CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Milena M. Andzelm

Project Number
S1401

Project Title
Growth Factor Rescues Cell Growth Following Bcr/Abl Inhibition by STI571

Abstract

Objectives/Goals
The purpose of the experiment was to examine the effect of STI571 on the growth of Bcr/Abl positive and Bcr/Abl negative cells in the presence and absence of growth factor.

Methods/Materials
There was a series of five pre-experimentation pilot tests leading up to the final experiment. In the final experiment, cell lines expressing only the E2a/Pbx protein and cell lines expressing both E2a/Pbx and Bcr/Abl were cultured in various concentrations of growth factor, with or without STI571. There were four plates total with 12 wells each. After a 72-hour incubation period the cells were quantified using a hemocytometer and a microscope. There were two sets of data for this experiment as each concentration of growth factor was repeated twice per plate of cells.

Results
Plate 1, with no Bcr/Abl and no STI571 grew according to the concentration of growth factor. Plate 2, with no Bcr/Abl but with STI571, also grew according to the concentration of growth factor but had overall less cells than plate 1. Plate 3, which had Bcr/Abl but no STI571 grew independent of the concentration of growth factor. Plate 4, with both Bcr/Abl and STI571, grew according to the concentration of growth factor. Also a threshold of concentration of growth factor was observed, where with less than 50% growth factor there was no direct correlation with cell proliferation.

Conclusions/Discussion
The STI571 was shown to effectively block the Bcr/Abl protein in Plate 4, and the growth factor then rescued the cells so that they worked like normal cells without Bcr/Abl. This shows that STI571 is an improvement over other cancer drugs that seek to destroy cancer cells, since it only seeks to destroy the cancer causing protein. However, STI571 was also found to have some non-specific toxicity, so it is not perfect yet.

Summary Statement
Cell proliferation techniques were used to find that STI571 effectively blocked the Bcr/Abl oncoprotein and that growth factor rescued the cells, as well as showing the non-specific toxicity of STI571 and thresholds of growth factor.

Help Received
Lab space and equipment was used at the University of California, San Diego under the supervision of Dr. Park Trefts and Mr. David Sykes. This was done through the Consortium of High Schools, Universities and Medical Schools Program.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Lauren A. Baize

Project Number
S1402

Project Title
Can You "Catch" A Cavity? A Study of the Effect of Saliva pH and Oral Strep mutans Levels on Development of Cavities

Abstract

Objectives/Goals
This experiment shows how the ingestion of Coke, a surrogate sugar solution, affects saliva pH and oral Streptococcus mutans levels. Sugar is digested by Strep mutans when it enters the mouth, causing the release of acid. If acid released causes oral pH to drop below the #critical pH# of 5.5 for extended periods, a cavity may form.

Methods/Materials
Measure baseline Strep mutans and pH levels of 10 subjects before the ingestion of Coke, as a control. Then measure pH levels with pH strips immediately after the ingestion of Coke and every 10 minutes for 50 minutes. Measure Strep mutans levels with Dentocult# SM Strep mutans strips 5 minutes after the ingestion of Coke and every 10 minutes for 45 minutes; then incubate Strep mutans vials for 48 hours.

Results
The subjects# average saliva pH level was 7.0 before ingestion of Coke, fell to 4.2 immediately after ingestion of Coke, rose above the critical pH within 20 minutes, and returned to its normal level within 50 minutes. However, the average Strep mutans level did not change after ingestion of Coke, contrary to the hypothesis. People whose saliva pH dropped to 4.0 immediately after ingestion of Coke had, on average, a higher Strep mutans level than people whose saliva pH only dropped to 5.0 after ingestion of Coke. This experiment also showed that subjects# Strep mutans levels did not correlate with the number of cavities they had.

Conclusions/Discussion
The decrease in saliva pH is due to Strep mutans digesting sugar and then releasing lactic acid as a byproduct. My experiment shows no relationship between sugar ingested and Strep mutans levels. Also, because all subjects started with a saliva pH of 7.0, the fact that people with a higher Strep mutans level had a lower average saliva pH level after ingestion of Coke proves that the decrease in pH was not merely due to the slight acidity of Coke. It also proves that increased bacteria in the mouth causes more sugar to be digested, as shown by these subjects# lower pH levels. Lastly, there was no correlation between Strep mutans levels and number of cavities because, although a high Strep mutans level increases one#s vulnerability to cavities, taking preventive measures can reduce one#s risk. Interestingly, all three subjects with sealants had no cavities, even though they had high levels of Strep mutans in their mouths, showing the effectiveness of sealants.

Summary Statement
My project shows how the ingestion of Coke, a surrogate sugar solution, affects oral pH and Strep mutans levels and thus increases vulnerability to cavities.

Help Received
My parents helped buy materials, order Dentocult# SM Strep mutans strips from Finland, and design my display board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Emily C. Balmert

Project Number
S1403

Project Title
The Effect of Ultraviolet (UV-B) Radiation on Spirogyra

Abstract

Objectives/Goals
The goal of my project was to determine if low-intensity radiation exposure in addition to normal sunlight effects a simple unicellular organism. My experiment uses a UV-B light in addition to normal sunlight to demonstrate that increased UV-B radiation reaching the Earth#s surface through the hole in the ozone layer might have a similar effect on unicellular organisms.

Methods/Materials
Spirogyra samples from a laboratory supply store were put in petri dishes filled with rainwater. Half the samples were placed on a table in the sun and half were placed on the same table but also exposed to a five watt UV-B light. I took extreme care to prevent my exposure to any radiation. Every five hours I looked at individual spirogyra strands under a microscope to count any changes in the number of cells. In the next part of the experiment I weighed new spirogyra samples on an electronic balance and then repeated placing the samples on the table in equal groups. At various times I measured the amount of light passing through the spirogyra samples. I used a data logger with a light sensor attached and downloaded the data to my computer. The experiment was repeated numerous times and a statistical analysis was conducted.

Results
When compared to spirogyra in sunlight, the samples exposed to both sunlight and UV-B radiation developed a weaker pigmentation and exhibited reduced growth. Longer exposure made these differences more noticeable. In the first part of the experiment the sunlight spirogyra strands increased in cell count or remained constant while the samples exposed to sun and UV-B radiation decreased. In the main part of the experiment more sunlight consistently passed through the sunlight and UV-B samples, indicating less chlorophyll, while less sunlight went through the sunlight only spirogyra, indicating more chlorophyll. A #Student T Test# statistical analysis of this data shows that the differences between the samples were significant, and not due to chance.

Conclusions/Discussion
Spirogyra in only sun continued to thrive but samples exposed to sun and UV-B radiation showed weaker pigmentation and reduced growth. Since pigmentation indicates the amount of chlorophyll present it appears that UV-B radiation effects spirogyra's photosynthesis process. The experiment#s statistical evidence is strong. Low intensity UV-B radiation has a detrimental effect on the unicellular organism spirogyra.

Summary Statement
My project determines if low-intensity UV-B radiation exposure, like that passing through the hole in the ozone layer, will have an effect on a simple unicellular organism, spirogyra.

Help Received
My former science teacher Mrs. Sniffen loaned me a microscope, data logger, UV light, and an electronic balance and let me bring these home. Mrs. Taylor guided me through my project. My former math teacher, Mr. Whitaker, reviewed my statistical analysis. My dad connected the data logger to our

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Sara A. Bryant

Project Number
S1404

Project Title
Methoprene Acid Affects the Growth of 3T3 Cells

Abstract

Objectives/Goals
The objective of this experiment is to observe the effects Methoprene Acid (MA), which acts as a hormone, and Thyroid hormone (T3) have on the growth of 3T3 cells.

Methods/Materials
Cell Culture - 3T3 cells were grown in culture medium with serum at 37oC. Cells were removed from the flask with trypsin and counted with a hemacytometer. The same number of cells were plated into each well of a 24-well tissue culture plate. After 24 hours, the test solutions were added to each well. Each solution was tested in triplicate wells for each experiment, except for the standard curve experiment in which cultures were tested in duplicate. Cultures were grown for another 48 hours in the presence of the test solutions.

MTT Assay - The number of cells in each well was determined spectrophotometrically by measuring the amount of MTT that was metabolized. 50 ml of MTT (5 mg/ml in saline) was added to each culture well for 4 hours. Cells were then solubilized in 10% SDS overnight. Absorbance was measure at 550 nm after setting the zero reference at 690 nm.

Results
When the 3T3 cells were exposed to MA at low concentrations, the growth of the cells was stimulated. When exposed to high doses of MA, the MA had a lethal effect on the cells. The T3 inhibited the stimulation of growht by MA. T3 increased the growth of the 3T3 cells at high doses.

Conclusions/Discussion
The amount of MTT that is metabolized in each tissue culture well, is proportional to the number of cells in that well. DMSO is used to solubilize the test compounds (MA and TH). DMSO inhibits growth of cells in a dose-dependent fashion. MA stimulates growth of cells at low doses and inhibits growth at high doses. My hypothesis that the inhibition at high doses is a consequence of the induction of cell death. TH does not effect the growth of the 3T3 cells. TH neutralizes the high dose effect of MA. I hypothesize that TH functions to inhibit MA-induced cell death. "Cellular" balls were formed at high concentrations of Thyroid hormone (-4 and -5). Methoprene Acid inhibits the induction of the thyroid balls.

Summary Statement
Testing the effects Methoprene Acid and Thyroid Hormone have on the growth of 3T3 cells.

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

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Tina Cheung

Project Number
S1405

Project Title
What Is the Most Effective Treatment for Bacteria in Salmon?

Abstract

Objectives/Goals
My objective was to learn which of lemon juice, vinegar, garlic solution or water was the most effective in killing bacteria from fresh and refrigerated raw salmon. Many people die from bacterial food poisoning each year, thus it is essential to know what can be added to the food so that the bacteria level is lowered.

Methods/Materials
Agar plates were used to cultivate the bacteria. The mixtures of the bacteria from the salmon (fresh and refrigerated) and the treatments (vinegar, lemon juice, garlic solution, and water) were ejected onto agar plates and incubated at 37 degrees for 24 hours. The bacteria colonies that had cultivated on the plates were then counted and recorded.

Results
Vinegar resulted being the most effective in killing the bacteria whereas the water resulted in being the least effective. Lemon was the second most effective and the garlic solution was the third. The level of bacteria on refrigerated salmon was a bit higher than that of the fresh salmon.

Conclusions/Discussion
There was a slight positive correlation between the acidity of the treatments and the number of bacteria it killed. It was also found that short period refrigeration did not have much effect on bacteria levels. The results of this experiment could provide health guidance for those who like to eat raw/rare meat and sushi. Now, restaurant owners and chefs could also learn to be more cautious of how long food has been kept in the refrigerator.

Summary Statement
This project is about which of lemon juice, vinegar, garlic solution, or water kills bacteria on fresh and refrigerated raw salmon best.

Help Received
Used lab equipment at UC Berkeley under the supervision of Professor Antje Hofmeister.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Michelle M. Chiu

Project Number
S1406

Project Title
Mendaka Eggs

Abstract

Objectives/Goals
To find out how well the membrane of a fish egg protects the embryo within when confronted with various pollutants and bacteria.

Methods/Materials
Materials: 24 Medaka eggs, 2 petri dishes(separated into 4 compartments), 1 dissection microscope, 5 pipettes, 5 beakers, 1 plastic tweezers, florescent heat lamp, thermometer, methelene-blue, copper sulfate, potassium phosphate, motor oil, bacteria (Bacterial drain and trap cleaner)
Methods:
I separated the eggs into groups of 4 and placed them in to the pollutants. The remaining eggs i used to put in higher concentrations of pollution just to test the durability of the membrane. I viewed the eggs daily, along with recording and drawing the data.

Results
The 4 eggs in the clean water all survived and are alive, The 2 eggs in the 5% potassium phosphate solution died within 5 minutes. Of the 4 eggs in the 2% potassium phosphate solution, the membrane was greatly damaged 1 died in about 2 days, the 2 hatched half way, then died, one hatched completely but died within a minute. The 2 eggs in the 5% copper sulfate solution died instantly. Of the 4 eggs in the 2% copper sulfate solution, 2 died after one day, and the other two died the next. Of the 4 eggs in 2% the motor oil, 1 died after 2 days, the rest survived and hatched, but the fry died within the 1st minute of birth. The bacteria had no effect on the eggs.

Conclusions/Discussion
The egg membranes do protect the embryos, but only to a certain extent. When in high concentrations of pollution, the membrane could not protect the eggs, and the embryos died. In lower concentrations of pollution, the membrane was damaged, and was very weak and could be easily broken, but even so, it still protected the egg(under the circumstances no disturbance was made). The newly hatched fry in the polluted solutions died instantly because they could not handle the pollution in the water, and lacked the membranes fresh water and protection, thus causing them to die.

Summary Statement
My project is about how well the membrane of a fish egg protects the embryo within, when it is confronted with various pollutants and bacteria.

Help Received
none

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Carolyn Y. Chu

Project Number
S1407

Project Title
The Abrasiveness of Exfoliants on Skin

Abstract

Objectives/Goals
The purpose of my project is to find out which exfoliants are most abrasive on skin. One of my goals is to find out what products are good for your skin so people may pick products which are right for them and not to damaging.

Methods/Materials
Materials: balance, 4 types of exfoliants (Clean & Clear Daily Pore Cleanser, Biore Mild Daily Cleasing Scrub, Freeman Facial Scrub, and St. Ives Apricot Scrub), running water, and 50 pieces of chamois (2" by 2"). I tested by first massing the piece of chamois, then getting it completely wet, applying the exfoliant, scrubbing it 30 times, washing off the exfoliant, and letting it dry in the sun. After it was completely dry, I recorded its mass once again and calculated the percentage of mass loss. Ten trials were performed with each exfoliant and the control.

Results
The St. Ives Apricot Scrub was the most abrasive and the Biore Mild Daily Cleansing Scrub was the least abrasive. The Freeman Facial Scrub was the second most abrasive and the Clean & Clear was the third most abrasive. Not much change came to the control.

Conclusions/Discussion
My hypothesis was incorrect. I found that the St. Ives Apricot Scrub was the most abrasive not the Clean & Clear Daily Pore Cleanser. The St. Ives had a rough, sandy texture, and it also contained fragrances which are known to be harsh on certain skin. The least abrasive exfoliant, the Biore Mild Daily Cleansing Scrub, had a soft, smooth texture, and it did not contain any fragrances.

Summary Statement
My project is about testing the abrasiveness of exfoliants so that people may pick out products which are good for their skin and won't cause too much damage.

Help Received
Mrs. Zadik aided me getting materials and helped with testing methods, Ms. Houston from the Lu Ross Academy allowed me to interview her, and family helped lend support.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Nicole M. Cisneros

Project Number
S1408

Project Title
Does Lysozyme in Human Tears Kill Bacteria?

Abstract

Objectives/Goals
The purpose of my science project is to observe the effects of human tears on the growth of bacteria. Tears contain an enzyme called lysozyme that reportedly has bactericidal properties. I want to see if and how efficiently lysozyme actually kills bacteria. If tears do have antimicrobial powers,will lysozyme kill just any of the bacteria the eye comes into contact with or just specific bacteria? I also wish to see if the efficiency of lysozyme in tears varies from person to person. Is all lysozyme in tears the same or does its bactericidal strength vary in different people?

Methods/Materials
I used onions to collect tears from various people. I made lawns of four different bacteria on an agar plate and inoculated filter paper discs saturated with tears on each lawn. After 24 hours, I observed the plate and looked for a zone of inhibition which means that the lysozyme is having an effect on the organism and inhibiting its growth.

Results
My results show that Micrococcus lysodeiktius is susceptible to the lysozyme, but the other three bacteria are resistant and there is no inhibition in their growth.

Conclusions/Discussion
In conclusion, I believe that human tears indeed have microbial powers, which has some effect on Micrococcus lysodeiktius, but they are not effective nor strong enough to protect our eyes from all bacteria that comes into contact with them.

Summary Statement
My project is about the effects of lysozyme in human tears on bacteria.

Help Received
Mother, a former lab technologist, supervised my handling of bacteria

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Nicole T. D'Arcy

Project Number
S1410

Project Title
The Survival Rate of Bacteria Dependent on the Concentration of Antibiotics

Abstract

Objectives/Goals
The purpose of this experiment is to determine the survival rates of bacteria in the presence of different concentrations of the antibiotic ampicillin. Ampicillin-resistant mutant was also tested for multi-drug resistance to tetracycline, nalidixic acid, and vancomycin.

Methods/Materials
Samples of mouth bacteria were streaked on plates with different concentrations of ampicillin and the surviving bacteria colonies counted. Ampicillin-resistant bacteria colonies were plated on tetracycline, nalidixic acid, and vancomycin and the colonies that grew were recorded.

Results
It was found that the bacteria have tolerance to low concentrations of antibiotics so that the survival curve has three parts: complete survival (0-0.05 ìg/ml ampicillin), declining survival levels (0.05-1.0 ìg/ml ampicillin), and complete death (5.0 ìg/ml ampicillin and higher). The effective ampicillin dosage on this strain of mouth bacteria is 3.8 ìl ampicillin/bacterial cell. The ampicillin mutants were also resistant to tetracycline, nalidixic acid, and vancomycin.

Conclusions/Discussion
Antibiotic resistance is increasing and has recently become a large problem in human medicine. Due to the overuse of antibiotics combined with the natural process of evolution, antibiotic-sensitive bacteria have been effectively eliminated and only the stronger bacteria that could not be killed by antibiotics are left. This experiment determined the effective concentration of ampicillin in killing samples of mouth bacteria and also demonstrated that multi-drug resistance is a valid concern because multi-drug resistance plasmids decrease the kinds of antibiotics that are effective on different bacteria strains. The hypothesis was shown to be correct for the antibiotic concentrations above 0.05 ìg/ml ampicillin. Lower antibiotic concentrations were completely tolerated by the bacteria demonstrating that the bacteria has a degree of tolerance to antibiotics. There are three parts of the survival curve: complete survival, declining survival levels, and complete death.

Summary Statement
The focus of the experiment is to determine the survival rate of bacteria in the presence of different concentrations of ampicillin.

Help Received
Dr. Karen Otteman allowed me use of her toxicology lab at the University of California, Santa Cruz for eleven days. Her student, Tessa, supervised my experiment in the lab. Dr. Hoernschemeyer provided advice about presentation and layout of my lab report.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Victoria Garcia

Project Number
S1411

Project Title
The Effects of Cigarette Smoke on Plants

Abstract

Objectives/Goals
My project was to determine if cigarette smoke altered the growth and development of plants. I hypothesized that the cigarette smoke would definitely harm the plants# growth and development.

Methods/Materials
Before testing, I planted six cabbage and six celery plants in a container for the control group and another six cabbage and six celery in a large container for the experimental group. I also had to make a rectangular sphere out of straws and six 15 cm straws for the purpose of preventing the bag from falling on top of the cigarettes or plants. Once I had that, I started testing. Every day, I would place the experimental plant container (which had the 15 cm straws in it) in a plastic bag with the rectangular sphere made of straws. I would then place the two cigarette containers in the sphere with two lit cigarettes. I then tied the bag. After two hours, I would take the container out and measure the plants, including the control set of plants.

Results
The results were that the cigarette smoke did affect the growth and development of the plants.

Conclusions/Discussion
In conclusion, cigarette smoke is hazardous to the development of plants.

Summary Statement
It is about the harm that cigarette causes to plants.

Help Received
Teacher reviewed overall project

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Neil Gehlawat; Sean Matthews; Ryan Newbrough

Project Number
S1412

Project Title
Treating Pasteurella multocida

Abstract

Objectives/Goals
To determine which antibiotic treats the disease pasteurella multocida most effectively.

Methods/Materials
Antibiotic disks- oxacillin, clindamycin, ciprofloxacin, tetracycline, penicillin, augmentin, and septra. Other materials used were sterile swabs, saline solution, sheep blood agar plates, and an incubator.

Results
Top three antibiotics that worked best were ciprofloxacin(13.2mm kill zone), Augmentin and Penicillin(both 13mm kill zone), and Clindamycin and Penicillin did not work at all.

Conclusions/Discussion
Augmentin was the best antibiotic since it is cheaper than ciprofloxacin and it also can be used on people of all ages, unlike ciprofloxacin, which can cause detrimental effects to children under the ages of 18.

Summary Statement
We are determining which antibiotic treats pasteurella multocida best.

Help Received
Tracy Langenfeld- Lab Technician at Memorial Hospital provided incubator and Dr. Frank Edwards, who provided antibiotic disks. Also, Dr. Newbrough and Dr. Gehlawat helped with research.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Pavan Gollapudi

Project Number
S1413

Project Title
The Effect of Thimerosal on the Expression of Pro and Anti Apoptotic Proteins

Abstract

Objectives/Goals
Apoptosis is a form of cell death. It plays a major role in the immune system by regulating the number of cells necessary. It has also been linked to be responsible for cancer, AIDS, and Alzheimer#s disease. Bcl2 and Bax are two intracellular proteins are known to regulate apoptosis. Bcl2 protects the cell from apoptosis, whereas Bax promotes apoptosis. Thimerosal is a commonly used preservative in vaccines, and contains the toxic metal mercury. Thimerosal has also been addressed to raise mercury levels in infants. Previous studies have also shown that thimerosal causes problems in the immune system including apoptosis in lymphocytes. In this study, the effect of thimerosal on the expression of Bcl2 and Bax was examined.

Methods/Materials
In this experiment, cells were exposed to thimerosal, and then stained with antibodies labeled with fluoresceine. A flowcytometer was used to measure the amount of fluorescence, which directly proportional to the amount of Bcl2 or Bax present. A non-specific IgG antibody was used as a background staining to determine if there was in fact a change in the amount of protein expressed.

Results
The results showed that thimerosal induced apoptosis by decreasing the ratio between Bcl2 and Bax, making it more susceptible to apoptosis. Thimerosal drastically lowered the amount of Bcl2, while it did not affect the amount of Bax as significantly.

Summary Statement
Thimerosal, a vaccine preservative, induces apoptosis in T-cells by altering the ratio between anti-apoptotic proteins(Bcl2) and pro-apoptotic proteins(Bax).

Help Received
This experiment was carried out at UCI under the supervision of my father.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Heidi E. Honeycutt

Project Number
S1414

Project Title
Lowering Total Cholesterol

Abstract

Objectives/Goals
This investigation was designed to determine if the daily consumption of oatmeal(a water soluble fiber) and regular exercise will reduce a person's total blood cholesterol level twice as much as solely the daily consumption of oatmeal.

Methods/Materials
Thirty randomly selected subjects were divided into three groups: one group maintaining their normal eating and exercise schedule(control group), another group eating 3/4 cup of Quaker oatmeal once a day for thirty days, and the last group eating 3/4 cup of Quaker oatmeal once a day for thirty days and adding thirty minutes of aerobic exercise three times a week to their normal schedule. The two groups that ate oatmeal, substituted one of their normal meals with the oatmeal. Each subject's total cholesterol level was measured before and after the thirty days of experimentation, with the Lifestream Cholesterol Monitor Home Kit. Both the change in cholesterol readings and the percentage of improvement were calculated and recorded.

Results
Both the daily consumption of oatmeal and regular exercise reduce total cholesterol measurements, but the daily consumption of oatmeal and regular exercise will not reduce a person's total blood cholesterol level twice as much as solely the consumption of oatmeal. The exercise/oatmeal group's total blood choletserol reduction average was 32.2 mg/dl. The oatmeal group's total blood cholesterol reduction average was 20 mg/dl. Statistical analysis was run on the data, and the oatmeal/exercise group proved to be statistically significant. the oatmeal group was not found to be statistically significant, but showed a useful trend in the data. More subjects would need to be tested to confirm the significance of the oatmeal group.

Conclusions/Discussion
A person may indeed reduce his total blood cholesterol level by consuming a water soluble fiber such as oatmeal on a daily basis. A person may also reduce his total blood cholesterol by performing aerobic exercise on a regular basis (at least three times a week). Combining the consumption of water soluble fibers and participating in aerobic exercise increases ones chance of reducing blood cholesterol levels; but the daily consumption of oatmeal and aerobic exercise will not reduce a person's total blood cholesterol twice as much as solely the consumption of oatmeal. Results show that my hypothesis was incorrect.

Summary Statement
My project was costructed to determine if the daily consumption of oatmeal and regular exercise would reduce a persons total blood cholesterol level twice as much as solely the daily consumption of oatmeal.

Help Received
Mother helped construct back board and helped test subjects.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Abril Iniguez; Shirin Pillay

Project Number

S1415

Project Title

Examining the Detrimental Effects of Ultraviolet Radiation on Human Dermal Replacement

Abstract

Objectives/Goals

We have chosen to do this project to explore the properties of the human dermis, the primary factor of genetic mutations and/or skin cancer, and to study the response of the Dermagraft, a type of human dermal replacement tissue, when subjected to various amounts of UV exposure.

Methods/Materials

For the experiment, we exposed several samples of the Dermagraft tissue to various amounts of UV radiation under the UV sterilization light in a standard Bio-hood. After the UV exposure, the cells were incubated overnight to allow regrowth and an MTT Cell Liability Assay and FACS analysis were performed to determine the number of apoptotic cells present.

Results

Qualitative results of the MTT Assay did not indicate a significant effect as all samples were stained dark violet, indicating that most of the cells present were still alive and had not experienced apoptosis. Nevertheless, a statistical analysis of the MTT readings showed that a direct proportion between the number of dead cells present and the amount of UV exposure time the samples had been subject to existed. However, the FACS analysis indicated that the difference between the ratios of apoptotic cells in each sample was not substantial enough to imply that UV exposure induces a major effect.

Conclusions/Discussion

The qalitative results of the MTT Assay did not indicate a significant effect nor did the FACS analysis indicated that the difference between the ratios of apoptotic cells in each sample was not substantial enough to imply that UV exposure induces a major effect. However, a statistical analysis of the MTT readings showed that a direct proportion between the number of dead cells present and the amount of UV exposure time the samples had been subject to existed. Also, by interpreting the results of the FACS analysis, we were able to determine that UV radiation induces a much greater percentage of necrotic cells than apoptic cells. Thus, we concluded that while exposure to UV radiation does have detrimental effects on human dermal cells, the level of exposure must be quite substantial to induce a significant effect.

Summary Statement

This project was an examination of the detrimental effects of short-term ultraviolet radiation on a human dermal replacement (Dermagraft) that emulates the basal layer of the human dermis.

Help Received

Used the Advanced Tissue Sciences laboratory under supervision and mentorship of Dr. Dawn Applegate, Dr. Holly Perez, Dr. Sangeeta Dutt, and Mr. Frank Ziegler; Parents helped with transportation; Dr. Grai Andreason helped obtaining materials; Thomas Jett provided guidance and paperwork help

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Anna Jessmer; Jaimie Thomas

Project Number

S1416

Project Title

Less-Toxic Herbicide Alternatives

Abstract

Objectives/Goals

The objective of our project was to determine which of four less-toxic herbicide alternatives would kill Bermudagrass most efficiently over a five-day period. We believed that St.Gabriel Laboratory#s Fast Acting BurnOut Weed and Grass Killer would work most effectively due to its technique of killing vegetation through a burn-down process by binding to the plant cell structure.

Methods/Materials

We divided fifteen sections (25.4 x 38.1 cm) of Bermudagrass using 20.7 meters of wood strips to segregate the areas. Each of the following alternatives were used on three separate sections: St.Gabriel Laboratory#s Fast Acting BurnOut Weed and Grass Killer (vinegar and lemon juice components), Bioganic Weed and Grass Killer, (eugenol oil), Safer Brand Weed and Grass Killer (potassium salts), and 4.5 liters of boiling water (per square). Three squares were left untouched as our control. To fully protect ourselves during application, we wore work gloves, safety glasses, long sleeve shirts, and long pants. We took photos of the Bermudagrass patches immediately after the initial application and the following five consecutive days.

Results

On day-five of our testing period, Safer Brand Weed and Grass Killer had killed and disintegrated all the grass, leaving exposed soil behind. St. Gabriel Laboratory#s Fast Acting BurnOut Weed and Grass Killer had killed all the grass and caused the majority to dry up, leaving partially exposed soil. Bioganic Weed and Grass Killer had killed the grass and it had just started to break down to expose soil. Boiling water killed the grass but the majority of the dead debris remained. In our control areas, where no alternatives were applied, the grass had stayed healthy.

Conclusions/Discussion

After the five-day period Safer Brand Weed and Grass Killer had killed the grass most efficiently. Our hypothesis was incorrect. Although St. Gabriel Laboratory#s Fast Acting BurnOut Weed and Grass Killer had killed the grass well, it just didn#t do it as quickly as Safer Brand. Even boiling water killed the grass. The fact that all four methods killed the grass proves that less-toxic alternatives work well. Highly toxic herbicides, which can harm human health and the environment, aren#t as necessary as people assume them to be.

Summary Statement

Our project tests the effectiveness of less-toxic herbicide alternatives on Bermudagrass over a five-day period.

Help Received

Jaimie's mother (a Master Gardener) suggested research materials during our interview with her.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Stephen Li

Project Number
S1417

Project Title
The Scientific Study of the Effect of Ancient Chinese Medicine: Turtle Jelly on Cancer

Abstract

Objectives/Goals
My project objective is to study and verify the effectiveness of ancient Chinese medicine, Turtle Jelly on inhibiting cancer cell growth.

Methods/Materials
Decocted different herbal ingredients together produced Turtle Jelly. Liver and lung cancer cells were used in the experiment, as well as different equipments, which were provided by the research institute of VA Hospital Palo Alto. Extract of the herbs was tested and compared with the untreated group. The number of cells after the treatment determined the effectiveness of the medicine.

Results
Turtle Jelly was truly effective in inhibiting the liver and lung cancer cell growth. Among the individual herbal ingredients, except Turtle Shell, Glabrous Greenbrier Rhizome, Barbated Skullcup Herb, Akebia Stem and Densefruit Pittany Root-bark, were found to have certain degrees of inhibitive effect on the growth of cancer cells.

Conclusions/Discussion
Turtle Jelly was first analyzed by using the cell tissue cultivation method by Dr. H.Y. Cheung of the City University of HK. Since the herbs are not pure elements, distinct effect can be observed when high doses are used. Turtle Shell contains abundant amino acids, calcium, animal glue, fat calcium and phosphorous. Rather than growth inhibition, these substances provide nutrition for cancer cell to grow. These data showed that Turtle Jelly should be dispensed and analyzed carefully when used.

Summary Statement
To study and verify the effectiveness of Turtle Jelly on inhibiting cancer cell growth.

Help Received
Dr. Tao Li taught me how to work on the project.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Ying Lin

Project Number
S1418

Project Title
The Effect of Antioxidants on the Treatment of Breast Cancer with Tamoxifen

Abstract

Objectives/Goals
The objective is to examine the role of antioxidants in the development of resistance to Tam in breast cancer. Since antioxidants reduce oxdiative stress, they should help the cancerous cells survive.

Methods/Materials
First, I treated the moderately sensitive MDA-MB-231 breast carcinoma cells with Tam at 20 ìM for two hours, either alone or with one other antioxidant. The seven antioxidants were: NAC, N-acetylsysteine at 1 mM; vit. C, vitamin C at 1 mM; vit. E, vitamin E at 100 ìM; â-carotene at 100 ìM; SOD (40 unites/ml); catalase (1000 units/ml).
In the second experiment, the cells were seeded in 35-mm Petri dishes. I treated them with Tam at 5 or 10 ìM, either in the presence or absence of vitamin E at 100 ìM. Cells were trysinized and then counted on the Coulter cell counter. The values represent the mean of three dishes.

Results
In the first experiment, without any added compounds, the breast cancer cells had the highest PKC activity in the control compared to the others. The PKC activity dropped drastically when the cells were treated with only Tam.
Vitamin E had the higest PKC activity. NAC, N-acetylcysteine, was the least effective in blocking the oxidative stress.
In the other experiment, I used the same cell line and tested the extent of the interaction between Tam levels vitamin E. The cells with only vitamin E grew the fastest. The control was right behind it. On the other hand, the ones treated with 10ìM of Tam showed the lowest reading, meaning that the cells were killed by the drug. When vitamin E was applied with Tam, the cell still grew relatively fast.

Conclusions/Discussion
In the first experiment, the results show that most antioxidants do counter the effectiveness of Tam, which was my hypothesis. Because antioxidants reduce oxidative stress, cells had a higher rate of PKC activity when compared to the only Tam Petri dish. Vitamin E had the most adverse effect against Tam because the cells had a more rapid PKC activity rate. NAC had the lowest PKC activity.
The second experiment was conducted to further support first experiment.The focus of the data is how vitamin E and Tam would react when present together in a cell. Vitamin E successfully blocked most of the oxidative stress, since the readings were high. At a higher dose, 10ìM, Tam lowered the rate a little. Overall, when vitamin E was present in addition to Tam, the drug proved to be less effective than if used alone.

Summary Statement
Vitamin E had significant adverse effects on the treatment of breast cancer cells with Tamoxifen.

Help Received
Professor Rayudu Goplakrisna at the University of Southern California, School of Medicine helped handle radioactive substances in the experiments and also provided lab equipments as well as insightful advice to my experiments.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Henry L. Marr

Project Number
S1419

Project Title
The Effects of uPA Inhibition on Cranial Neural Crest Migration

Abstract

Objectives/Goals
To examine the effects of Urokinase-type Plasminogen Activator (uPA) inhibition on the normal migration of cranial neural crest cells in the early chick embryo.

Methods/Materials
After incubation to proper stages, chick embryos were cultured using either New Culture or Window Culture to allow access to the embryo while promoting normal growth. A 1mM solution of Amiloride was added either by dripping onto the embryo or injecting with a Picospritzer. After reincubation, embryos were fixed in 4% Paraformaldehyde and immunohistochemistry was performed for Hnk-1. Staining allowed for the visualization of neural crest cell locations. Each stage (4, 7, or 8) had between 50-70 embryos in each group. Percentages were employed for data analysis.

Results
The inhibition of uPA drastically reduced the number of embryos that showed some sort of neural crest migration (14% instead of 98% in controls). Stage 4 (18 hours incubation) embryos showed that uPA has a direct effect on the ability of neural tubes to close. Every single control embryo had normal closure, while amiloride-treated embryos only had 9% successful closure. A peculiar morphological effect of uPA inhibition is the bifid heart. Although not shown on the majority of embryos, a total of 12 experimental embryos showed the bifid heart characteristic.

Conclusions/Discussion
The inhibition of uPA does indeed halt cranial neural crest migration. Most results showed a clump of premigratory neural crest cells in the neural tube. Inhibition of uPA also prevented neural tube closure, the cause of Spina Bifida in humans. By understanding how neural crest is prevented from migrating and how neural tubes remain open, I can apply this towards developing methods for the promotion of neural crest migration in cells that have failed to do so.

Summary Statement
My project focuses on the effects uPA play on normal neural crest migration; inhibiting uPA allows for the determination of its typical role in early embryonic development.

Help Received
Lab funding and equipment used under the guidance of Dr. Mark A.J. Selleck at the USC Keck School of Medicine

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Sara J. Miles

Project Number
S1420

Project Title
A Novel Cancer Killing Strategy: Direct Protein Delivery of Caspase-3

Abstract

Objectives/Goals

The present project was undertaken to test the feasibility of a novel strategy- direct delivery of functionally active proteins to kill tumor cells. The commercially available protein delivery reagents Profect P-1 and Profect P-2 (Targeting Systems, Ca) were used in delivering Alexa-488 conjugated Histone H-1, b galactosidase and activated caspase-3. Caspases are enzymes, which in their active form can induce cell death by a mechanism termed as apoptosis- a fundamental biochemical pathway for normal tissue homeostasis, cellular differentiation, and development within a multi-cellular organism (Simizu, 1998).

The direct delivery of Alexa-488 conjugated Histone H-1 was delivered using Profect P-2. A bright yellow color was observed under fluorescent light. The yellow is a nuclear localization signal activated once the protein had efficiently entered the cells nucleus. The delivery of b galactosidase was confirmed by a blue color, which stained the nucleus once the protein had entered the cells nucleus. Once the efficient delivery of Alexa-488 conjugated Histone H-1 and b galactosidase was successfully achieved the delivery of activated caspase-3 into 80% confluent cells was acheived using Profect P-2 (Targeting Systems, Ca).

Summary Statement

Using protein delivery reagents in order to introduce active caspase-3 into an MCF-7 cell line, in order to kill the targeted cells in the form of apoptosis.

Help Received

Dr. R. Walia at Targeting Systems, Ca

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Karina H. Nakayama

Project Number
S1421

Project Title
Can Ibuprofen Reduce the Amount of Apolipoprotein E in Neuronal Plaques?

Abstract

Objectives/Goals
Apolipoprotein E has been linked with the formation of senile plaques in neurons. ApoE collects at the ends of neurons, interfering with inter-neural communications. These plaques, which contribute to neuronal death, are one of the hallmarks of Alzheimer's Disease. Ibuprofen is suspected of altering the binding ability of ApoE. If Ibuprofen can reduce the amount of ApoE, it would model a partial reduction of neuronal plaques.

Methods/Materials
Utilizing an anti-serum specifically developed against ApoE, the ELISA procedure was used to determine any noticeable fluctuations in levels of ApoE. This was done by comparing untreated antigen samples to samples that had been incubated with 20mg/ml of Ibuprofen.

Results
Initial results did not reflect a signifcant reduction in the amount of Apolipoprotein E in the treated sample. However, after a slight alteration in the procedure, a clear decrease in ApoE levels was observed.

Conclusions/Discussion
Treatment with Ibuprofen resulted in an immediate lowering of Apolipoprotein E levels. Since ApoE makes up a portion of neuronal plaques, Ibuprofen may be able to reduce the size of the plaques or retard their growth. Consequently, Ibuprofen may be a possible answer to slowing down the progression of Alzheimer's Disease.

Summary Statement
Using Ibuprofen to reduce the amount of Apolipoprotein E in neuronal plaques

Help Received
Used lab supplies and spectrophotometer at UCR

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Dan H. Nguyen

Project Number
S1422

Project Title
Effects of BT Corn on Bacteria

Abstract

Objectives/Goals
PROBLEM: Does Bt Corn juice affect the bacteria Escherchia coli and Rhizobium leguminosarum?

HYPOTHESIS: Bt corn juices will affect both Escherichia Coli and Rhizobium leguminosarum.

Methods/Materials
E.Coli and Rhizobium slants were prepared using bacterial growth kits. In addition, thirty-two petri dishes were prepared with melt and pour agar kits. Sixteen plates were prepared with beef extract agar, and the remaining twenty with soil and yeast extract agar. Within each group, one of sixteen and one of twenty plates, half of the plates were reserved for control and half for Bt testing. Using the slants and agar plates, E. coli was grown on the first group of sixteen plates and Rhizobium on the second group of twenty. Sterile paper discs were placed on all control plates (sixteen controls total) for both bacteria after they had been grown on the plates. For the remaining sixteen plates, discs soaked in Bt juice were implanted on them. Juice was obtained by cleaning the leaves of Bt corn plants and grinding them for juice. Sterile techniques were used throughout the entire experiment.

Results
According to this experiment, Bt corn juices do not affect the bacteria Escherichia coli and Rhizobium leguminosarum. The bacteria grew over the Bt discs and there was no zone of inhibition. The results do not agree with my hypothesis. Even though Bt corn is capable of killing the European corn borer, the caterpillars of monarch butterflies, and the caterpillars of some moths, it did not affect the tested bacteria in this experiment.

Conclusions/Discussion
According to this experiment, juices from the leaves of Bt corn have no effect on the growth or life of the bacteria Escherichia coli and Rhizobium leguminosarum. The bacteria survived the Bt corn toxin while some microorganisms cannot. For future experiments, I would like to test other types of essential soil bacteria.

Summary Statement
How Bt corn juice affects the bacteria Escherichia coli and Rhizobium leguminosarum.

Help Received
Used equipment and greenhouse at Eastlake High School under the supervision and guidance of Mr. Jim Merzbacher; Mom took me to UCSD library and Eastlake; Eldon Harley helped raise corn plants.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Nam Nguyen; Henry Ugale

Project Number
S1423

Project Title
Electrifying Algae

Abstract

Objectives/Goals
To find the effects of electromagnetic fields on algae cells (cyanobacteria).

Methods/Materials
Get the algae in test tubes and expose them to electromagnetic fields (EMF).

Results
The algaes in the test tube with more coils shrank the most algae.

Conclusions/Discussion
We concluded that our hypothesis was correct. In our experiment we found out that electromagnetic fields do have an effect on cyanobacteria algae cells.

Summary Statement
In our experiment we applied electromagnetic fields to algae and and it showed that EMF can kill an entire algae

Help Received
Mike Cryder helped; supplied the microscope, test tubes (science equipment)

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

Maksim Olshansky

Project Number

S1424

Project Title

Influence of rAm and rAb in Differentiation of Odontogenic Cells in vitro

Abstract

Objectives/Goals

An extract of pig enamel proteins is being used to repair tissues destroyed by periodontal disease without knowing what is the active ingredient. In this project I want to determine if the major enamel proteins (amelogenin (Am) or ameloblastin (Ab)) can function like growth factors to repair tissues.

Methods/Materials

Cells were grown in Petri dishes containing permissive media until they reach confluence and then placed on differentiation media containing recombinant Am or Ab protein or just the media. Cells were grown for different days, media was changed every other day and changes in morphology were documented before mRNA was isolated. Cell differentiation was determined using Reverse Transcription # Polymerase Chain Reaction (RT-PCR). RT was done by adding a Poly-T, 4 deoxy-nucleotides and reverse transcriptase enzyme to the mRNA and incubated at 42oC for 1 hour. PCR was done by with 1 µl of cDNA, dNTPs, Ex Taq polymerase and specific primers for proteins associated with tooth formation. The PCR products are analyzed using agarose gel Electrophoresis and the genes expressed are visualized using UV light.

Results

The results indicate that there are no morphological changes in cells incubated with rAM or rAB as compared to the control. The results from the RT-PCR indicate that there is a band for β-actin primer for each of the cells used. Osteonectin primer: there is no differences at 7 days, the expression goes down at 14 days in culture, and at 28 days, rAm down regulates the expression of osteonectin, rAb just a little. BMP4: day 7, no effect, follows a similar profile as osteonectin except at 35 days rAm and rAb down regulated its expression. NFI-X primer: at 14 days, rAb up-regulates expression of NFI-X, later it down regulates. For the DSPP primer bands do not appear.

Conclusions/Discussion

No morphological changes were found in any of the cells tested in the presence of rAb or rAm. All mRNAs obtained were of good quality to do the studies. rAm down regulates the expression of osteonectin and BMP-4 after 14-28 days in culture. rAb up-regulates the expression of NFI-X at 14 days and then it down-regulates it. This suggest that Am and Ab might act as growth factors and induce cell differentiation besides being involved in the production of an enamel extracellular matrix.

Summary Statement

Influence of rAm and rAb in Differentiation of Odontogenic Cells In Vitro.

Help Received

Used lab equipment at the Center for Craniofacial Molecular Biology under the supervision of Dr. Margarita Zeichner-David

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Veena Raghavan

Project Number
S1425

Project Title
The Effects of Agricultural Pollutants on the Marine Diatoms, Skeletonema costatum, and Thalassiosira Pseudonana

Abstract

Objectives/Goals
The purpose of my project was to determine the effects of various agricultural and other pollutants, such as DCMU, iron, copper and glyphosate on marine diatoms.

Methods/Materials
Two different species of diatoms, Skeletonema costatum and Thalassiosira pseudonana, were used. Diluted cultures were made of each of these diatoms. Dichlorophenyldimethyl urea (DCMU), glyphosate, copper and iron found in some pesticides or other marine pollutants were added to separate tubes of each diatom. A control culture was also made for each. Then the maximum fluorescence of each sample was measured using a pulse amplitude modulated fluorometry (PAM fluorometry) on day 0 and day 7. On day 7, cell counts were taken of each sample under a microscope using a hemocytometer.

Results
DCMU increased the fluorescence and the number of cells for both diatoms. Glyphosate had little effect on either of the diatoms. Iron increased the number of cells per mL of both diatoms, but reduced the fluorescence level. But, copper killed nearly all of the cells by day7.

Conclusions/Discussion
Copper used in pesticides and paints has been known to be a potent inhibitor of photosynthesis, which agrees with the results. The DCMU increased the chlorophyll content of both diatoms, possibly because in small amounts it serves as a nutrition source. With the exception of iron, the cell counts and fluorescence have a direct correlation. Since there was a greater number of cells with iron, but a lower fluorescence, it is possible that over an extended period of time, the diatom cell number would decrease as well, due to the inefficiency of the photosynthetic process, when exposed to iron. The concentrations used in my project are much higher than those that are presently being tested as #iron farming# by scientists. The levels of pesticides used in agricultural areas, which flow into runoff, should be reduced to prevent adverse effects on marine organisms, in particular the primary producers.

Summary Statement
My project tested the effects of certain chemicals found in pesticides on tow species of diatoms (Skeletonema costatum and Thalassiosira pseunana).

Help Received
Dr. Jason Smith from Moss Landing Marine Labs provided the lab eqipment.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Anthony R. Rajasingham

Project Number
S1426

Project Title
Examining the Presence of Antimicrobial Properties in Allium sativum L

Abstract

Objectives/Goals
The objective of this experiment is to find out whether Allium sativum L(commercially available garlic) has noteworthy antimicrobial properties, which are effective against a wide range of pathogens, if garlic is only effective at inhibiting growth of a narrow range of pathogens, or if it has no antimicrobial properties at all. Relative efficacy of Allium sativum L will be tested by introducing antibiotics to cultures of pathogens which Allium sativum L was tested against. Antibiotics used were: Ampicillin, tetracycline, and Chloramphenicol.

Methods/Materials
Filter paper discs were immersed in dilutions of pure garlic. Also, discs of three antibiotics were obtained. In addition, quality cultures of 4 pathogens: Staphylococcus aureus, Group B Streptococcus, Proteus mirabilis, and Staphylococcus epidermidis were obtained. The pathogens were subcultured on blood agar and maconkey media plates and were incubated at 37C in the presence of the antibiotic, garlic, and saline control discs. The areas of inhibition were recorded.

Results
Allium sativum L proved to be effective in killing all 4 pathogens. Against one pathogen (Staph epi) 100% garlic produced larger zones of inhibition than any antibiotic, and against the rest of the pathogens Garlic was able to cause zones of inhibition larger than at least one antibiotic, and relatively close in size to the others. Noteworthy is Allium sativum L#s performance against staph aureus. The staph aureus strain used was resistant to both ampicillin and tetracycline, but 100% garlic was able to produce zones of inhibition.

Conclusions/Discussion
Allium sativum L does indeed display antimicrobial properties effective against a wide spectrum of pathogens. As seen in other strains of Allium roots, the chemical allacin may be responsible for these antimicrobial properties. These data suggest that after in vivo trials Allium sativum L might have feasible clinical applications.

Summary Statement
In this experiment I looked to see if commercially garlic could inhibit growth of common pathogens, and if so, to what extent could it inhibit growth of those pathogens.

Help Received
Mr. Cota provided lab supervision and inaluable insight; Fahumiya Samad provided invaluable insight with regards to scientific analysis of results; Mr. Easton aided me with statistics; Mother drove me everywhere, Mr. Thompson helped paint and hinge board; Dr. Rajasingham helped with cross

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Peter K. Rath

Project Number
S1427

Project Title
Stopping Cancer in Its Tracks

Abstract

Objectives/Goals
The object of this project was to determine whether berberine would halt the cell division of cancer cells and to determine which concentration would be most effective.

Methods/Materials
U87-MG gleoma cell lines were exposed to varying concentrations of Berberine and incubated for 120 hours. After this time, cells were counted to observe the effectiveness of Berberine,

Results
The 5mM/ml concentration of Berberine was most effective in halting cell division.

Conclusions/Discussion
It was concluded that the 5mM/ml concentration of Berbine was most effective in halting cell division while maintaining liveliness of the cell samples and that Berbine does in fact inhibit cellular differentiation.

Summary Statement
The halting of cell division of cancer cells.

Help Received
Lab technology and lab assistance provided by La Sierra University under Jim Wilson and Michael Cryder.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Jenny O. Ross

Project Number
S1428

Project Title
Herbal Remedies and Cell Division

Abstract

Objectives/Goals
To see wether the introduction of herbal extracts causes the miotic rate to increase or decrease in onion root cells.

Methods/Materials
Materials: 1.Onions; 2.Herbs 10 grams; 3.Water; 4.Pot in which to boil the water and herb; 5.Containers; 6.Knife; 7.1 M HCl; 8.Clothespin; 9.Slides and covers; 10.Bunsen burner; 11.Paper towel; 12.0.5% aqueous solution of toluidine blue; 13.Microscope; 14.Safety glasses
Methods: 1.Bring 10 oz. of water to a boil. Turn off heat and add 1 oz. of plant material. Allow it to steep for one hour. 2.Water onion bulbs with solutions and one with water (control). 3.Cut off the first few mm of a root after roots emerge and lay it on your slide. 4.Cover the root with two drops of HCl. Using a clothespin to hold the slide then pass it back and forth over the flame of a Bunsen burner for five seconds. 5.Use the edge of a paper towel to remove excess HCl and cover the root with toluidine blue. Pass the slide above the Bunsen burner flame two times without boiling. Let stand for one minute. 6.Remove excess stain. Add a drop of toluidine blue and apply a cover. Place the slide between two layers of paper towl and apply pressure to spread the root tissue. 7.Examine the slide (40X) and identify various stages of mitosis.

Results
Water : Interphase: 75.24%, Mitosis: 24.76%; St. John#s Wort : Interphase: 44.98%, Mitosis: 55.02%; Chamomile: Interphase: 64.87%, Mitosis: 35.13%; Echinacea: Interphase: 81.2%, Mitosis: 18.8%; Essiac: Interphase: 73.39%, Mitosis: 26.61%

Conclusions/Discussion
These results suggest that the average root spends 75% of the time in interphase and 25% of the time in mitosis. St. John#s Wort greatly increases the rate of division (by 30%). In other words, this herb will increase the rate at which wounds heal, it encourages mitosis. Chamomile also increases the rate of mitosis (by 10%). Essiac, an herb recommended for cancer patients also increased the rate of division, by 2% which is insignificant by a chi square test. The only herb tested that lowered the rate of cell division was Echinacea (by 6%) which was also insignificant by a chi square test. These results were surprising, considering that Essiac is an herb prescribed to cancer patients and therefore expected to slow the rate of mitosis. Concentration may have altered these results, even a beneficial herb in high concentrations can cause damage.

Summary Statement
My project tests the effects of herbal extracts on the miotic rates in onion root cells.

Help Received
Used equipment at PCS under the supervision of Mr. Steely.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Claribel Sanchez

Project Number
S1429

Project Title
Antagonism of Ethanol's Effects on Glycine Receptors Expressed in Xenopus oocytes by Increased Atmospheric Pressure

Abstract

Objectives/Goals
Ethanol is the number one drug abused in the United States today, the effects it has on people are understood. However, it is uncertain exactly how and where ethanol binds to have this effect. My objective is to find the exact binding site on this ligand-gated ion channel using pressure as an ethanol antagonist.

Methods/Materials
Oocytes expressing glycine receptors were clamped at #70mV and tested with EC2 concentrations of glycine in the absense and presence of 10-200mM ethanol at control and experimental atmospheric conditions.

Results
Pressure is a direct antagonist to ethanol#s enhancement of glycine receptor activation in higher concentrations (40- 200 mM) of ethanol but not that of the lower concentrations(10-25 mM) of ethanol.

Conclusions/Discussion
Pressure can thus be used as a direct ethanol antagonist in higher concentrations. The lack of antagonism in the lower concentrations of ethanol suggests that ethanol has two binding sites within the glycine receptor.

Summary Statement
My project is about trying to find the exact binding site of ethanol in ligand gated ion channels using increased atmospheric pressure as an ethanol antagonist.

Help Received
I used lab equipment at USC under the supervision of Dr. Daryl L. Davies, the principle investigator, and Dan Crawford, my grad-student mentor.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Travis R. Shaw

Project Number
S1430

Project Title
The Effects of Progestrone Implants and Serum Gonadotropin Injections on Suffolk Ewe Lambing

Abstract

Objectives/Goals
The objective of this test is to see if progestrone implants and serum gonadotrone (PG600)injections can play a role in causing an earlier lambing in Suffolk ewes, thus producing heavier lambs for market.

Methods/Materials
In a herd of twenty Suffolk ewes ten were selected to be implanted with progestrone using pessaries in June of 2001. After fourteen days the pessaries were removed and the ten ewes were injected subcutancously with PG600. The ram was placed with all twenty ewes following injections until all ewes were covered (bred). Weights of all lambs both newborn and again at market time were taken and recorded.

Results
It was found that out of the ten implanted ewes, three successfully lambed two months earlier than the non-imlpanted ewes. This significantly increased market weight of lambs by an average of sixty-seven pounds.

Conclusions/Discussion
It can be concluded, that ewes can lamb earlier by using progesterone pessary implants followed by PG600 injections. The significance of this finding is that by producing early lambs, there will be an increase in lamb weight, thus increasing profit.

Summary Statement
This project tested whether or not hormone treatment would cause Sullfock ewes to lamb earlier and produce heavier market lambs.

Help Received
Agricultural Instructor Mr. Biff Charlton , Science Advisor Mrs. Michelle Poquette

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Arjun A. Suri

Project Number
S1431

Project Title
The Effect of Arsenic Trioxide on the Endocrine System of Tenebrio molitor Beetle Larvae

Abstract

Objectives/Goals
The objective of this study is to determine the effect of arsenic trioxide, an abundant form of arsenic in our environment, on the endocrine system of tenebrio molitor beetle larvae. The hypothesis states that the arsenic trioxide will inhibit the endocrine system of the tenebrio larvae by suppressing the prothoracicotropic hormone responsible for releasing ecdysteroids which control molting, thus delaying or preventing the hormonal process of metamorphosis.

Methods/Materials
The endocrine system of tenebrio larvae was tested by observing colonies for molting. Arsenic trioxide was dissolved in distilled water to create concentrations of 0.5, 10, 30, 60, and 120 parts per million. Three petri dish colonies were created per concentration by soaking the bran meal in individual solutions. Twenty tenebrio larvae were placed in each petri dish and fed the bran meal. Observations for viability and metamorphosis were noted every 24 hours for a 10-day period.

Results
The results show a positive dose-related response of the rate of pupation of tenebrio larvae to the concentration of arsenic. The exception was the 10 part per million concentration, possibly due to experimental error. The concentration of 60 parts per million provided the highest rate of pupation, followed by 30 ppm and 0.5 ppm. Arsenic trioxide toxicity showed a threshold effect, as there were relatively constant mortality rates up to 60 ppm concentrations, with a 95 percent mortality rate in the 120 ppm solution after the ten-day period.

Conclusions/Discussion
The results of this study suggest a strong correlation between the concentration of arsenic and disruption of the endocrine system. Medium to high doses accelerated pupation, implying one of two theories. The arsenic may have stimulated the prothoracicotropic hormone, or inhibited its antagonistic pair, juvenile hormone, responsible for maintaining the larval stage. In either case, arsenic may alter the steroid hormone-receptor complex thereby disrupting the modulation mechanism for certain gene activity. In all species, steroid hormones, including glucocorticoids, have widespread effect and are responsible for modulating genes that may suppress cancer and regulate blood pressure. Thus, the effect of arsenic trioxide, an ever-present chemical in our environment, on the endocrine system is of great significance, and it is imperative we research further, possibly with mammalian subjects.

Summary Statement
This study establishes a possible correlation between arsenic and disruption of the endocrine system of tenebrio molitor beetle larvae.

Help Received
Mr. Garabedian assisted in creating the arsenic trioxide solutions in the laboratory. Mr. Mirigian and Mr. Hunter provided the incubator and magnetic stirrer for the experiment.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Matt A. Troncale

Project Number
S1432

Project Title
Researching the Future: Bionic Humans

Abstract

Objectives/Goals
It seems inevitable that the widespread availability of more powerful computer chips will lead to their incorporation into the human body. Scientists should figure out what negative effects this might have on the human body before such experiments are done. This set of experiments tested whether or not the presence of two types of silicon affected a key biological process.

Methods/Materials
Every cell moves using cytoplasmic flow. A slime mold was used as the model organism for cytoplasmic flow. Physarum plasmodia were exposed to two types of silicon. Effects of this exposure on regular oscillations in cytoplasmic strands and gross plasmodial migration were measured by microscopy, digital movies, and comparison of areas of growth.

Results
These measures indicated that the presence of silicon does not inhibit cytoplasmic flow or plasmodial migration.

Conclusions/Discussion
The initial results suggest that the use of silicon chips in human tissue wouldn#t have a negative effect on human health.

Summary Statement
Testing the effects of silicon on a key biological process called cytoplasmic flow.

Help Received
Used lab equipment at Cal Poly Pomona University under supervision of Dr. Len Troncale; Microinjection help by Dr. Sep Eskandari; Digital movie editing aid by Kevin Frank

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Calvin Wu

Project Number
S1433

Project Title
Analyzing the Ability of Vinegar to Inhibit Bacterial Growth at Different Acid Levels

Abstract

Objectives/Goals
The purpose of my experiment is to determine how well vinegar inhibits bacterial growth at different acid levels.

Methods/Materials
The main materials in this experiment are: vinegar solutions, E.Coli,acetic acid,water,sterile filter paper, agar plate. I took all of the vinegar solutions and adjusted the pH to 2.6 and 3.4 by adding more acetic acid or distilled water to the vinegar solution because acetic acid is the main base in vinegar. Then I used an inoculating lupe to streak a bacterial lawn. After that I soaked four hole punched filters into a vinegar solution and placed it on the agar. Then I repeated the process for the other vinegar solution at the other pH. After that I allowed the bacteria to grow for five days. Then in the control ,using the same method, I adjusted acetic acid to pH2.6, and pH3.4. Then I repeated the process of growing bacteria but this time I only put one filter soaked with the solution on the agar. After that I repeat the control test five times each. After that I took the results and statistically analyze them, using the T-Test, to determine whether there was another variable besides the pH that effected the reaction, for the control.

Results
The results of my investigation showed that most of the vinegar solutions inhibit bacterial growth better when it is more acidic. About 71.4% of the vinegar solutions showed that it inhibits bacterial growth better when it is more acidic with significance after the T-test, while only 14.3 % of the vinegar solutions showed significance when it inhibited bacterial growth better when it was less acidic. What happen was that there was one vinegar solution that inhibited bacterial growth better when it was less acidic. However, the T-Test showed that the result was caused by chance which. Then when I compared the vinegar solutions to the control group through the T-Test, 57.14% of the vinegar solutions showed significance. This means that there is another variable besides the pH that caused teh reaction. However, the variable showed up more often in the more acidic solutions.

Conclusions/Discussion
In conclusion, most of the vinegar solutions inhibited bacterial growth better when it is more acidic then when it was less acidic. However there is another variable in the vinegar solution that caused the reaction.

Summary Statement
The purpose of my experiment is to determine how well vinegar inhibits bacterial growth at different acid levels.

Help Received
Used lab equipment at Sanger High School under supervision of Mr. Whittington, Dad help take pictures

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Christine H. Yang

Project Number
S1434

Project Title
The Effect of Pollutants on the Reproductive Cycles of Daphniidae magna

Abstract

Objectives/Goals
Objective: To determine whether the presence chemicals commonly found in pollutants is a factor in forcing daphnia to switch from asexual reproduction to sexual reproduction. Should the previous objective prove successful, to then determine the percentage of successful reproduction at each concentration of each chemical.

Methods/Materials
Method: A daphnia magna environment was set up with optimal conditions for asexual reproduction. Seven various chemicals found in pollutants were then obtained, and weighed out to make 200 mL of 0.1, 0.01, and 0.001 M concentrations of each. They were: AlSO(4), CrCl(3), CuSO(4), MnCl(2), (NH(4))(2)SO(4), PbO, and ZnSO(4). These chemicals were each put in a beaker and dissolved in water (half spring water and half daphnia tank water). A set number of daphnia was then introduced to each beaker, and observations on the chemicals' effects were made. The concentration was then increased/decreased as necessary. Once the concentrations that caused sexual reproduction were determined, they were retested to ensure the data's integrity. Finally, the solutions based on the experimentally derived data were once again introduced to the daphnia, and the percentage of successfully reproducing daphnia was recorded.

Results
The following are the concentrations that caused sexual reproduction, as well as the percent of daphnia that reproduced successfully:
Aluminum Sulfate: 0.003 M, 16.7%; Trivalent Chromium: 0.0015 M, 16.7%; Copper Sulfate: 0.000078125 M, 25%; Manganese Chloride: 0.0025 M, 33.3%; Ammonium Sulfate: 0.0025 M, 25%; Lead Monoxide: 0.01 M, 8.3%; Zinc Sulfate: 0.0000625 M, 16.7%.

Conclusions/Discussion
Conclusion: This experiment showed that the presence of pollutants at certain concentrations is a factor in forcing daphnia to reproduce sexually. I believe that this data can be applied to the testing of water quality. Bioassays, which are one method of testing, center on the fact of mainly whether or not the test subjects die in the water sample. However, I feel that if the water has already deteriorated to that point, the environment may have already suffered greater effects than necessary from pollution. By observing instead whether or not there is sexual reproduction present, which is a sign of the daphnia's attempt to survive in adverse conditions, steps can be taken earlier, rather than waiting for the organisms to die.

Summary Statement
This experiment tested pollution as a possible factor in stimulating sexual reproduction in daphnia magna, and then explored the possibility of using this information as an indicator of water quality.

Help Received
Dr. L. Bartrom and Ms. G. Corbet provided chemicals; Dr. L. Bartrom provided scale; Mr. P. Hunt provided microscope

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Sophia Young

Project Number
S1435

Project Title
Contortrostatin: Evaluation of Its Effect on Ovarian Tumor Growth

Abstract

Objectives/Goals
Evaluate the effectiveness of using a reporter gene (SEAP) to monitor ovarian tumor progression and to determine the efficacy of contortrostatin (CN) treatment on the progression of ovarian tumors.

Methods/Materials
Twelve immunodeficient mice were each injected with A2780 human ovarian cancer cells. The A2780 cell line is a metastatic ovarian carcinoma cell line transfected with a gene for secreted alkaline phosphatase (SEAP). Following 11 days of tumor growth the mice were divided into two groups of six (control and treated). The treated group received 20micro grams of CN (a protein from the venom of the southern copperhead) injected intraperitoneally twice a day, with the control receiving saline injections of the same volume. Mice from each group were randomly selected and weighed approximately once a week. After being weighed, the mice were anesthetized with Nembutal and blood was drawn in accordance with USC animal resource guidelines. Blood samples were then analyzed for the presence of SEAP using a commercially available assay for alkaline phosphatase based on the fluorescence of 4-methylumbelliferyl phosphate (MUP).

Results
Following 11 days of tumor growth, all animals exhibited similar plasma levels of SEAP. Over the course of the subsequent treatment period, mice administered CN showed a slowed growth in plasma SEAP, while control mice SEAP levels rose to the maximum detectable amounts. The weight of the two groups did not show a significant difference. Gross examination of control and treated animals by collaborators from the USC Department of Pathology showed a greater degree of tumor dissemination in the control compared to the treatment group.

Conclusions/Discussion
Ovarian tumors, the 5th leading type of cancer to cause death, are not solid tumors and in experimental models, there is no reliable method for determining tumor burden. The expression of a marker gene in the blood, as observed in this study, is a novel and valid method to quantitate the degree of tumor growth and ultimately tumor burden. This experiment shows that the administration of the disintegrin CN slows tumor growth. Future experiments will focus on both microscopic spread of tumors and vascularization of the tumors in the presence of CN. The SEAP assay provides a novel method to evaluate the growth and dissemination of ovarian tumors and a method to evaluate in vivo the growth of ovarian tumors.

Summary Statement
The purpose of these studies is to develop and evaluate a novel method for measuring the growth and dissemination of ovarian tumors both in the absence and presence of the investigational drug contortrostatin.

Help Received
The Norris Cancer Research Center laboratory of Dr. Francis S. Markland provided the laboratory space and supplies. Supervision of the project and biological samples were collected by Dr. Swenson and Dr. Golubkov. Participant in the Bravo/USC Biomed Program.