CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Easun Arunachalam

Project Number
S1801

Project Title
Countering Free Radicals: Comparing the Antioxidant Effects of Vitamins

Abstract

Objectives/Goals
The goal of my project was to determine the Vitamin (A, C, or E) that would most effectively neutralize free radicals, thereby creating a favorable environment for seed germination.

Methods/Materials
I conducted 32 trials (a total of 160 readings) consisting of 80 readings with mung bean seeds and 80 readings with radish seeds.Each trial involved three vitamins, A, C and E. One vitamin was added to each Petri dish (containing seeds in hydrogen peroxide), in order to determine the vitamin with the most effective antioxidant properties to counter the harmful effects of free radicals. This was measured by counting the number of seeds that germinated successfully, in the presence of each vitamin.I averaged the results separately for each type of seed. Finally, I calculated the combined average for both sets of trials.

Results
Vitamin E most effectively neutralizes free radicals during the germination of radish seeds while mung bean seeds show identical rates of germination when supplemented by either Vitamin A or E.

Conclusions/Discussion
My hypothesis was incorrect: Vitamin A was not the most effective vitamin to neutralize the free radicals in hydrogen peroxide. Germination environments containing Vitamin E allowed for the greatest rate of seed growth overall suggesting that it was the most effective vitamin in neutralizing the free radicals in H2O2. I am currently pursuing a follow-up experiment to see if the any (or all) of the vitamins themselves are responsible for lowering the rate of germination of the seeds as opposed to the free radicals in H2O2.

Summary Statement
A project to determine which Vitamin (A,C or E) would most effectively neutralize free radicals.

Help Received
Mom helped me count seeds and prepare board.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Vivian Ascencio; Maitreyee Mittal

Project Number

S1802

Project Title

What Toxins Affect the Heart Rate of Daphnia magna?

Abstract

Objectives/Goals

The purpose of this project is to study the effect of ethanol and nicotine on Daphnia magna. Observations were made on the heart rate of D. magna as the concentration of each poison increased.

Methods/Materials

The D. magna were divided into six groups for each substance, i.e. control, 1%, 5%, 10%, 15%, and 20% solutions. Each chemical was diluted into solutions of the different concentrations of the chemical. Five D. magna were observed under a stereo-dissection microscope, and the time was counted using a digital stopwatch. The variable controlled in this project was the concentration of the toxic chemical. A total of 15 separate measurements were taken per group to create a larger sample of data.

Results

As the concentration of ethanol increased, the heart rate for D. magna decreased. In a controlled setting, the heart rate was 155.2 bpm. As the concentration of ethanol increased to 20%, the heart rate decreased, by 89%, to a rate of 17.6 bpm.

As the concentration of nicotine increased, the heart rate for D. magna increased. In a controlled setting, the heart rate was 148.8 bpm. As the concentration of nicotine increased to 20%, the heart rate increased, by 39.5%, to a rate of 207.6 bpm.

Conclusions/Discussion

The project provided an interesting comparison between the contrasting effects of ethanol and nicotine on D. magna. Ethanol and nicotine are known to be extremely toxic substances that can cause much harm to the human body. This project enabled physical visualization of the extent to which the poisons could harm organisms by either increasing or decreasing the heart rate. The change was caused by ethanol and nicotine binding to different nerve cells in the body of the D. magna, thus affecting the heart rate in different ways. Ethanol decreased the heart rate, while nicotine increased it.

Summary Statement

This project was aimed to study the effects of ethanol, a depressant, and nicotine, a stimulant, on the heart rate of Daphnia magna.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Priyanka Athavale; Sudarshan Bhat

Project Number

S1803

Project Title

The Effects of Caloric Restriction on the Subsequent Stress Resistance and Chemosensation of Caenorhabditis elegans

Abstract

Objectives/Goals

The nematode, C. elegans, displays sensitivity to certain stressors, such as heat, oxidative stress and caloric restriction. The purpose of Part I of the experiment was to demonstrate the effects of controlled nutrient deprivation on the lifespan of C. elegans. In Part II, we developed a chemotaxis assay in order to efficiently and accurately quantify chemosensation (used as a measure of neural function) of the C. elegans by observing the worm's transition to a dauer state (lowered cellular function due to minimal environmental nutrients). In Part III, we tested our chemotaxis assay on worms that were starved initially for 24 hours and 48 hours to observe the effects of nutrient deprivation on chemo-sensation.

Methods/Materials

The worms were cultured in NGM plates and then synchronized. These worms were starved for up to a 48-hour period before they were revived on an NGM+OP50 plate. For Part I, worms were deprived of E. coli for up to 10 more days and the percentage of non-dauer worms was calculated. Part II focused on the development of a chemotaxis assay. In Part III, the worms were starved and then revived, and subsequently their cognitive development was measured using the chemotaxis assay from Part II.

Results

In Part I, we show that C. elegans can have an increased lifespan when exposed to a caloric restriction stressor. Results from Part III conclude that the worms are not able to respond as well to chemical odorants after caloric restriction. This means that despite the fact that they are able to live longer, the worms' cognitive development is harmed by caloric restriction.

Conclusions/Discussion

Part I of our experiment demonstrated that worms exposed to longer periods of starvation subsequently showed a decrease to the susceptibility to becoming dauer. Because butter seemed to be the strongest tested attractant in Part II, we chose to use butter as the primary attractant for testing in Part III. As predicted, Part III showed that longer periods of starvation weaken chemosensation. With the data collected in Part I and Part III, we can conclude that ROS produced through starvation has disrupted the proper function of the neurons responsible for chemosensation.

Summary Statement

Through the research process, we have learned that caloric restriction can actually increase the worms# lifespan, but has subsequent negative impacts on the worms# cognitive development as shown by our studies.

Help Received

Mrs. Alonzo and Dr. Rocklin at Lynbrook High School for all their supervision. SCCBEP for their help acquiring materials. Mr. Dunn for his guidance with the development of the chemotaxis assay. A special thanks to Dr. Greg Chin who took great time out of his schedule to guide us and help us acquire materials.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Jessica N. Beltran

Project Number
S1804

Project Title
Investigating the Effectiveness of Glutathione as a Melanin Inhibitor

Abstract

Objectives/Goals
The study seeks to investigate how effective glutathione is in preventing the over production of melanin thereby lightening the color of the skin. It also tried to determine the effects of glutathione in the protein levels of the volunteers.

Methods/Materials
Volunteers were asked a copy of their physical examination report before and after taking glutathione as a pill, as a lotion, and for the other five, using both. Photographs before and after the treatment were also taken. The testing period was three months.During this time, volunteers will be asked to have zero or minimum exposure to the sun.

Results
Based on the results, the effects of using glutathione vary in each person. Factors affecting its effectiveness are original skin tone, metabolism, and ability of the body to absorb the pill. It is interesting to note that although majority of the subjects tested experienced a significant lightening of their skin tone especially for those who took the pill and use the lotion, one develop spots on her face which was less visible as a result of her original darker skin tone. It is important to note that glutathione users who originally have abnormal protein levels had a reduction in their protein levels. Since glutathione pill leaves the body as you urinate, it must be taken continually to maintain a fairer skin.

Conclusions/Discussion
Glutathione inactivates the enzyme tyrosinase; cleanses the body from free radicals which contribute to tyrosinase activation and the formation of melanin, thus causing the skin to lighten. Another interesting fact that I#ve known through this study is that glutathione could be injected which means faster absorption rate which equates to faster results in lightening the color of the skin.

Summary Statement
Glutathione can be used as a skin lightening agent and it is effective when taken as a pill and also used as a lotion.

Help Received
Jennifer Magana, Melissa Marin, and Ivan Paquot for helping me with my project; Ms. Adriatico for valuable assistance and guidance in the whole research process and Ms. Sandy Puray, my consultant in this project.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Kevin T. Bibera

Project Number
S1805

Project Title
White Tea's Effects on Osteoblast Proliferation

Abstract

Objectives/Goals
The purpose of this investigation was to observe whether white tea's nutrients could increase bone growth and thus have a possibility to decrease bone loss caused by side effects of radiation.

Methods/Materials
The 7F2 rat osteoblast cells were divided evenly into six petri dishes. Four dishes had different amounts of white tea added while two dishes contained no white tea. The 7F2 rat osteoblast cells were cultured over a 12 day period and were counted twice on the 12th day to find the total amount of cells. A second count was used to calculate the approximate number of viable vs. nonviable cells in each dish. Finally, the data was averaged and a chi squared goodness of fit test was used to determine whether or not the results were statistically significant.

Results
The total amount of cells given the variable white tea almost doubled the average amount of cells found in the controls. The cultures total number of bone cells increased with every larger amount of white tea added. The chi squared goodness of fit test had a chi squared equaling 423965116.279 and a P value less than 0.0001. All dishes, except for dish A, had a viability percentage ranging from 80-90. Dish A contained the lowest viability percentage (34%).

Conclusions/Discussion
The dishes given the variable white tea consistently had a greater number of cells in each dish when compared to the controls. In addition, as the white tea supplements increased, so did the total amount of cells in the dish, thus deducing that white tea is capable of significantly increasing osteoblast proliferation. The viability of the cells varied in the six dishes. This could be the result of many issues (i.e. contamination, dehydration, etc.) With the two-tailed P value equaling less than 0.0001, the data was proven to be statistically significant. In the end, the total number of cells given the variable white tea nearly doubled that of the cells without white tea, thus making white tea a strong candidate for the reduction of bone loss caused by radiation.

Summary Statement
Testing the effects of white tea on bone growth

Help Received
Mother and Father helped put glue on the poster; Used school lab equipment under the supervision of Mrs. Acquistapace

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Antranik M. Byas

Project Number

S1806

Project Title

Investigating the Relationship Between Hypokalaemia and Excessive Consumption of Carbonated Drinks

Abstract

Objectives/Goals

This study seeks to investigate the effects of consuming large amounts of carbonated drinks in terms of muscle-related problems like hypokalaemia, a condition in which the concentration of potassium in the blood is low.

Methods/Materials

Ten volunteers consisting of adults and teens participated in this experiment along with a control group of ten people. The ten volunteers were excessive soda drinkers prior to the experiment. The control group only drank water and/or juices. If the control group drank any sodas, it was only an extremely small amount. I had to keep track of the weekly and monthly habits of each participant regarding their intake of soda, the soda brand, and any muscle aches they experienced. Each person submitted a copy of their blood test before and after the 3-month research period in order to monitor their sugar and potassium levels.

Results

The experiment#s outcome showed that excessive soda drinkers had abnormal sugar and potassium levels. The heavy soda drinkers don#t drink enough water to balance their diet. The ones who had very low potassium levels did experience some muscle pains especially the adults. This is due to the harmful ingredients in certain carbonated beverages. The control group#s level of potassium and sugar remains within the normal range.

Conclusions/Discussion

The study shows that adults are more affected than teens due to the fact that the teens surveyed are more active than the adults.Furthermore,it reinforces the fact that consuming excessive amounts of carbonated drinks can have detrimental effects to the body.

Summary Statement

Excessive consumption of carbonated drinks can lead to muscle-related problems like hypokalaemia in teenagers and adults.

Help Received

Ms. Adriatico, my teacher for the guidance in doing this research; and my mother who provided the materials and logistical support.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Autri Chattopadhyay

Project Number

S1807

Project Title

The Role of the Dorsal Hippocampus and Prefrontal Cortex in the Onset of Nicotine Addiction in Adolescents

Abstract

Objectives/Goals

The goal of the project is identifying the amounts of neuronal activation in the dorsal Hippocampus and Prefrontal Cortex regions in response to nicotine. By obtaining the amounts of c-fos protein activation, one can determine the roles of each region in the onset of nicotine addiction in adolescents.

Methods/Materials

The basic structure of the study conducted involved the use of a Sprague Dawley Rat Model resembling adolescence and adulthood in humans. Rats were treated with nicotine and saline treatments (control) in both acute and chronic doses. After analyzing locomotion responses to these treatments, the brains were extracted from the mice. Using in-situ hybridization methods, the tissue was fixed and we were able to calculate the density of c-fos mRNA in various regions of the adolescent brains using autoradiography analysis.

Results

The c-fos protein is a marker of neuronal activation in the brain. Dpm/mg is a measure of optical density meaning the disintegrations per minute per milligram of tissue. In the P31 Chronic Nicotine Rats, the optical density was measured to be an average of 1925 dpm/mg in the CA1, 2015 dpm/mg in the CA3, and 2178 dpm/mg in the DG. In the prefrontal cortex region, similar results were found. The higher amount of activation in the adolescents shows a greater neural response from an adolescent brain to nicotine than the adult brain.

Conclusions/Discussion

The high amount of activation in the hippocampus, which deals with the memory and the formation of connections between contextual stimuli and reward, indicates that in the given circumstances there is a strong connection being established between nicotine use and the subsequent reward in adolescents. The fact that there is a profound neuronal response to nicotine within the prefrontal cortex suggests a correlation between personality and nicotine addiction.

Summary Statement

I am trying to identify the roles of the Dorsal Hippocampus and Prefrontal cortex regions of the brain in the onset of nicotine addiction in adolescents.

Help Received

I would like to thank Dr. Frances Leslie for letting me into her lab at the University of California, Irvine and UCI MD-PhD student Jasmin Dao who mentored me in all the processes of the lab.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Monica L. Chen

Project Number
S1808

Project Title
Antibacterial Properties of Chitosan Nanoparticles Encapsulated by Cocos nucifera-derived Peptides

Abstract

Objectives/Goals
This study sought to identify the potential of a novel biocide system consisting of chitosan nanoparticles encapsulated by the peptides found in green coconut water (GCW).

Methods/Materials
Through ionotropic gelation, chitosan nanoparticles were formed and mixed with filtered green coconut water (GCW) to promote encapsulation. The physiochemical properties of the biocides were analyzed through zeta potential and particle sizing analyses. A bacterial bioassay was conducted to determine the antibacterial properties of the combined biocides against Pseudomonas putida, a surrogate environmental bacteria strain.

Results
The biocide system was shown to be less effective against P. putida when compared to the antibacterial activity of chitosan nanoparticles, but more bactericidal in comparison to the GCW peptides.

Conclusions/Discussion
Chitosan nanoparticles were re-asserted as efficient dose-dependent biocides while the absence of antimicrobial activity from the GCW peptides suggested the need for purification and isolation of the peptides. Thus, the novel composite of the GCW peptides and the chitosan nanoparticles did not significantly enhance the antibacterial properties of the individual bactericides as hypothesized.

Summary Statement
This research explored the potential of a biodegradable and easily implemented novel antibacterial agent created through the combination of peptides derived from green coconut water and chitosan nanoparticles.

Help Received
Used lab equipment at UCLA under supervision of Catalina Marambio-Jones

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Alyssa N. Cook

Project Number

S1809

Project Title

Toward Skeletal Regeneration: Corticoids Affect Marker Gene Expression in Murine Osteogenic Cells

Abstract

Objectives/Goals

To determine the effect of physiologic doses of three glucocorticoids on gene expression of bone formation markers Bone Morphogenic Protein-2 and Osteocalcin in osteogenic cells, via RT-PCR and mineralized cell counts. To determine if gene expression is related to corticoid receptor affinity and if the changes are biphasic.

Methods/Materials

Murine MC3T3-E1 cells were grown with hydrocortisone, prednisolone, or dexamethasone in growth media for 4 days. Cells were harvested at either 4 or 14 days. Controls were run. mRNA was extracted,reverse transcribed,and amplified by PCR using primers for BMP2 and OCN, and for reference gene Rn18S. PCR products were resolved by gel electrophoresis and bone nodules counted using microscopy. Relative intensities were compared for marker gene DNA expression, and cells counts were compared with Student's T-test to determine significance.

Results

In the BMP2 4 day group, the control showed greater gene expression than the corticoids, indicating that in the preconfluent preosteoblast stage corticoids downregulate BMP2. In the 14 day BMP2 group, the corticoids showed increased expression over the control, indicating that in the mature osteoblast corticoids upregulate gene expression. The effect on BMP2 marker expression is seen to be biphasic. In the 14 day OCN group, the corticoids caused upregulation of the marker expression over control. Mineralized cell counts supported the increase in bone formation when cells are exposed early in the preconfluent stage. Long term induction in the postconfluent mature cell reversed this effect.

Conclusions/Discussion

Corticoids affect marker gene expression for BMP2 and OCN in murine osteogenic cells, but these effects are biphasic and highly dependent on the stage of cell maturity as well as the length of drug exposure. Interestingly, this does not completely correspond to receptor affinity alone, as the intermediate potency of PRED showed greater OCN induction than the more potent DEX. These findings have important application for future in vitro pharmacologic enhancement of autologous osteogenic cell therapy.

Summary Statement

Therapeutic regeneration of bone will begin at the cellular level, and this project explores the positive and negative effects of corticoids on bone formation in osteogenic cells.

Help Received

Used lab equipment at UC Irvine; parent drove me to the lab and acted as immediate supervisor; general guidance offered by department director.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Avenlea L. Gamble

Project Number
S1810

Project Title
Run from the Runoff

Abstract

Objectives/Goals
The purpose of my experiment was to see how common chemicals that end up as runoff in our waterways effects pond organisms. The pond organisms I used were daphnia, and the chemicals I used were used antifreeze, motor oil, common pesticides, and car soap.

Methods/Materials
Method: I placed 6 daphnia in a clear dish with 98 mL of water and 2 mL of which ever chemical I was using that particular experiment. Every 15 minutes, I wrote down observations of any harm or deaths that occurred among the daphnia group. I observed up to 45 minutes, and after every 15 minutes, I checked the 2 most harmed/dead appearing daphnia under a microscope and compared them to a control group of daphnia. Materials: microscope, slides, daphnia, spring water, measuring spoons/cups, pipettes, motor oil, used antifreeze, car soap, pesticides, petri dishes, timer, and supplies for the daphnia.

Results
Twelve daphnia died in all. Seven of the twelve fatalities were caused by pesticides, three by antifreeze, two by the motor oil, and none caused by the car soap. The pesticides seemed to slowly be shutting down their systems, as I observed under the microscope. The motor oil immobilized the daphnia, the antifreeze either had no effect on the daphnia or would suddenly kill them, and the car soap did nothing.

Conclusions/Discussion
The pesticides killed the most daphnia, but the motor oil had the most harmful effect. By becoming immobilized, daphnia cannot get food, flee from enemies, or move. The pesticides seemed to cause a painful and slow death, which should be realized by all as a cruel death for the pests it's meant to kill, even if they are pests. Ultimately, it must be realized that when our car leaks or we spill these chemicals, we are killing organisms.

Summary Statement
My project is about how chemicals we commonly spill can and does harm the organisms in the water that the chemicals end up in.

Help Received
Borrowed microscope from my teacher Mrs. Erin Vaccaro; Mrs. Erin Vaccaro ordered my daphnia from a company for me

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Dave S. Ho

Project Number
S1811

Project Title
Case Study: Various Modern Chemical Hazards on the Taxis Behavior and the Regenerative Ability of Dugesia tigrina

Abstract

Objectives/Goals
To discover the reaction of ubiquitous freshwater invertebrates such as brown planarian (Dugesia tigrina) towards external manmade chemical stimuli from acid rain and eutrophication. To analyze the severity of several compounds with regards to freshwater ecosystems in North America.

Methods/Materials
1. Place 4 brown planarian at the 4 intersections ABCD surrounding the center intersection of the petri dish. 2. Load the desired chemical onto the center intersection point via transparent sponge. Label this point as the loading dock L. 3. Wait 5 minutes. 4. Measure the distance each planarian travels from its starting position. Note whether this is towards or away from the center. 5. Measure the distance away from the center loading area. 6. Note for any changes in the behavior of the planarian.
MATERIALS: Tank, distilled water, Oxygen Pump, Tweezers, Nitric Acid (0.1 M), Sulfuric Acid (0.1 M), Sodium Nitrate (NaNO3), Sodium Phosphate (Na2PO4), Sponge, Ruler, Camera, Stopwatch, Glassware, Pipets, Goggles, Chemical Apron, Organism Refrigerator, Disinfectant.

Results
The severity of acid rain and eutrophication has been reaffirmed. In every case, Dugesia Tigrina were rendered inactive, erratic, or dead. This issue is only aggravated higher up the trophic levels due to biological magnification. The result of increasing the toxin concentration in water for the planaria was also discovered. An increased concentration generally increased the death toll, and decreases the erratic 'sniffing' condition. The presence of nitric acid in water is more devastating than any of the other chemicals tested with regard to the Dugesia Tigrina. Therefore, more environmental studies should be directed towards the removal of nitric acid from water sources.

Conclusions/Discussion
Should future research be done on this topic, it is suggested that a broader array of chemical be tested. Presently, millions of artificial chemical species enter our water every day. A more precise understanding of toxins affecting planarian behavior can be done by testing more chemicals. In addition, this experiment was conducted with only two levels of concentration: low and high. A more reliable trend can be established by increasing concentration by increments. However, this leaves more room for error, that can only be buffered through an even greater number of trials.

Summary Statement
In an effort to direct global environmental efforts, I attempted to rank the severity of specific manmade compounds on North American freshwater ecosystems by observing how the compounds affected the fitness of Dugesia tigrina.

Help Received
Lab provided by Mr. Shrake; Animals and animal development information by Ward's Natural Science

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Ashley C. Jones

Project Number
S1812

Project Title
Does the pH Level of a Liquid Affect the Solubility of Aleve?

Abstract

Objectives/Goals
Will the liquid that I take with Aleve affect the time for it to dissipate? Does it matter whether it is a tablet or gel? The purpose of this experiment is to determine if varying levels of pH will affect the solubility of Aleve. Additional investigation will be conducted to determine whether the form of Aleve - tablet or gel capsules - respond differently to the varying levels of pH.

Methods/Materials
The materials used were 8 Plastic Test Tubes (60mL each); 3.0 Bottles of Aquafina Purified Drinking Water; 900 mL Clorox+ Bleach (splash-less); 900 mL ReaLemon 100% lemon juice; 48 pH strips; 2 Stopwatches; 24 Aleve Tablets (220 mg); 24 Aleve Smooth Gels (220 mg); and 1 Measuring Cup. Varying amounts of water and acid (lemon juice), or base (bleach), were placed in different test tubes and carefully measured until the desired pH was reached. The pH level of each tube and the corresponding amounts of acid or base added were recorded. Afterwards, either an Aleve tablet or gel capsule was placed in a test tube at each pH. Starting times were taken at the moment the Aleve contacted the liquid. Final times were recorded once each tablet or gel was completely dissolved, as evidenced by the fact that no more bubbles were produced. There were three trials conducted for both tablets and gels at each level of pH.

Results
The results showed that in a base, smooth gel capsules dissolved considerably faster than the tablets. When an acid was used, the smooth gels consistently melted away before the tablets, but with no significant difference in time. Interestingly though, the tubes containing the lowest pH of acid, and conversely, the highest pH of base, were the last to dissolve in each of the trials.

Conclusions/Discussion
This project set out to answer two simple questions. Does the pH level of a liquid affect the solubility of Aleve? Is there a difference between tablets and gels? The hypothesis stated that a lower pH level for an acid, and a higher pH level for a base, would cause Aleve to dissolve quicker. Upon conclusion, it was proven that with a base, in fact, the lower the pH level (and therefore the weaker the base), the faster the Aleve would dissolve. This is contrary to the original hypothesis. But, the final results did support the fact that the gel capsules would dissolve more rapidly than the tablets.

Summary Statement
This project tested the affect of pH levels on the time it would take Aleve to dissolve, and if there is a difference between tablets and gels in their reaction to pH.

Help Received
My mother helped me by insuring the accuracy of the liquid measurements and pH readings, and my father provided time and money to gather the materials needed for this project. My Biology teacher, Ms. Jennifer Davis, provided her time and support throughout the entire project.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Ayan Kusari

Project Number
S1813

Project Title
Characterizing the Role of Arachidonic Acid-Derived Eicosanoids in Breast Cancer

Abstract

Objectives/Goals
This project was done in an attempt to answer two questions: Were these inflammatory molecules, and thus the inflammatory response, also associated with breast adenocarcinomas? Eicosanoids can be produced via diverse metabolic pathways. However, only a few have significant output of a variety of eicosanoids -- and one, the arachidonic acid pathway, is a particularly appealing pathway because it involves the inducible (generally inactive) enzyme cycloxygenase-2 (COX-2). Was the notorious arachidonic acid pathway responsible for any elevated eicosanoid output?

Methods/Materials
The procedure I devised to determine the relationship between arachidonic acid (AA) and eicosanoid production can be split up into three major subprocedures. 1) A cancerous (MCF7) and a noncancerous (MCF10a) cell line were cultured and tested for viability at various concentrations of AA. 2) The two cell lines were given arachidonic acid treatments at 200 and 250 micromolar concentrations, and the pellet and media eicosanoids were collected. 3) Eicosanoid production was characterized and quantified through HPLC analysis.

Results
The MCF10a cell line exhibited a strong dose-response relationship. The MCF7 cell line did not--its eicosanoid production without the input of any arachidonic acid was already very high. This dose-response relationship in the MCF10a cell line was reflected in both cellular eicosanoid levels--measured from the pellet--and secreted eicosanoid levels--measured from the media.

Conclusions/Discussion
That I was able to isolate such a significant amount of eicosanoids from the MCF7 cell line is both anticipated and explanatory. It tells us that inflammation plays a key role in the maintainable of growth in this particular adenocarcinoma. Not only do the cells exhibit the lack of density-dependent regulation characteristic of the majority of cancer cells, these in particular bolster their proliferation capabilities through the secretion of these inflammatory eicosanoids.

Summary Statement
My project was to compare the effects of a particular type of inflammation on normal breast endothelial (MCF10a) and breast adenocarcinoma (MCF7) cell lines, and thereby determine whether cancer cells use it to proliferate.

Help Received
Participant in research internship sweepstakes (UTEP/CRP), used lab equiptment at the Das Research Group at University of Texas, El Paso. They taught me to use many of the lab equiptment that I would need to conduct my research.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Eugene Laksana

Project Number

S1814

Project Title

MgCl(2) Stimulating Effect on Osteogenesis and Promotion towards Bone Densification

Abstract

Objectives/Goals

The purpose of this experiment is to determine how magnesium chloride plays a role in the bone remodeling process, osteogenesis, and how its role differs from the effects of various other supplementary medications.

Methods/Materials

I used 15 cups (and bones) each containing 3 samples of the 5 variables: (per cup) 120 ml H2O; 120 ml H2O, 1g OsteoPhase; 120 ml H2O, 1g MgCl2; 120 ml H2O, 1g CaCl2, 120 ml H2O, 1g OsCal. The bones were submerged and left in their solutions for 4 months with periodic x-ray samples taken halfway between the experimental term and the end. Upon completion, the radiographs were taken to City of Hope to be analyzed with the bio-rad densitometer and an image density quantifier to determine density in OD (optical density.)

Results

Each of the radiographs produced very different results, suggesting that each of the supplements played a different role in bones, and by working by themselves, they proved to be very ineffective. However, in terms of density repair, every medication contributed to increasing density between term 1 and term 2. H2O bones increased by 14%, Osteophase bones increased by 6.7%, MgCl2 bones increased by 11.4%, CaCl2 bones increased by 15.9%, and OsCal bones increased by 27.2%.

Conclusions/Discussion

I believe that bone development (based on the radiograph observations) and repair is not singularly based on one mineral in order to not only sustain density but stabilize growth, especially during child/teenhood. Instead, the whole idea of bones is literally dealing with numerous elements and compounds, which work together in order to develop the structure that we refer to as, the framework of our body, our skeletal system. Although a single element may contain primary dominance in bones, without the other, it just will not work.

Summary Statement

What are the combinations of various supplementary and non-supplementary substances effects towards bone health, strength, and repair?

Help Received

Dr. Haidekker helped with research; Dr. Jia Wang helped with bio-rad operation; Dr. Chen introduced bio-rad technician; Mrs. Zschomler gave access to City of Hope facility; Dr. Judo helped with x-ray machine operation; Mr. Jankowski helped with microscope operation; Dad helped sizing the bones; Mom

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Jorie A. Moore

Project Number
S1815

Project Title
Investigating the Effectiveness of Natural Pesticides in Controling Leaf Gall Insect Development

Abstract

Objectives/Goals
The objective is to determine the effectiveness of natural pesticides in controlling leaf gall aphid development.

Methods/Materials
250 leaves with galls from poplar cottonwood trees were collected. Four different pesticides were tested: lemon, 30% vinegar, tomato, and pepper. The pesticides and a water control were sprayed on the collected leaves in an enclosed environment then observed for one day. A second test was conducted in the natural environment of the leaves. Parts of the cottonwood trees were sectioned off then sprayed with the pesticides and control and were observed for one day.

Results
After one day of testing the controls in the lab and field test were 100% of the aphids alive. The field results are: tomato- 78% alive, lemon- 76% alive, pepper- 70% alive, vinegar- 62% alive. The lab results are: tomato- 70% alive, lemon- 56% alive, pepper- 40% alive, vinegar- 36% alive.

Conclusions/Discussion
The 30% vinegar pesticide was the most effective in both the lab and field test but it killed the cottonwood leaves as well as the aphids. The tomato pesticide was the least effective in both the field and lab test. All the pesticides were more effective in killing the aphids in the lab test over the field test. Overall the pesticides were effective in controlling the aphid development, which indicates their effectiveness against other insects.

Summary Statement
I tested natural pesticides in controlling leaf gall aphid development to indicate their effectiveness.

Help Received
Norman Smith, certified Fresno County entomologist, helped identify the type of insect tested

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Suchith R. Nareddy

Project Number
S1816

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

Abstract

Objectives/Goals
Test the effects of caloric restriction and dietary supplementation of Resveratrol and Rapamycin on the lifespans of Drosophila Melanogaster.

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

1. Allow live culture to reproduce to adequate experimental size.
2. Move all adult flies to large mating container with media and netting.
3. Allow flies to mate over a period of 3 days and then remove all adult flies to previous vial, leaving only eggs in the new vial.
4. Allow newly laid flies to grow to a size wherein sex can be determined.
5. Prepare experimental vials by mixing required amounts of basic fly feed, water, resveratrol, and rapamycin.
6. Anesthetize young flies and separate them according to their sex.
7. Place male flies into newly prepared vials. Repeat with female flies. The sexes are separated in order to prevent mating and thereby maintain a constant number of flies.
8. Check vials approximately every 8 hours and record time of death when a fly dies.
9. Repeat steps 2-8 for each experimental group.

Conclusions/Discussion
My hypothesis stated that a calorically restricted diet, along with supplementation of resveratrol and rapamycin, would siginificantly increase the lifespan of the flies; and that a diet containing a caloric surplus would significantly decrease their lifespan. Based on the data observed, I found that caloric restriction and resveratrol caused statistically significant lifespan increases and that caloric surplus causes nearly statistically significant lifespan decreases. However, my data also points to the conclusion that rapamycin supplementation has no significant effect on lifespan

Summary Statement
Testing whether caloric restriction coupled with dietary supplementation of Resveratrol and Rapamycin(Sirolimus) will have a quantifiable lengthening effect on the lifespan of Drosophila Melanogaster(common fruit fly).

Help Received
Conducted project in the back of Mr. Garabedian's classroom at school. Used certain materials such as beakers, scales, and dissection scope.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Adam D. Nitido

Project Number

S1817

Project Title

Multi-Drug Resistance and the Mechanism of Orlistat-Induced Cell Death in Ovarian Carcinoma

Abstract

Objectives/Goals

The purpose of this study is to investigate the pathway(s) of orlistat induced cellular death in ovarian cancer cells by comparing the effects of Orlistat on drug resistant and drug sensitive ovarian cancer cells.The primary objective is to evaluate GRP78 (and endoplasmic reticulum stress indicator) shows greater expression in drug sensitive ovarian cancer cells compared to multidrug resistant ovarian cancer cells during drug treatment.

Methods/Materials

Multi-drug resistant and drug sensitive cells were used as the basis of comparison for the orlistat treatment. A Trypan Blue exclusion and a sulforhodamine B assay (SRB) were performed to test cell viability. A SDS-PAGE gel electrophoresis separated out the proteins of interest and a western blot was used to probe for the protein GRP78. RT-PCR with GRP78 primers were used to measure GRP78 expression. A SDS PAGE gel electrophoresis was also conducted, then stained with Coomassie or SYPRO Ruby to differentiate protein expression.

Results

The western blots and the RT-PCR show that there are similar levels of GRP78 expression in both the drug resistant and drug sensitive cell lines both before and after treatment with orlistat. The SYRPO Ruby stain showed different protein expressions between the drug resistant and drug sensitive cell lines both with and without orlistat treatment. One of these proteins was Identified as heterogeneous nuclear ribonucleoprotein isoform C, which was down regulated after orlistat treatment in both the drug sensitive and drug resistant cell lines.

Conclusions/Discussion

The data does not support the hypothesis that orlistat uses a endoplasmic reticulum stress induced pathway with regard to cellular death. It is possible that the biological mechanism(s) which causes the differences in GRP78 protein expression between the drug resistant and drug sensitive cell lines, plays a major role in the effectiveness of orlistat.The use of the coomassie and SYPRO Ruby stains are the first steps to proteomic analysis of the cells under orlistat treatment

Summary Statement

Orlistat does not use a endoplasmic reticulum stress induced pathway with regard to cellular death.

Help Received

Worked in the lab of Dr. Jason Bush

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Katelyn R. Paxton

Project Number
S1818

Project Title
Soy: Carcinogen or Prevention?

Abstract

Objectives/Goals
This project is to determine if isoflavone phytoestrogens found in either hormone replacement therapy or infant nutritional formula may cause a change in the luteinizing hormone level that regulates estrogen production, and how the trials for both suggest pre-breast cancerous carcinogenic effects. The hypothesis is that phytoestrogens will stimulate the overproduction of the hormone estrogen through a rapid surge in the LH level, and will exhibit similar effects in both experiments.

Methods/Materials
Four female mice, given either HRT or daily infant nutritional formula, and four separate female mice, not exposed to soy products of any kind, were tested over a ten-day trial period. Each mouse had its own individual cage with half paper shreds, and half wax paper. All subjects received the same amount of food each day at the same time over the trial period. All received 2 fl. oz. of distilled water a day, and manipulated subjects were also given either crushed HRT tablets or infant nutritional formula dissolved in their water. Doses of HRT and infant nutritional formula were proportioned to the mice's weight and size. Every night, urine samples were taken and distributed on an ovulation test that gave the exact luteinizing hormone level. Mice were also monitored to look for unusual behavioral patterns.

Results
After the first 72 hours, the controlled group's LH level remained steady at a rate of 7.0 mlU/ml, while the HRT manipulated group rose from an average of 7.3 mlU/ml to 11.4 mlU/ml; and the INF group rose 7.2 mlU/ml to 9.0 mlU/ml At the conclusion, the controlled group's level was still constant at 7.4 mlU/ml, while the HRT manipulated group's had surged to 23.6 mlU/ml; the INF group concluded at 17.0 mlU/ml. The manipulated group also experienced similar negative physical effects, such as loss of appetite and fatigue.

Conclusions/Discussion
The hypothesis was supported by the data collected. Over the ten-day trial period, the HRT manipulated group#s hormone level surged about 16 mlU/ml; while the INF group#s surged 9.9 mlU/ml and grew at a constant rate to levels considered abnormally high. The effects, such as fatigue, shaking, restlessness, and loss of appetite, suggest that if these LH rates continued for a substantial period of time, breast cancer has a potential to develop. Research suggests that high levels of estrogen for a long period of time can cause rapid cell mutations and proliferation.

Summary Statement
Testing and comparing the potentially carcinogenic effects of two soy isoflavone phytoestrogen products, hormone replacement therapy and infant nutritonal formula.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Karen Payne; Brandi Ruscher

Project Number
S1819

Project Title
Caffeine: Friend or Foe?

Abstract

Objectives/Goals
Our goal is to examine the affects of caffeine on humans and then on Daphnia and compare the results to see if they are related.

Methods/Materials
We started with our human testers giving them a different type of caffeinated source and then testing their heart rate, breathing rate and reaction times. After a week of testing we then separated our Daphnia into different testing groups for each substance with one control group. We then fed them the substances and observed them under a microscope. We found their heart rate and observed their behavior. After gathering all of our data we will conclude if caffeine has a similar affect on Daphnia Magna as on humans. Materials: Rockstar, Redbull, Monster, 5 Hour Energy, Coffee, Daphnia Magna, fish tanks, microscope, human volunteers.

Results
Our results were that caffeine affects humans and Daphnia. We used a more concentrated source of caffeine in the Daphnia. The more concentrated dose had a greater affect on the heart rate than the smaller doses.

Conclusions/Discussion
After testing the daphnia we noticed many different changes. After the daphnia were given the carbonated drinks they seemed to have a reaction to it causing their hearts to stop. A possible cause of this was the Carbon Dioxide bubbles using up all of the Oxygen causing them to go into a state of shock. We have concluded that when a large amount of caffeine is digested in a short amount of time there will be a drastic affect in heart rate. Even the majority of daphnia that did not go into a state of shock had a drastic change in their heart rate or activity. Our experimental faults were: stressing out the daphnia which could lead to a higher heart rate, too much concentration of the energy drink, incorrect counting, leaving the daphnia in the water with the drinks for too long, and overheating. Our control was the starting heart rate, our dependent variable was the final heart rate, and the independent variable was the energy drinks. For humans, with a smaller dose, the effects on their hearts wasn#t as pronounced. In many of the cases however, we did have a small increase in the heart rate. This project shows that too much caffeine is not ideal for a healthy lifestyle.

Summary Statement
We administered caffiene in the form of 5 popular energy drinks to Daphnia Magna and Humans comparing their heart rates to see if they are related.

Help Received
Used our chemistry teacher's microscope.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Adam J. Protter

Project Number
S1820

Project Title
The Effect of Deuterium Oxide on Senescence in Drosophila melanogaster

Abstract

Objectives/Goals
The objective of this project was to test the effect of ingestion of deuterium oxide on the lifespan of Drosophila melanogaster. My initial idea was that with the use of the non-radioactive heavy isotope deuterium oxide, which is known to stabilize singlet oxygen, cells may be able to resist the free-radical oxidation, which would allow a longer lifespan. My hypothesis is the consumption of lower concentrations of D2O will increase the lifespan of the fruit fly, while the toxicity of high concentrations will considerably decrease the lifespan.

Methods/Materials
Drosophila melanogaster were placed in culture vials varying from 0% (control) to 100% D2O mixed within their feeding medium. A total of 10 different H2O/D2O concentrations were tested, each with 5 trials. Each trial consisted of 10 newly emerged virgin female D. melanogaster for a total of 500 flies. The flies were kept at a constant temperature and humidity, and the dry medium, habitat, light, methods, and procedures accross each trial were constant. Observations were made, and lifespan data was collected daily, then recorded, graphed, and analyzed.

Results
Data analysis showed that my hypothesis was partially correct. Concentrations of 15%, 20%, and 25% increased the lifespan by 18%, 15% and 10% respectively, while concentrations of 5% and 10% D2O decreased the lifespan of D. melanogaster by 5% and 13% . At concentrations above 30%, the toxic effects of D2O outweighed its health benefits, and dramatically reduced the lifespan of D. melanogaster, becoming lethal within a few days at 100% D2O.

Conclusions/Discussion
Certain concentrations of D2O showed a statistically significant increase in survivability over the control (0% D2O). The data shows that in the case of 15% D2O, an increase in average lifespan of 18% was observed over the established baseline control. The exact mechanism that is responsible for increasing the lifespan at certain concentrations while reducing the lifespan at others is still unclear. While this preliminary data seems promising, further research, including expanding the scope to include other invertebrates, effect on males vs. female, different temperatures, effects on reproduction, generational effect, and finally, research on a molecular level to analyze how deuterium oxide influences lifespan and senescence in mammals would shine light on the mechanisms of aging and the potential benefits of D2O.

Summary Statement
I tested the effect of feeding different concentrations of deuterium oxide and water to Drosophila melanogaster and found that certain concentrations statistically increased their lifespan.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Anita Sarkar

Project Number
S1821

Project Title
Filtering Contaminants Saves Lives

Abstract

Objectives/Goals
I investigated the importance of filtering polluted water using three different pollutants in varying concentrations mixed with 200 milliliters of water. For accuracy, I tested each pollutant in each concentration and the control group grown in distilled water five times. To observe the severity of the effects of water pollution, I grew pinto bean plants in polluted water and compared their growth to that of plants in filtered water. Any reduction in average plant growth rate of the pinto bean plants was a measure of water toxicity.

Methods/Materials
I grew 65 pinto bean plants (12 for pollutants in varying concentrations for filtered and unfiltered solution, five of each type, and five for the control group) in potting soil. Once stable, I transferred the plants from the soil into a mixture containing 200 milliliters of water and a varying concentration of NaCl, motor oil, and Na2SO4. I recorded plant growth for a week.

Results
All of my experiments with both NaCl and Na2SO4 solutions gave the pinto bean plants several symptoms of phytotoxicity: dry leaves, brown root-tips, and slow growth. The plant was clearly becoming dehydrated. The pinto bean plants grown in 2.5% and 5% motor oil with distilled water did not die;however plant growth was hindered. Because many of the roots were covered with motor oil, water absorption was reduced, which also had a significant effect on plant growth.

Conclusions/Discussion
My data tends to show that my hypothesis was correct; pollutants have serious effects on plant health. Water filtration is definitely necessary. This is demonstrated in all of my filtered NaCl and Na2SO4 experiments. This may have been because my filter was not able to trap the small, dissolved salt ions. Although my homemade filter was not very effective with the water-soluble salts, it was extremely effective in filtering out motor oil.

Summary Statement
I used motor oil, table salt, and sodium sulfate in varying concentrations per 200 milliliters distilled water; I compared the growth of plants grown in filtered water versus unfiltered water versus the control group.

Help Received
I borrowed many beakers from Mr. Garabedian; my father helped me paste everything on the board

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Michael W. Setchko Palmerlee

Project Number
S1822

Project Title
Plants and Pollution

Abstract

Objectives/Goals
The objective was to determine how different levels of pollution affected the growth of corn plants.

Methods/Materials
I used clear sheets of plastic to make three separate tanks, plastic glue, 27 corn seeds, car exhaust, pipes, water, a spray bottle, and pH paper. Every day, I ran car exhaust through a pipe to the tanks of plants. I polluted one of the tanks twice a day, one once a day, and one I didn't ever pollute.

Results
My results were that the plants with the highest level of pollution wilted and died fairly quickly. The plants with a medium level of pollution wilted a little bit, but none died. The plants with no added pollution were very healthy throughout the experiment.

Conclusions/Discussion
My conclusion is that pollution does have a negative affect on the growth of corn plants. My results did enable me to meet my objective, and my hypothesis was supported. One possible source of error is that I had to keep the plants outside and it got very cold at night, which could have affected how the plants grew.

Summary Statement
My project is about what effects air pollution has on the growth of plants.

Help Received
My dad helped me with the process of running car exhaust into the tanks safely and he helped me glue the plastic tanks together.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Elly J. Shao

Project Number
S1823

Project Title
Dynamic Monitoring of the Effects of Lovastatin and Acetaminophen on Human Liver and Muscle Cells

Abstract

Objectives/Goals
The purpose of this project is to study the dynamics and drug-drug interaction of lovastatin and acetaminophen (APAP) in affecting the health of human muscle and liver cells. Both of these drugs have been reported in previous studies to induce mitochondrial toxicity. Since mitochondria are the "power plants" of cells, my hypotheses are that these drugs will cause dose dependent cell damage after prolonged treatments in both human muscle and liver cells, and that cells pretreated with lovastatin will be more sensitive to APAP-induced damage than cells that were not pretreated.

Methods/Materials
Instead of using conventional end-point cell assays, I monitored cell dynamics using real-time cell electronic sensing (RT-CES) technology, which automatically measures the microelectrode impedance at the bottom of each well in a special cell culture plate (E- plate). The changes of impedance in each well are used to derive cell index (CI), reflecting cell proliferation and viability. In this study, human liver cell line (HepG2) and muscle cell line (A204) were seeded in the wells of E-plates and cultured with the drugs for 72 hours at 37C. The CI was collected every minute in the first hour after treatment and every 15 minutes thereafter. The independent variables were the concentrations of the drugs and length of time of treatment. The dependent variable was the CI.

Results
APAP induced dose-dependent decrease in CI in both HepG2 and A204 cells in the 1st hour of treatment. A204 cells were not able to recover from the damage, and the CI remained at low levels, but the HepG2 cells recovered from the damage after 48-hours, and the CI grew to the same level as the control cells. By itself, lovastatin did not show significant damage to either cell type even at the highest dose (50uM). However, the 48 hour incubation with lovastatin made the liver cells more sensitive to APAP-induced cell damage when compared to the cells without lovastatin treatment.

Conclusions/Discussion
Dose-dependent decreases in the CI were observed when HepG2 cells were treated with up to 20 mM APAP, consistent with previous studies of APAP hepatotoxicity. In addition, pretreatment with lovastatin made HepG2 cells more sensitive to APAP-induced damage. This finding may warrant a caution for patients who take lovastatin and large doses of APAP together.

Summary Statement
A comparison of the effects of lovastatin and acetaminophen on human liver and muscle cells using microelectrode impedance-based real-time cell electronic sensing (RT-CES) technology.

Help Received
Used lab equipment at ACEA Biosciences under supervision of Dr. Xu and Ms. Zhu

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Yi-Shiuan Tung

Project Number
S1824

Project Title
The Effects of Environmental and Artificial Substances or Conditions on the Growth of Mycorrhizal Fungi

Abstract

Objectives/Goals
Mycorrhizal fungi are the basis of our plants' existence. The fungi has long been considered as a plant. Research has shown many times the role of the mycorhizal fungi in the mineral intake and nutrient transport of a plant and proved that without the fungi, less variety of plants would be able to survive or some would have to evolve to have the traits that can adapt to the environment. A research conducted by Northern Arizona University showed that soil fertility is a key driver of the growth and adaptation of arbuscular mycorrhizal (AM) symbiosis. It has also concluded that soil fertility might be the main cause for the evolution of mycorrhizal fungi, allowing them to adapt to different environments. If soil fertility has that much of an effect on an organism essential for plant's life, what can environmental pollutants do to the fungi?

Methods/Materials
I've acquired different types of fungi by digging up soil around tree roots. Assuming that the fungi take part in the absorbing of minerals and nutrients for the plants (aka mycorrhizal fungi), the things that affect the growth of the fungi can be considered to affect the growth of plants in that region. Growing the fungi in sabouraud agarose gel, I applied different pollutants to see the effect they have on the growth of the fungi.

Results
The results complied with the hypothesis that natural and artificial pollutants will affect the growth of mycorrhizal fungi. The control, agar without any pollutants, had numerous hyphae and spores that was TNTC. Coke had far less hyphae than the control, which was surprising since fungi grow well in areas with high concentration of glucose. The fungus grown on the south pole of the field flourished but the fungus cultured on the north pole had fewer hyphae. This may imply that the orientation of the magnetic field can have different effects on the growth of mycorrhizal fungi. The agar affected by ultraviolet rays wasn#t affected as much as expected. The plated agar was left exposed to UV rays for around one hour in this experiment; more exposure may be needed for a more significant result. Unleaded gasoline and motor oil killed off most of the fungus on the plates. Diluted vinegar had the most hyphae growth besides the control. There were areas TNTC. I took the average of the numbers and gave the estimation to the best of my ability. Acid of pH4 did not affect the growth of hyphae drastically.

Summary Statement
Applying pollutants and substances onto the fungi, an observation can be made about the degree in which the substances are effecting the fungi and also the plant life.

Help Received
Used lab equipment at Clovis West High School under the supervision of Dr. Rebecca

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Abhishek Venkataramana

Project Number

S1825

Project Title

Sensitization of CD44+ Cancer Stem Cell Apoptosis by Sequential Inhibition of the S-Phase

Abstract

Objectives/Goals

Although there are multiple reasons for the lack of response to cancer therapy, the emergence of cancer stem cell populations, subsets of cancer cells with self-renewable properties, has been thought to be a crucial reason for the poor response to conventional cancer therapy. The goal of this study was to sensitize these cancer stem cells in order to enhance apoptosis, and thereby improve response to cancer therapy. Cell cycle regulation is one of the central mechanisms for controlling cell growth and cell death in cancer cells. In this study, we targeted the S-phase of the cell cycle, in which DNA synthesis occurs, in a sequential manner. We first arrested the cell cycle of the cancer stem cells in the S-phase, in order to block DNA synthesis, and then exposed the cells to cisplatin, an apoptosis agent.

Methods/Materials

CCL-30, human airway epithelial carcinoma cells were obtained and cultured. Cancer stem cells were sorted by using surface marker CD44+, a possible surface marker for cancer stem cells, by a fluorescence-activated cell sorter. Sorted CD44+ cells were treated with Cdc7 inhibiting drug, C75 for 24 hours followed by cisplatin, an apoptosis agent. Inhibition of Cdc7, by C75, results in the arrest of DNA synthesis in the S-phase. Immunoflourescence staining, Alamar Blue Assay, and TUNEL Assay were used in order to assess apoptosis.

Results

Induction of arrest in the S-phase of the cell cycle by Cdc7 inhibitor, C75, followed by treatment with cisplatin, significantly enhanced cancer cell apoptosis in CD44+ cancer stem cells and decreased cell proliferation as assessed by TUNEL and Alamar Blue assays. Immunoflourescence staining showed that sequential sensitization of cancer stem cells caused enhanced apoptosis via a mitochondrial death pathway.

Conclusions/Discussion

Sequential sensitization by induction of growth arrest followed by an exposure to an apoptosis agent may enhance the efficacy of currently available cancer therapies. The use of such an approach can not only improve response to therapy in cancer of airway disease, but it can also revolutionize the therapeutic approaches in all types of human cancer worldwide.

Summary Statement

Sequential sensitization by induction of growth arrest followed by an exposure to an apoptosis agent significantly increase apoptosis in CD44 cancer cells and may enhance the efficacy of currently available cancer therapies.

Help Received

Conducted project under the mentorship of Dr. Daya Upadhyay in her lab at the Stanford Medical Center; received lab training from Research assistants Dr. Wei Le and Dr. Weihua Wang, who directly supervised lab work; Project was generated as an extension to on-going studies in the Upadhyay lab.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Lillian J. Williams

Project Number
S1826

Project Title
Effect of Biodegradable and Non-biodegradable Car Wash on Pansy Plants

Abstract

Objectives/Goals
The purpose for this experiment was to understand how the chemicals we use to wash our cars effect our environment. Also to see if the eco-friendly car washes actually do what they say they do.

Methods/Materials
I used 30 pansy plants which I divided into nine different groups(control,25b,50b,75b,100b,25b,50b,75b,100b). I used four different dilutions of each car wash and sprayed it onto the plants. Everyday all the plants received the same a lot of water(15ml). I set all the plants under a growth light.

Results
My results was that the non-biodegradable car wash affected the plants posture and the biodegradable car wash affected the plants coloration.

Conclusions/Discussion
The biodegradable car wash affected the plants in a negative which lead to the discoloration of the pansy. I think that the results occurred because some of the ingredients in the biodegradable soap are harmful to plants. The ingredient has affected the moisture of the plant also photosynthesis of the pansy. The use of different brands of biodegradable and non-biodegradable would make clearer results of what car wash is better for the environment. The non-biodegradable car wash affected the plants posture. If this experiment was to be repeated, the plants should receive more water. These improvements will make the experiment more detailed and believable.

Summary Statement
My experiment was conducted to see if eco-friendly car washes really does help our enivorment.

Help Received
My teacher helped me figure out how i was going to mearsure the plants.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Jeannette W. Wright

Project Number
S1827

Project Title
The Cellular Scarinnng!

Abstract

Objectives/Goals
The purpose of my project is to observe the effects of cell phone radiation on plants, looking for any abnormalities that could possibly occur in their growth patterns or appearance from the cell phone radiation exposure. From there, the results can be compared to the effects and impact that cell phone usage can have on DNA and cells, such as mutations, that can affect the composition and characteristics of the plants.

Methods/Materials
The basic materials for this project included 2 cardboard containers, potting soil, 9 small gardener dishes, a cell phone, 2 lamps, cherry belle radish seeds, 2 full-spectrum lightbulbs, an electornic kitchen scale, measuring spoons, and water.
To do this experiment, I had four dishes in each cardboard container, with one cell phone in the middle of only one of the containers (the cell phone radiation exposed container). Each of the four dishes in each container were given the same amount of soil, radish seeds, light (from the lamps with the full-spectrum lightbulbs), and water, yet the only difference between the dishes in both containers, was that one of the containers was exposed to cell phone radiation, while the other dishes in the other container were just grown regularly without that exposure.

Results
In the container that was exposed to the cell phone radiation, the plants in dishes 1 and 3 (which were located where the bottom of the cell phone was) were abnormally tall, while the plants in dishes 2 and 4 (which were located where the top of the cell phone was) were abnormally short, compared to the other plants in the non-exposed radiation side that were all in average about the same height.

Conclusions/Discussion
My results led me to believe whether or not the cell phone radiation caused a stunt or spurt in the plants growth development or a change in their genetic makeup. The cell phone radiation either could have caused the plants to grow taller or shorter than normal, or it could have even gone both ways depending on where the dishes were situated around the cell phone. In some way, though, it must have affected all the plants in the dishes because the plants height differed greatly from the height of the regular plants whether taller or shorter. Overall though, longer testing would need to be conducted to actually know how the cell phone radiation affected the plants growth.

Summary Statement
My project tested the impact of cell phone radiation on plant growth and DNA to compare it to how cell phone radiation can affect humans and their DNA.

Help Received
Aunt helped with material purchases and finances; Mother helped with board creation; Teachers helped with experimental design