CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Risha R. Bera

Project Number
S1401

Project Title
Development of a Protocol Linking the Effects of Secondhand Smoke to the Effects of Vehicle Exhaust on Wound Healing

Abstract

Objectives/Goals
Second hand smoking studies have revealed that the wound healing process is negatively affected by toxins in the smoke. The goal of this study is to examine the wound healing process with the influence of a simulated air quality. It is hypothesized that the hazardous organic chemicals common in vehicle exhaust and secondhand smoke will hinder the wound healing process in standard white mice.

Methods/Materials
The experiment was conducted by puncturing a 5-millimeter diameter wound in twelve white mice. Four mice were kept to a cage. Two of the cages were connected to an automated smoking machine from 10 PM to 5 PM every weekday. One cage of mice was only exposed to second hand smoke, and a second cage was only exposed to mainstream smoke. The third cage was placed in a normal environment to simulate a control group. The smoking machine smoked a pack of cigarettes every day.

Results
Tissue analysis showed that sidestream smoking caused cytoskeletal changes in the fibroblast. A decrease in cell migration also resulted in the wound area and led to the accumulation of cells at the edge of the wound. This prevented full wound healing and could potentially cause fibrosis and excess scarring.

Conclusions/Discussion
It is possible to apply the procedure used in the smoking study to study the effects of the environment on mice. An environmental chamber would be an ideal place to raise the mice. Dosages of chemicals could be injected into the chamber to simulate the conditions of outdoor air pollution; especially those caused by diesel fuel exhaust.

Summary Statement
This project used previous research to develop a protocol which examines the effects of vehicle exhaust on wound healing.

Help Received
Used lab equipment at University of California, Riverside under supervision of Dr. Mauela Martins-Green; tissue samples provided by UCR graduate student Robin Schleiff

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Brendan J. Bordelon

Project Number
S1402

Project Title
Study of the Effect of Lipitor on the Muscular System of Mus musculus

Abstract

Objectives/Goals
The purpose of this study is to discover if Lipitor, a cholesterol-lowering drug, causes muscular degeneration and/or rhabdomyalysis in Mus musculus and, therefore, human beings.

Methods/Materials
The procedure of the study is as follows: I bought 20 Mus musculus, common mice, from a pet store, and divided them into a control group and a Lipitor group, each with 10 mice. These mice were separated into different cages. The mice were then each weighed individually and were timed to see how long it took them to climb straight up a 46 centimeter tube individually. After recording the averages of each group, I ground up a pill of Lipitor, added it to water, waited one day, then added corn syrup to the solution, so the mice would find it appetizing. I then fed 1 mL of this solution to the mice each day through a small syringe. After seven days, I re-weighed each of the mice individually, checking for any muscular degeneration. I then ran each of them through the 46 cm tube again, again to check for any muscular degeneration or rhabdomyalisys. After taking the averages of both these tests, I continued feeding the solution to the Lipitor mice every day until the next seven days, when I repeated the tests above. This pattern lasted for six weeks, at which time I stopped feeding the Lipitor to the mice and officially ended the study.

Results
The data showed that the Lipitor mice weighed, on average, about 5.2 grams less than the control mice. It also showed that, during the six week study, the Lipitor mice continued to take more time, on average, than the control mice, and that by week six, the Lipitor mice were taking, on average, twenty more seconds to climb straight up the 46 centimeter tube.

Conclusions/Discussion
By analyzing the data, one comes to the conclusion that the Lipitor did have some effect on the muscular systems of the Mus musculus, causing muscular degeneration and possibly mild rhabdomyalisys. The fact that the Lipitor mice lost, on average, 5.2 grams out of an average weight of 28 grams shows that at least some muscular degeneration occurred. Also, the fact that the Lipitor mice spent, on average, twenty seconds more time in the 46 centimeter tube than the control mice demonstrates that the Lipitor mice had a more difficult time climbing to the top of the tube, which speaks to some degree of muscular problems.

Summary Statement
To determine the effects of Lipitor, a cholesterol-lowering "statin" drug, on the muscular systems of vertebrates.

Help Received
Mother helped complete board; friend's father helped procure equipment needed for study; Uncle helped answer pharmacology questions

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Gina G. Catalano

Project Number
S1403

Project Title
The Effect of Airborne Pesticide Pollution on Student Attendance in Salinas Elementary Schools

Abstract

Objectives/Goals
The purpose of my project was to see if there was any correlation between pesticide use in farm fields and absenteeism in six Salinas elementary schools located within a 1.5 mile radius of the fields during the 2002-2003 school year. If it can be proven that pesticide use decreases school attendance, this would be a significant finding and further investigation would be strongly advised.

Methods/Materials
Specific pesticides, agricultural sites, and schools were selected. Pesticide data and crop information were obtained from the Monterey County Agricultural Commissioner's office and the California Department of Pesticide Regulation's Pesticide Use Reporting (PUR) database. Attendance information for the six schools was obtained from the Salinas City Elementary School District. Data analysis, calculations, and comparisons between the data were then made.

Results
From these results, it is inconclusive whether airborne pesticide pollution from methyl bromide and chloropicrin is or is not significant enough to affect the attendance of elementary school students.

Conclusions/Discussion
The data obtained from the Salinas City Elementary School District were limited in nature and only available in monthly form. Had the data been more detailed, specifics concerning why the students were absent could be helpful. Another element of the project that would contribute to a more accurate assessment would be if the attendance figures from the district were in weekly or daily form rather than in monthly form.

Summary Statement
This project investigates the possibility of a correlation between pesticide use (methyl bromide and choloropicrin) in farm fields and the rate of student absenteeism in six elementary schools in Salinas, which is surrounded by fields.

Help Received
A scientist provided access to the California Department of Pesticide Regulation's Pesticide Use Reporting (PUR) database. A representative from the Salinas City Elementary School District was also very helpful in aiding me in the very difficult job of getting the necessary information.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Katrina Chen; Julia Goldstein; Erin Wiley

Project Number
S1404

Project Title
Can Food and Drink Additives Lead to a "Heartbreak"?

Abstract

Objectives/Goals
The objective of this experiment is to determine whether Monosodium Glutamate and the Energy Drinks Red Bull and Monster have an effect on Daphnia magna heartbeat rate.

Methods/Materials
Serial dilutions of MSG (10%, 5%, 2%, 1%) and energy drinks were each incubated with a single Daphnia magna and heart rate counted over a period of 15 to 20 minutes. Each count was tested over a period of ten seconds. Because the Daphnia heart rate was too fast to count at room temperature we performed the experiments on ice to lower the rate of the heartbeat. We used a dissecting microscope, tissue culture plates, stopwatch, pipettes, test tubes, calculator and a balance.

Results
There was no significant change of heartbeat after ten, five, two and one percent. We also tested Monster and Red Bull. Our results showed that the Monster drink lowered the heart rate and killed the Daphnia magna over a period of time.

Conclusions/Discussion
The purpose of the first part of our experiment was to see if MSG would affect the heart rate of Daphnia Magna. The results made us think that MSG does not have a general affect on Daphnia Magna. Unlike MSG, Monster and Red Bull energy drinks did affect the heartbeat. On average, the results show that MSG is not harmful to the heart rate of Daphnia magna. Energy drinks are advertised as energy boosters, but the findings of the experiment on the Monster and Red Bull show that the drinks lower the heart rate, thus causing the Daphnia magna to die. To know how MSG and energy drinks affect humans this experiment should be performed on a species closer to humans, such as mice.

Summary Statement
These studies tested the effect of MSG and energy drinks on the heart rate of Daphnia magna.

Help Received
Dr. Irvin S.Y. Chen helped us to organize our experiment and provided us with equipment and supplies. Mrs. Jill Moeller also provided us with equipment and supplies.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Ravi P. Deedwania

Project Number
S1405

Project Title
Effects of Nicotine on Cancer Cell and Endothelial Cell Proliferation

Abstract

Objectives/Goals
The objective of this experiment was to determine the effects of nicotine on cancer cell and endothelial cell proliferation, which are both intricately involved in tumor growth.

Methods/Materials
Bovine pulmonary artery endothelial cells (CPAE), human colon colorectal adenocarcinoma cells(SW480), and human prostate carcinoma cells (LNCaP) were taken from confluent culture flasks and put into 24 well plates, 24 hours before administering nicotine. After 24 hours nicotine was administered in concentrations from 10^0 to 10^-7 M. Cells were then incubated for 72 hours. After 72 hours results regarding cell proliferation were obtained using a phosphotase assay and colorimetric analysis.

Results
Nicotine induced significant cancer and endothelial cell hyperplasia (proliferation) at varied concentrations depending on the type of cell. Nicotine also was cytotoxic to the cells at the highest concentrations.

Conclusions/Discussion
The findings from this in vitro experiment document two different mechanisms by which nicotine, contained in tobacco smoke, can produce tumorigenic effects. Firstly, nicotine can act directly on cancer cells by inducing proliferation. Secondly, nicotine can induce hyperplasia in endothelial cells, which are essential to angiogenesis (the growth of new capillaries)and tumor metastasis.

Summary Statement
The goal of this project is to determine the effects that nicotine has on cancer and endothelial cell proliferation, and it's possible role in supporting tumor growth.

Help Received
Research was performed at Fresno State University under the supervision of Dr. Kinping Wong.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Jacqueline Farrales; Danielle Vidal; Megan Westermeier

Project Number

S1406

Project Title

Does Beano(R) Reduce the Level of Gas Found in Human Digestion?

Abstract

Objectives/Goals

Our project tests the gas production of certain vegetables and tests to see if the food enzyme dietary supplement Beano#, reduces the level of gas. We hypothesized that if Beano# is related to the reduction of gas production, then adding Beano# to vegetables will significantly diminish the level of gas produced.

Methods/Materials

By grinding vegetables, mixing water and yeast, and placing the mixture into a water bottle with a balloon on top, we first tested how much gas the vegetable produced on its own. Then, we created the same mixture, this time adding Beano# to it, in order to observe the amount of gas produced. Once the balloons were filled with gas, we tied them off and measured the amount of water each displaced.

Results

Overall, we found that the trend in our results was that the balloons with the mixture containing Beano# formed more gas, thus refuting our hypothesis.

Conclusions/Discussion

We think more gas was produced in the balloons with the water bottles containing Beano# because in our experiment the Beano# broke down the complex carbohydrates, starches, and cellulose. This allowed the yeast to devour the simpler substances with gas as the byproduct. In the human body, the Beano# would act in the same way, allowing the colon to absorb the nutrients of the simpler substances in a more efficient manner. This means that there is less substance left over for the gas-making bacteria to use, resulting in a significantly less amount of flatulence.

Summary Statement

Our project tests the gas production of certain vegetables and tests to see if the food enzyme dietary supplement Beano#, reduces the level of gas.

Help Received

We would like to acknowledge Mrs. Wright, Mrs. Evashenk, and our parents for their support and guidance throughout the project.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Shiraz Ghanimian

Project Number
S1407

Project Title
Effects of Air Pollution on Freeway Plants

Abstract

Objectives/Goals
The goal of my project was to detect and compare the effects of air pollution given off from a small sized car, a mini-SUV, and a large SUV on iceplants (plants that are commonly found on freeways). Each car had a designated group of plants that would be polluted for intervals of one hour; the fourth group of plants was the control, which was not exposed to the pollution.

Methods/Materials
I used three different methods in this project. The first method was simply measuring average plant height between the intervals of pollution and measuring the average number of leaves before and after the pollution. The second method was running protein electrophoresis on the specimens from the plants. For my last method, I used an air pollution test kit to compare the amounts of different air pollutants given off from the different cars.

Results
The control grew the most in height and in average number of leaves, while the large SUV's plants were the least; the small sized the car's and the mini-SUV's plants showed similar growth, although the small sized car's plants showed a bit more growth. As for the protein electrophoresis, there were differences in proteins that were detected. The large SUV released the most pollutants. The mini-SUV released more of some, and the small sized car released more of others.

Conclusions/Discussion
All three cars were unhealthy for the plants, but the large SUV polluted the most; the other two cars were very close, but the small sized car would be put last out of the three because its plant were the healthiest out of the three.

Summary Statement
The purpose of this project is to detect and compare the air pollution given off by a large-SUV, a mini -SUV, and a small sized car and to compare the effects of the air pollution on iceplants (freeway plants).

Help Received
Ribet Academy Biology Lab

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Daniel Gomez

Project Number
S1408

Project Title
Effect of Protein Secretion on the Relative Size of Golgi Organelles in Eukaryotic Cells

Abstract

Objectives/Goals
The purpose of my experiment was to observe the effect of protein secretion on the relative size of Golgi organelles in eukaryotic secretory and non-secretory cells. I hypothesized that the Golgi of the secretory cells will be larger in surface area than the Golgi of the non-secretory cells. In order to measure the difference in the sizes of the Golgi, I compared mouse fibroblast cells with rat kidney cells. Fibroblasts specialize in the production and secretion of proteins that constitute connective tissue. On the other hand, kidney cells cleanse the body of waste products, and they are not known to secrete proteins. I used immunocytochemistry to study the Golgi. Immunocytochemistry is a powerful technique used to visualize the localization and distribution of specific cellular components within a cell by exploiting an antibody's remarkable ability to target a specific protein.

Methods/Materials
Cell lines and cell culture: Cell lines used were rat kidney cells and mouse 3T3 fibroblast cells. Cells were cultured in Dulbecco's modified Eagle's medium (Ham's F14 + 10% Fetal Bovine Serum (FBS)) and in a 37 degree C incubator with 5% CO_2. Other materials for cell culturing include 70 % ethanol, negative pressure laminar flow hood, cell culture flasks, gloves, and pipettes.
Antibodies: Monoclonal rabbit anti-Golgi antibody (Giantin) and polyclonal rabbit anti-Golgi antibody (GRASP65) that cross-reacts with both rat kidney and mouse 3T3 fibroblast cells as well as mouse anti-tubulin antibody were used as primary antibodies. Goat anti-rabbit antibody (594nm) and goat anti-mouse antibody (488nm) were used as secondary antibodies.
Immunocytochemistry: Cells were fixed with 4% formaldehyde and blocking buffer (2.5 % FBS, 0.1 % Triton X-100, 0.02 % NaN_3 in PBS) was applied after fixation. The primary antibodies (GRASP65, mouse anti-tubulin antibody) were then incubated. Cells were washed with PBS (Phosphate Buffered Saline) and stained with the secondary antibodies. The cells were then mounted on coverslips.
Analysis: Inverted microscope, Adobe Photoshop, and NIH Image J software to calculate the measurements of the surface areas.

Results
The relative size of the Golgi in rat kidney cells is significantly smaller than the size of the Golgi in mouse 3T3 cells.

Conclusions/Discussion
My results suggest that the relative size of Golgi in a cell is directly related to its rate of protein secretion.

Summary Statement
I am interested in the size variation of Golgi organelles between secretory amd non-secretory cells.

Help Received
Used lab equipment at the University of California, Irvine, under the supervision of Dr. David Gariner, Debra Mauzy-Melitz, and Dr. Christine Sutterling, Participant in NFS Program, Advised by UCI Undergraduate Maria Tokuyama

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Ryan J. Honda

Project Number
S1409

Project Title
Gamma Radiation Effects on Plant Growth

Abstract

Objectives/Goals

This experiment is a series of five minilab experiments. The first experiment examines & measures plant root & shoot growth in a Control farm & a Gamma exposed farm. The second experiment investigates how distance affects gamma radiation exposure by exploring The Inverse Square Law. The third experiment measures the absorption of gamma rays through the plastic viewing window. The fourth experiment measures the intensity of gamma radiation via the absorption of gamma rays through the plastic viewing window & soil. The last experiment measures how much gamma radiation the gamma exposed farm received. My hypothesis is plant root & shoot growth decrease as the intensity of gamma radiation increases as a function of distance, shielding, & exposure time.

Methods/Materials

1. Two Root-Vue Farms (Control & Gamma)
2. Cutout plastic viewing window
3. Spectrum Techniques ST-360 Counter with GM Tube & stand
4. Sony Vaio Computer
5. 10 Radioactive Gamma Sources
6. Radish seeds

Results

Minilab 1:
TABLE 1 & GRAPH A show an average of 24% less root growth & Table 2 & GRAPH B show an average of 32% less shoot growth in the Gamma farm samples when compared to the Control farm samples for plants 17, 18, & 19.
Minilab 2:
Gamma radiation exposure to plant roots and shoots is a function of distance. A decrease in root & shoot growth occurs when seeds are planted next to the gamma sources & compared to control samples as demonstrated in TABLE 1, TABLE 2, GRAPH A, & GRAPH B in MINILAB #1. Retarded cell growth is greatest when the plant is located directly next to the radioactive gamma source.
Minilabs 3 & 4:
TABLE 6 shows the plastic viewing window of the gamma farm absorbing 10% of the gamma intensity when compared to gamma readings without a shield.
TABLE 7 shows the plastic viewing shield absorbing 21% of the gamma intensity & 33% using the plastic viewing shield plus soil when compared to gamma readings without a shield.

Summary Statement

This project is a series of five minilab experiments that test the effects of gamma radiation on plant root and shoot growth as a function of distance, shielding, and exposure time.

Help Received

Used lab equipment at Ribet Academy; used microscopes at Verterans Hospital

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Natalya Kostandova; Akhila Pamula

Project Number

S1410

Project Title

The Effect of Curcumin on Normal Human Fibroblasts and Human Microvascular Endothelial Cells

Abstract

Objectives/Goals

The project analyzes the effect of antioxidant curcumin on the proliferation and migration of normal human fibroblasts and microvascular endothelial cells, which are vital in wound healing.

Methods/Materials

Methods: The stock solution was created and was diluted into desired concentrations.
Proliferation: Cells were divided into control and treatment groups and plated accordingly for cell counting. Curcumin was applied every other day for seven days. For MTT assay, cells were divided and plated for three days, whereupon MTT assay was performed.
Migration: Cells were plated inside the cloning rings. After the cells attached, the cloning rings were removed. Indentures were made along the outer edge of where the cells were confined by the ring. The distances that the cells migrated outside these limits were measured at different points at different times.

Results

Low doses of curcumin stimulated the proliferation of normal human fibroblasts and hMVEC, whereas high doses inhibited it. There was not enough evidence to conclude that curcumin had a significant effect on the migration of either fibroblasts or hMVEC.

Conclusions/Discussion

Proliferation: Low doses of curcumin stimulated proliferation, possibly because of curcumin's effect on the cell signaling pathways. This could occur if curcumin stimulated the induction of Phase II (proliferation phase) defense genes, which would enhance cell survival and have a beneficial effect on homeostatic responses. This, in turn, would stimulate cell proliferation. Also, it is possible that low doses of curcumin may reduce the production of Interleukin-8 (IL-8), thus reducing inflammation. High doses of curcumin, however, may potentially stimulate apoptosis, or cell death, due to the activation of caspase pathways. As a result, it would inhibit cell proliferation.

Migration: Curcumin did not significantly affect cell migration because normal cells are not able to migrate during proliferation; thus, by stimulating proliferation, curcumin did not change the patterns of cell migration. In addition, migration partially depends on additional external factors, such as fibronectin and tissue inhibitors of metalloproteinases. The migration of both fibroblasts and hMVEC in skin tissue depends on their interaction with the extracellular matrix (ECM).

Curcumin's antioxidant properties may reduce inflammation, thus speeding up the wound healing process.

Summary Statement

The project tests the effect of an antioxidant on two aspects of wound healing.

Help Received

Used lab equipment at University of California, Riverside under the supervision of Dr. Min Yao and direction of Dr. Manuela Martins-Green.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Hunter W. Link

Project Number
S1411

Project Title
Of Mice and Magnets: The Effect of Prolonged Magnetic Exposure on the Weight and Behavior

Abstract

Objectives/Goals
The purpose of this project was to determine if magnetic fields had any effect on the weight or behavior of mice. The hypothesis was that if mice were exposed to a constant level of high-power magnetism over an extended period, then they would lose weight.

Methods/Materials
Experimentation began on 12/22/04, and consisted of 3 groups of 2 mice each: Groups A, B, & C. Each subject was a 6-12 month old female white mouse. Each lived in a separate cage. Subjects were allowed a control period without magnets to get used to their new habitiat. On Jan 4, Groups A & B were exposed to magnetic fields. Group A (Mice 5 & 6) was exposed to higher levels of magnetism (4 high-power magnets under the cage and 4 high-power electromagnets (EMs) on each corner). Group B (Mice 3 & 4) was exposed to low-level magnetism (75 small magnets under the cage and 4 weak EMs on each corner). Group C (Mice 1 & 2) had no magnetic exposure, but dummy EMs were set up just like Groups A & B's. Each subject was weighed each morning at 6:30 AM. The environment was as controlled as possible for each cage (Same feeding and cleaning schedule, etc.). The mice were exposed to the magnets for three weeks. A final experiment was done, involving #6. All the magnets from Cage 5 were placed around Cage 6. Magnets from Group B were removed. Weight was recorded in the same way as before. This experiment was conducted for a week.

Results
(Note: All weight deltas are the deltas of the average weight of the mice before the magnets were introduced and after they were introduced.) In the three-week experimental period , #1 gained just under 1g, while control #2 lost nearly 1.6g. Both #3 and #4 gained 2g and 3.6g, respectively. #5 lost .2g, and #6 gained .9g. In the second experiment, #6 lost 2.8g in the first day after the magnets were introduced, but gained it back within a day. #6#s final delta between the beginning of that week and the end of that week was exactly -1g.

Conclusions/Discussion
The data are inconclusive and did not support the hypothesis. Although a slight weight loss occurred in #5 in the 1st experiment, #6 gained much more weight. While the 2nd experiment seems to support the hypothesis, there is not enough data to make a definite conclusion. However, the 1st experiment clearly shows that magnets of this strength do not decrease the weight of mice or have any effect on weight at all.

Summary Statement
The purpose of this experiment was to determine if magnetic and electromagnetic fields have an effect on the weight or behavior of mice.

Help Received
I received help from three sources: My father who helped me with the construction of the electromagnets, my mother who drove me to store to buy supplies and took pictures of me while I worked, and Capt. Patrick Grimm who helped me take care of the mice.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Rodelyn Lipumano; Elyse Marchant

Project Number

S1412

Project Title

The Effect of Rain pH on Ryegrass

Abstract

Objectives/Goals

The objective of this experiment was to ascertain the pH level at which ryegrass would begin to show noticeable tissue destruction.

Methods/Materials

30 flats of ryegrass were grown and divided into five treatments of different pH levels. The pH concentrations were created using distilled water and vinegar to simulate acid rain. The pH was measured using pH paper. Each flat was sprayed using a spritzer bottle with 280 mL of solution over a period of a week. Each application was applied until water was running off the blades. After each application, plants were observed and any damage was recorded.

Results

The flats that were sprayed with a concentration of 49 parts water: 1 part vinegar (pH: 3.5) showed the first signs of tissue deterioration. The 2:1 concentration (pH: 3) showed significant reduction in chlorophyll. The pure vinegar solution (pH: 2.5) resulted in the death of the plants.

Conclusions/Discussion

The results indicate that in short-term time periods, acid rain does not become dangerous for ryegrass until it reaches a pH level between 3.0-3.5. Since rain pH of 3.0 has been measured on the West Coast, our data suggest that this could be harmful to plant life.

Summary Statement

This project was done to determine the rain pH at which ryegrass begins to show damage.

Help Received

Teacher edited manuscript and provided instructions on cultivating grass.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Kristin N. Miller

Project Number
S1413

Project Title
The Hidden Dangers of Ozone Depletion: Is Our Food Supply at Risk? Part II

Abstract

Objectives/Goals
The effects of ozone depletion and resulting increased amounts of ionizing radiation in our environment are under investigation. What effects might these increased doses of radiation have on our food supply?

Methods/Materials
Four groups of Early Girl Tomato plants were exposed to ultra low, moderately low, and low doses of radiation respectively, twice weekly. Group One was the control group and received no radiation. The five groups were measured in centimeters once weekly to determine any difference in growth. At the end of ten weeks, the plants and tomatoes were weighed. The tomatoes were also counted.

Results
The control group had the greatest growth in terms of height, weight, and total number of tomatoes. Group One had a height increase of 224%, while the other groups had an average 150% increase. Also, the control group's tomato production was five to ten times greater than that of the experimental groups. The experimental plants average total weight (including tomatoes) was 47% less than the control group.

Conclusions/Discussion
Overall, the effects of ionizing radiation seemed to have a detrimental effect on the health of the plants, as measured by growth rate, tomato production, and overall weight. If all plants in our environment share this sensitivity, it could lead to a decrease in food production, as well as a decrease in carbon dioxide absorption and oxygen production. Ultimately, this could cause food shortages and an acceleration of global warming.

Summary Statement
Ozone depletion allows for more ionizing radiation to be transmitted to the surface of the earth, with a possible impact on our food supply.

Help Received
Used linear accelerator at Los Robles Hospital, with the help of Jesse Lee (physicist) and radiation therapists.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Ashley N. Muirheid

Project Number
S1414

Project Title
How Does Water Treated with NaF Affect the Development of the Invertebrates Artemia, Daphnia, Paramecium, and Planaria?

Abstract

Objectives/Goals

I hypothesized that water treated with NaF concentrations above the optimum fluoride level (.7-1.2 ppm) would affect the development of the invertebrates Artemia, Daphnia, Paramecium, and Planaria when exposed. Therefore, all specimens tested with concentrations of NaF below or within the desired level will show no adverse effects.

My rationale for selecting the specific organisms was based on their susceptibility towards wastewater discharge. If a significant threat is posed on their survival by the presence of a fluoride compound, serious damage will result in the ecosystems upon which man is ultimately dependent.

Methods/Materials

Three colonies of each type of organism were used to eliminate any variations in consistency during experimentation. NaF concentration levels were tested at 1 ppm, 2 ppm, and 5 ppm, which reflect solution levels projected from the environment#s accumulation of natural water runoff from water treatment facilities. The water in the control was left unaltered.

To determine any effects on the mobility of the organisms, I designed a measuring instrument based on centimeters. To chart the food consumption of the Paramecium cultures, I used a Congo Red stain solution on the food source of the organisms. I viewed the Daphnia and Artemia eggs under a stereoscope to determine irregularities between the controls and fluoridated samples. To measure the heart rates in the Daphnia species, I counted the amount of beats within a time frame. At three viewing periods, I counted the fatalities for all organisms.

Results

For all of the species, the fluoride levels increased directly with the amount of fatalities, except for the Daphnia eggs, for which the results were inconclusive. All of the mobility rates were decreased as the sodium fluoride increased. For both the Daphnia species, their heartbeat rates slowed down and their phototaxis behavior changed, as the levels of fluoride in their water increased.

Conclusions/Discussion

I used statistical analysis to determine whether the difference between the control and the experimental groups was significant, or if it was due to chance alone, by using a t test as a probability guide for all of my results. Because I was able to reject the chance, or null, hypothesis, I could conclude that, 95% of the time, probability supported my results, as determined by varying fluoride levels.

Summary Statement

My project investigates whether sodium fluoride in concentrations typically found in runoff from municipal water supplies affects the development of Artemia, Daphnia, Paramecium, and Planaria species in the environment.

Help Received

My science fair advisor graciously provided me with the majority of the materials that I needed to conduct my experiment. My father aided me with digital photographs.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
H. Sabreena Rana

Project Number
S1415

Project Title
TSV Infected Shrimp

Abstract

Objectives/Goals
My objective was to see if pacific white shrimp that are not infected with Taura Syndrome and are fed with green tea for a certain period, and then exposed to shrimp that are infected with TSV what would happen to the non-infected shrimp?

Methods/Materials
To test this I had equal number of infected and non-infected shrimp in two different tanks. I mixed green tea into the non-infected shrimp#s food to boost their immune system. I then mixed the infected shrimp with the non-infected. By doing this I was able to see if the shrimp that were non-infected became infected and the rate of that it occurred.

Results
My results were pretty self-explanatory, the green tea did have some effect on the shrimp of how fast the shrimp were getting the virus, but it didn#t help as much as we need it to help.

Conclusions/Discussion
If there are non-infected shrimp that are fed with green tea for a period of four days and then exposed to shrimp that are infected with the virus, then about half will be infected.

Summary Statement
TSV non-infected shrimp were given a immune system enhancer (green tea) and then exposed to a TSV infected shrimp.

Help Received
Grandfather help me get the shrimp tested in my experiment.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Emilio Torales

Project Number
S1416

Project Title
Microwave Radiation and Seed Germination

Abstract

Objectives/Goals
What family of seeds has the most resistance to microwave radiation?

We think that tomato seeds will be resistant to microwave radiation because the smaller the seed the less radiation it will get.

Methods/Materials
Procedure
1. Divide each package of seeds into two groups; experimental and control.
2. Put each group in separate (Six Packs).
3. Put the control groups aside and label the containers control.
4. Take the experimental groups and label them according to how much time they will get radiated.
5. Put the experimental groups in the microwave for the time indicated (30 sec, 60 sec, and 90 sec.
6. Plant both experimental and control groups of seeds and place them under a 24-hour light. Label them carefully: Control and Experimental.
7. Schedule watering and growth measurement.
8. Water plants 10ml with a graduated cylinder.
9. Record watering amounts and growth measurements.

Materials: 1. Seeds; 2. Microwave; 3. Six Packs(to grow plants); 4. Ruler; 5. Graduated Cylinder.

Results
Our hypothesis was correct. The tomato plants grew in all but the 90 sec. time periods. Corn and most the others grew at control andc 30 sec. We found out the the longer the time in the microwave the less the plants would grow.

Conclusions/Discussion
We found out that Microwave Radiation did effect the growth of our plants. Like we said in our hypothesis that Microwave Radiation would effect the growth of our plants. If my partner and I were to do this experiment we would use more seeds, and we would put them in the microwave for more time.

Summary Statement
How microwave radiation affects plant growth.

Help Received
Used computer lab at Anderson Valley High School under the supervision of John Woods.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Diana A. Tran

Project Number
S1417

Project Title
In Vitro Evaluation of Cytotoxic and Anti-Angiogenic Cancer Therapies on Human Tumor Cells

Abstract

Objectives/Goals
Cancer is one of the leading causes of death among Americans. Treating cancer with chemotherapy involves many harmful side-effects including hair-loss and gastrointestinal disorders. The ultimate goal of this ongoing study is to develop a treatment for cancer using a novel anti-angiogenic cancer therapy, contortrostatin (CN), that could lower the detrimental side-effects of current chemotherapeutic agents when used in combination. The present study evaluates the effects of treating tumor cells in culture with CN alone and in combination with cytotoxic chemotherapy.

Methods/Materials
Glioma cell lines, LN229 and A172, were grown in culture and treated using CN and a chemotherapeutic drug, Doxorubicin. A proliferation assay was employed to test cell viability. To detect apoptosis, the TUNEL assay was used to qualitatively analyze adherent cells underneath a fluorescent microscope. The Annexin-V-FITC assay was also utilized for apoptosis detection by a quantitative analysis using FACS. Materials included cell lines, LN229 and A172; contortrostatin; Doxorubicin; Non-Radioactive Cell Proliferation Assay; Fluorimetric TUNEL System; Annexin V FITC Apoptosis Detection kit. Tools included a plate reader; fluorescent microscope; FACS machine.

Results
The proliferation assay revealed that tumor cells treated with CN and Doxorubicin did not have a higher effect compared to tumor cells treated with Doxorubicin alone. Moreover, the apoptosis detections showed that CN does not cause programmed cell death in tumor cells. The results of this study showed that (1) CN in combination with Doxorubicin does not have an overall synergistic effect on tumor cells in vitro and (2) CN does not induce apoptosis and therefore would not be cytotoxic to cells.

Conclusions/Discussion
Previous studies showed that CN interacted with cell integrins to disrupt tumor growth, angiogenesis, and metastasis. This study further showed that contortrostatin does not induce apoptosis in tumor cells and thus would not have a damaging effect on normal cells. However, CN does not have a synergistic effect in combination with chemotherapy in vitro. This may be due to the dissimilarity of cell cultures to real life organisms. Cell cultures lack blood vessels and vascular endothelial cells which CN has been shown to have an effect on. Future research will include the evaluation of CN in combination with chemotherapy on in vivo models of cancer.

Summary Statement
This project evaluates the effects of combination drug treatments on human tumor cells using cytotoxic chemotherapy and a novel anti-angiogenic agent, contortrostatin.

Help Received
Used lab equipment at the University of Southern California under the supervision of Dr. Steve Swenson and Dr. Francis Markland Jr.; Graduate student, Fritz Costa, provided assistance during experimentation.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Victor H. Tran

Project Number
S1418

Project Title
The Effect of Hair Dye on Hair Strands

Abstract

Objectives/Goals
How will the time hair is emerged in dye affect the intactness of the hair shaft?

Methods/Materials
First, submerge hair dye for different periods of time (20 mins, 40 mins, 60 mins, 80 mins, and 8 hours). After each sample of hair is dyed for its allotted amount of time, wash and dry hair. Take 5 strands of hair from each time period and analyze the hair, and count the breaks under 100X. Materials:Blonde hair, Loreal Red Hair Dye, Horsehair paintbrush, Distilled water, stopwatch, and microscope.

Results
The average amount of breaks in 16 mm of hair dyed for 20 mins is 1 break. The average amount of breaks in 16 mm of hair dyed for 40 mins is 1.7 breaks. The average amount of breaks in 16 mm of hair dyed for 60 mins is 2.1 breaks. The average amount of breaks in 16 mm of hair dyed for 80 mins is 3.1 breaks. The average amount of breaks in 16 mm of hair dyed for 8 hours is 3.7 breaks. The longer hair is submerged in dye, the more breaks were found. The fastest rate of damage occurred in 80 mins, and rate of damage decreased dramatically after 80 mins.

Conclusions/Discussion
The data I have collected demonstrates that as time increases, breaks in the hair shaft increases. Although dasmage increases at a steady rate from 20 mins to 80 mins, the rate of damage decreased after 80 mins. I believe that this decrease in hair damage is due to ammonia being used up as reagents

Summary Statement
Determining the extent of hair damage due to the time hair is submerged in hair dye.

Help Received
UCI supplied microscope, NCSF focus grant gave money, Dr. Debra supervised, Angelica Nangit and Natasha Narayan helped carry out experiment.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Daniel L. Wetzel

Project Number
S1419

Project Title
The Effects of Oil Spills on Underwater Plant Life

Abstract

Objectives/Goals
The objective is to discover at what rate an oil spill effects the growth rate per gram of underwater plant life, and how it effects its photosynthetic rate.

Methods/Materials
Mass each sprig of Milfoil Weed and place each in a test tube. Fill the test tube with water then find the volume of that water using a graduated cylinder. Flip each of the test tubes upside down once underwater allowing no excange of water from the test tube with the environment. Let it sit for 2,4, or 12 hours. Remove the test tubes and find the difference in volume and the difference in mass. Record the data.

Results
The plants with no oil on the surface had a constant photosynthetic rate per gram, and a constant percent change in mass per gram. When the oil cover was applied, the plants photosynthetic rate dwindled over time, and its percent mass change per gram was extremely small and sometimes negative, showing that over time they lost mass.

Conclusions/Discussion
I think that the plants with the oil over them may have ceased to progress in areas such as photosynthesis and growth not due to the reduced amount of sunlight, but possibly due to the inability for the carbon dioxide to diffuse into the water. This would decrease the photosynthesis rate, and the plants would have to use sugars from their cellular structures to compensate for the lack of sugars produced for metabolism.

Summary Statement
It demonstrates the way aqueous plants are effected by oil spills.

Help Received
My father showed me how to use Microsoft Excel

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Charles C. Wong

Project Number
S1420

Project Title
Potential Celecoxib-induced Cerebrovascular Signaling Alterations in HIV Patients

Abstract

Objectives/Goals
The blood-brain barrier (BBB) is the first line of defense against potentially harmful drugs or toxins passing from the blood stream into the brain. Human immunodeficiency virus (HIV) patients frequently take antiretroviral protease inhibitors as well as cyclooxygenase-2 (COX-2) inhibitors to treat disease-associated complications. The primary objective is to investigate potentially deleterious medication interactions, signaling induced by COX-2 inhibitor celecoxib, HIV glycoprotein 120IIIB (gp120), and HIV protease inhibitor, indinavir.

Methods/Materials
Experiments were performed using human brain microvascular endothelial cells (HBMECs) exposed to 0.4 ug/ml celecoxib, 25 ng/ml gp120, 5 uM Indinavir or combinations thereof. Doses of celecoxib and indinavir treatments were selected based on cited peak plasma concentrations after first pass metabolism. A non-toxic dose of gp120 was utilized, and a dose of 5 mM hydrogen peroxide (H(2)O(2)) sufficient to induce oxidative stress was used as a positive control for cell death. After 24-hour incubation, HBMECs were harvested and analyzed for viability along with signaling changes. Viability assays were conducted by Trypan Blue exclusion assays. Western blot analyses were subsequently performed to examine cascading protein signaling pathways. HBMEC expression of COX-2, glycogen synthase kinase 3-beta (GSK3B), and extracellular regulated kinase (ERK) phosphorylation levels were quantified via densitometry.

Results
No significant cell death was observed after single or combined treatments with celecoxib, gp120, or indinavir. However, western blot analyses of cellular fitness proteins (COX-2, GSK3B, and ERK) revealed statistically different expression and phosphorylation after singular and combined treatments.

Conclusions/Discussion
Although the combinatory drug treatments did not prove to be significantly toxic to HBMECs, Western blot analyses reveal a disruption in cellular signaling. These alterations in cell fitness associated signaling cascades, may contribute in part to neuropathogenesis of HIV in the central nervous system of patients taking both indinavir and celecoxib. The understanding of drug interactions between indinavir and celecoxib will greatly benefit clinicians in prescribing these medications and assist in educating the public about the consequences from taking these particular drugs.

Summary Statement
The experiments examined the potential of celecoxib to disrupt the BBB protein signaling cascade in patients battling HIV.

Help Received
Laboratory equipment was used at the Department of Pathology at the University of California, San Diego under the supervision of Dr. Dianne Langford and Rosemary Hurford.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Lisa Yan

Project Number
S1421

Project Title
Discovery of Novel Histone Deacetylase Inhibitors for Breast Cancer

Abstract

Objectives/Goals
The purpose of this project is to determine whether Histone Deacytelayse (HD) inhibitors, 51 novel compounds, are effective compounds against MDA-MB-435 breast cancer cells. Effectiveness is determined by whether the compound surpasses a certain toxicity; thereupon it will be an active compound that kills breast cancer cells. HD Inhibitors are effective because they bind onto the histones causing hyperacetylation, which is when many acetyl groups attach onto the histone, forcing the DNA to unravel. This forces the DNA to be transcribed, but it is an unregulated transcription of DNA, in effect the DNA malfunctions. The cell cycle is arrested and apoptosis occurs. We hypothesize these novel small-molecule compounds to works against breast cancer based on docking studies.

Methods/Materials
With a breast cell culture, trypsinizning the cells removes the cells off of the flask. Then, the amount of cells present can be determined by counting the cells under a microscope. After plating the cells into a 96 well plate, prepared compounds are added into each well. An incubation period of 48 hours is needed so that the drugs can be incorporated into the newly dividing cells. MTT assay is then used to stain cells that are metabolically active, which in this case, is a purple stain. The color will help determine the amount of cells alive in each well, as with the intensity of the purple coloring.

Results
The dose response demonstrates that compounds HD 38, HD 39, and HD 42 displays activity on the MDA-MB-435 breast cancer cells. The IC50s found for the compounds implies a good set, where the lowest concentration that destroys the cancer cells is determined to be below 20 µM (micro-molar). The IC50s of HD 38, HD 39, and HD 42 are 2.3, 2.2, and 14 µM (micro-molar) respectively. The IC50 value is the concentration of each compound that eliminates 50% of the cells, and this is the standard that is needed to determine how potent a compound is. The compounds are proven to be active based on their toxicity, which illustrates that they do inhibit the site of the histone attachment site with the DNA.

Conclusions/Discussion
Compounds HD 38, HD 39, and HD 42, are potential anti-cancer compounds. These compounds are acting as histone deacetylase inhibitors to eliminate MDA-MB 435 Breast Cancer Cells.

Summary Statement
To determine if the newly developed novel Histone Deacytelayse inhibitors are potential anti-cancer compounds for MDA-MB 435 breast cancer .

Help Received
Lab equipment at University of Southern at the Department of Pharmaceutical Sciences

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Janey Yu

Project Number

S1422

Project Title

Cellular Characterization of Nickel-Induced C3H/10T1/2 Cl 8 Cell Transformation

Abstract

Objectives/Goals

Inhalation exposures to soluble and insoluble nickel compounds during sulfidic ore refining were previously correlated with excess respiratory and nasal cancer risks by others in epidemiological studies. No excess risks were detected among workers refining lateritic ores. My objective is to investigate the genotoxicity of nickel compounds found in the occupational setting to reduce the risk of lung cancer in refinery workers and also to understand the process of metal carcinogenesis.

Methods/Materials

A lateritic ore sample (95% Ni, 5% NiO) called Queensland Nickel Compact (QNIC), was evaluated to detect whether or not it can be taken up into C3H/10T1/2 Cl 8 (10T1/2) mouse embryo cells by phagocytosis, induce cytotoxicity, and morphological transformations and chromosome aberrations in 10T1/2 cells. QNIC was compared to various nickel compounds including carcinogens, NiO and Ni(3)S(2). QNIC was also compared to the known carcinogen, 3-methylcholanthrene (MCA), and the well-known chromosomal breaking agent, mitomycin C (MMC) in transformation and chromosome aberrations studies.

Results

QNIC was: phagocytosed less, less cytotoxic, and not less able to induce cell transformation (transformation slope = 0.06 not significantly different from zero) than black/green NiO or Ni(3)S(2) (slopes = 5-10 and 1-50, respectively). The genotoxicity of the lateritic sample was low and the LC(50) level of QNIC was determined to be between 10 to 20 ug/mL concentration.

Conclusions/Discussion

The cytotoxicity by the QNIC sample was dose-dependent in 10T1/2 cells. From 0-20 ug/mL concentration, the phagocytic uptake was dose-dependent. Frequencies of chromosomal aberrations were small in the range of 5-30 ug/mL (3-fold to 7-fold), but results did not show a dose-dependent pattern. Frequencies of transformed cells revealed no dose-dependence pattern in QNIC concentration and did not induce Type-III foci at any concentration. Therefore, information gathered from this study indicates QNIC to be either non-carcinogenic or at not readily carcinogenic.

Summary Statement

A nickel compound called QNIC was induced into C3H/10T1/2 Cl 8 mouse embryo cells to detect whether or not it can be phagocytosed, induce cytotoxicity, and morphological cell transformations and chromosome aberrations in 10T1/2 cells.

Help Received

Used lab equipment at University of Southern California under the supervision of Dr. Joseph Landolph; advised by Duane Nichols; trained by Patricia Loo and Ashiya Hamirani

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Christina Zhu

Project Number
S1423

Project Title
The Effect of Concentration of Fluoride in Saliva on the Remineralization of Hydroxyapatite

Abstract

Objectives/Goals
What is the effect of the concentration of fluoride in saliva on the remineralization of hydroxyapatite? My objective is to find the optimal concentration of fluoride to restore minerals to teeth without causing fluorosis.

Methods/Materials
A. Demineralize teeth by placing in 3M HCl.
B. Place 3 teeth in 3 separate beakers with calcifying solutions (containing calcium, phosphate, and carbonic acid) with no fluoride (control group) for 30 minutes.
C. Acid-base titration of phosphate ion with nitric acid.
D. EDTA titration of calcium ion.
E. Repeat steps B-D with 1.6 ppm, 21.6 ppm, and 41.6 ppm sodium fluoride.
F. Independent variable: concentration of fluoride; dependent variable: amount of calcium and phosphate ions taken up by teeth; 3 trials each for 0 ppm, 1.6 ppm, 21.6 ppm, and 41.6 ppm fluoride.

Results
As the concentration of fluoride increased, the concentration of calcium ion remaining decreased, meaning more calcium ion was taken up by the teeth. At 0 ppm and 1.6 ppm fluoride, calcium was actually lost from the teeth, while calcium was restored to the teeth at 21.6 and 41.6 ppm fluoride. The phosphate ion titrations were unclear and inconclusive. Fluorosis was observed as white spots, more common on dentin than on enamel, at 21.6 ppm and 41.6 ppm fluoride. At 1.6 ppm, teeth were white, but did not show signs of fluorosis. At 0 ppm fluoride, demineralization from the HCl was still evident as faint pink/orange erosion.

Conclusions/Discussion
Fluoride does indeed have an effect on the remineralization of the hydroxyapatite mineral in teeth. In this experiment, the optimal concentration of fluoride was 1.6 ppm, because remineralization was visible from the lack of pink/orange erosion, and fluorosis did not occur. At certain concentrations, fluoride is beneficial, but higher concentrations can cause fluorosis.

Summary Statement
The experimenter sought to discover the optimal concentration of fluoride in saliva to restore minerals to teeth.

Help Received