug within a protective membrane, has been explored in my experiment to increase the viability of drug-delivery systems and to allow the encapsulated drug to maintain a longer dosing period. Chitosan, a novel material in the area of drug-delivery systems, will be used to synthesize microcapsules alongside standard protocol material polylysine to test their overall viability in a simulated oral administration involving a digestive tract. It is hypothesized that Chitosan will have the same level of microencapsulation efficiency as Polylysine.

Methods/Materials

Microcapsules synthesized from alginate-chitosan and alginate-polylysine during an atomization procedure were used to encapsulate fluorescent beads for testing. Batches of capsules were monitored through UV-Spectrophotometry to monitor pre-digestive tract leakage, where there was a 100% encapsulation efficiency in all. The capsules, alongside control capsules of simple alginate capsules, were suspended in separate vials into simulated digestive tracts of Gastric and Intestinal fluids in a shake bath for 120 minutes and then 22 hours, respectively. Samples were taken every 60 minutes to be quantified using a UV-filter for a fluorescent imaging microscopes.

Results

Chitosan experienced deswelling of hydrogel properties during the intestinal tract while Polylysine was very unstable. There was visible wrinkling of the polylysine membrane. Roughly 75% of the membranes experienced this as well as membrane tearing and leakage. Chitosan's microcapsules remained in the same condition as pre-digestive tract capsules. Roughly 98% of the capsules were completely intact.

Conclusions/Discussion

Polylysine's unstable membrane was due to its amino-acid properties which causes the membrane's degradation. Chitosan's membrane was very stable and experienced little leakage or membrane tearing. Chitosan is far superior as a viable microcapsule membrane for orally-driven drug-delivery systems because of its viability in extreme pH environments.

Summary Statement

Drug-delivery systems are improved in cost-efficiency and viability through implementing Chitosan as a membrane material for microcapsules.

Help Received

Performed experiment at San Jose State University under the supervision of Dr. Maryam Mobed-Miremadi

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Tyler G. Urban

Project Number
S1724

Project Title
Microscopic Matchup: Plankton vs. Oil Dispersant

Abstract

Objectives/Goals
The objective of this experiment was to determine the effects of a widely used oil dispersant (Dispersit SPC 1000) on a specific autotrophic plankton genus (Gloeocapsa) which is one of the most important organisms at the base of many freshwater environment food webs.

Methods/Materials
Twenty petri dishes were placed under the timed growth lights. The petri dishes were filled with varying concentration ratios (dispersant: 0%, 1%, 5%, 10%, 20%) by volume of spring water and the dispersant. All dishes were then injected with identical amounts of cyanobacteria culture and allowed four days to multiply and be measured. The first day was allowed to grow unmeasured to allow for and confirm reliably measurable growth. Thereafter, five sample sets were collected and analyzed over the remaining time span.

Results
The most significant results were those of the average colony counts per 64mm^2. The amount of growth difference in the number of colonies was calculated for all sets and was found to be 32 for the control (0% conc.), 30 for the 1% dispersant concentration, 36 for the 5%, 10 for the 10%, and 4 for the 20% conc. This calculated to be that the growth difference of the low conc. end (1%) was actually 94% of the control#s growth difference, and the high conc. end (20%) was only 12% of the control#s growth difference. The initial measurements taken especially showed this lag of growth between the control and the other sets with additives. After the first growing day, the control showed 10 colonies per 64mm^2 while progressively from 1% to 20% the others showed only 4, 3, 2, and 2 colonies.

Conclusions/Discussion
Overall, the growth curve of the Gloeocapsa cyanobacteria was inversely affected by the concentration of the Dispersit SPC 1000. The data show that the dispersant concentration inhibited (and virtually stopped when high) growth of the autotrophic plankton at increasingly higher concentrations. The effects could possibly be attributed to biological toxicity of the dispersant but are more likely due to the opacity of the solution that is created when the spring water and dispersant are mixed, which would limit the cyanobacteria#s ability to photosynthesize and therefore reproduce. Because of plankton#s position at the base of the food web, at worst this could cause a chain reaction die-off along the food web as food supplies of plankton ran out.

Summary Statement
The project's aim was to observe the effects of Dispersit SPC 1000 to Gloeocapsa genus cyanobacteria.

Help Received
Advising teacher Mark Grubb helped find an oil dispersant to use; other science teacher Debbie Lewis allowed the use of her microscope.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Haley Washburn

Project Number
S1725

Project Title
What Is the Effect of Different Juices and Green Tea on the Effectiveness of Antibiotics?

Abstract

Objectives/Goals
The purpose of my science project was to determine if different juices and green tea would help my test antibiotics create a larger area of bacterial inhibition than the antibiotics would have alone. It is commonly believed that green tea, pomegranate juice, grapfruit juice, and cranberry juice are beneficial to your health, for this reason I wanted to see what would happen if I mixed them with Penicillin and amoxicillin.

Methods/Materials
For my control I tested the antibiotics and juices/tea individually to determine if they created an area of inhibition around a test dot. To do this I dipped an absorbent test dot in the test liquid and placed it in a petri dish that I swabbed with bacillus subtilus bacteria. After I completed my control tests I mixed 10ml of test antibiotic and 50ml of a test juice/tea in seperate perscription containers. I repeated the steps I used to test my control liquids to test my mixed liquids. Each test was completed 11 times for a more accurate result. After 48 hours and again at 96 hours I measured the areas of inhibition and documented them in my log book. I had a total of 17 different test substances.

Results
After 48 hours of incubation all of my mixed substances had larger areas of inhibition than the control substances. After 96 hours the mixed test substances still had larger areas of inhibition than the control test substances, however the overall areas of inhibition were decreasing. The addition of the test juices as well as the green tea did affect the effectiveness of both test antibiotics by creating larger areas of inhibition than the antibiotics created alone.

Conclusions/Discussion
Through testing I discovered that these juices/tea did help the antibiotics create a larger area of inhibition, however, through my research I discovered that while these juices have health benefits on their own, they also contribute to negative drug interactions due to different enzyme suppression in the digestive system which can lead to the build up of a drug possibly causing an overdose. I feel that further investigation is needed before drinking these juices/tea while taking antibiotics.

Summary Statement
The objective of this project was to determine if the addition of juices or green tea to antibiotics you then increase the antibiotics ability to fight bacteria.

Help Received
Dr. Mary F. Paine Ph.D., provided guidance and research information, Dr. John Inouye M.D. provided antibiotics, Mr. Carl Gong provided petri dishes and bacteria, My Mom photographed my experiment.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Cynthia L. Yin

Project Number

S1726

Project Title

Catalytic Delivery NanoSubstrates (CDNS) for Highly Efficient Delivery of Biomolecules

Abstract

Objectives/Goals

The delivery of biomolecules to rectify cells can potentially treat incurable diseases. Biomolecule delivery is performed with layer-by-layer deposition of biomolecules coated onto substrates. Targeted cells are then cultured on the substrates in order to induce biomolecule delivery. However, the pre-coating process prohibits continuous delivery of biomolecules. Furthermore, current approaches raise concerns pertaining to transfection performance, biocompatibility, and cell viability. In order to address these issues, Catalytic Delivery NanoSubstrates (CDNS) are engineered to efficiently deliver biomolecules to different types of cells. Additionally, to eliminate biomolecular pre-coating of substrates, CDNS use nanowires as substrates and improve delivery performance.

Methods/Materials

Transfection efficiency with CDNS was compared to that with two commercially available reagents, Lipofectamine 2000 and RGD-jet-PEI, at high and low DNA dosages. Enhanced green fluorescent protein (EGFP) was transfected into different cell lines. Additionally, cell viability after transfection was assessed for all transfection experiments.

Results

Transfection of EGFP using CDNS has the highest efficiency for all cell lines with both DNA dosages when compared to Lipofectamine 2000 and RGD-jet-PEI. In addition, cells transfected with CDNS exhibited high cell viability with both DNA dosages, whereas cells transfected with Lipofectamine 2000 and RGD-jet-PEI at high DNA dosage had lower cell viability.

Conclusions/Discussion

CDNS transfect biomolecules to different cells with high efficiency, compared to two commercially available reagents, Lipofectamine 2000 and RGD-jet-PEI. Cells transfected with CDNS had lower cytotoxicity as well. CDNS can potentially cure diseases by delivering biomolecules to cells for treatment and replacement. These substrates revolutionize in vivo and in vitro studies to treat cancer and deliver drugs.

Summary Statement

This project develops Catalytic Delivery NanoSubstrates (CDNS) for not only highly efficient delivery of biomolecules into targeted cells but also high cell viability after transfection.

Help Received

Used lab equipment at University of California, Los Angeles under the supervision and guidance of Dr. Tseng, Dr. Wang, and Dr. Liu.