CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Amanda Herbst; Kelsey Warren

Project Number

S2201

Project Title

The Effects of Increasing Water Temperatures on Planarian Regeneration

Abstract

Objectives/Goals

The purpose of this study was to investigate the regenerative response of Brown Planarian worms to increasing global water temperatures.

Methods/Materials

45 brown planarian worms of Dugesia tigrina ,adjustable aquarium heater, five-gallon buckets, smaller jars, kettle/stove to boil water for cleansing, ruler, pipette, microscope/stereoscope, petri dish, refrigerator, fresh water supply, scalpel. Separated worms into 5 temperature groups and cut each worm in half. Measured the length of each worm after 15 days in heated water bath.

Results

The lowest and highest water temperatures were best suited for planarian regeneration. Variance in regeneration was shown in the middle temperature groups. All worms regenerated in stunted forms at temperatures above room temperature (20 C).

Conclusions/Discussion

As water temperatures increase due to global warming, planarian worms may regenerate in stunted forms. This may serve as an adaptive benefit to the worms because they will need fewer resources to survive. However, the worms are decomposers at the bottom of the food chain, and their smaller sizes may decrease biomass transfer to organisms higher up the food chain.

Summary Statement

We tested the effects of increasing water temperatures on planarian worms and determined that warmer waters will cause stunted forms of worms.

Help Received

We devised our project idea and testing setup by ourselves, as well as tested alone. Our mentor, Patricia Sadeghian, lent us a scalpel and petri dishes and suggested we use a microscope for measuring.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Carly Hill; Mira Lion

Project Number

S2202

Project Title

Effect of Sea Surface Temperature on the Presence of Acanthocephalan Parasites in Emerita analoga

Abstract

Objectives/Goals

Sand crabs are generally regarded as an indicator species of the health of sandy beach ecosystems. Sand crabs are also the intermediate hosts of acanthocephalan parasites that are hazardous to the health of seabirds and marine mammals such as otters when ingested. The goal of our project this year is to determine if there is a correlation between sea surface temperature and abundance of acanthocephalan parasites in Emerita. We hypothesize that there will be less acanthocephalan parasites this year due to the warm water of El Niño and the #Blob#.

Methods/Materials

This year we are continuing to gather data monthly on number and sex of sand crabs at Seabright beach following limpets protocols. In addition, beginning summer 2015, we started collecting and dissecting sand crabs to quantify the parasite load. To determine if there are a high number of parasite eggs in the water, we will use mortality rates of otters and sea and shorebirds which are hosts of the parasites.We follow the LiMPETS (Long-term Monitoring Program and Experiential Training for Students) protocols for Sandy Beach Monitoring to survey the distribution and abundance of Emerita at Seabright beach. We also use these procedures to dissect the sand crabs and discover the prevalence of parasites seasonally.

Results

We started our project in fall of 2014 and we found that sand crabs are most abundant during spring. Thus far this year, we have found that sea surface temperature does not affect abundance of Acanthocephalan parasites.

Conclusions/Discussion

We found no evidence to suggest that acanthocephalan parasites are affected by sea surface temperature. This shows that fluctuations in acanthocephalan parasite abundance must be caused by some other factor.

Summary Statement

After collecting many samples of acanthocephalan parasites from sand crabs and comparing their abundance to the sea surface temperature at the time, we found no evidence to suggest a correlation between SST and parasite abundance.

Help Received

LiMPETS coordinator, Emily Gottlieb, showed us how to do the procedure. Dan Merritt, former professor, helped us gather research concerning otter deaths attributed to acanthocephalan parasites. Jane Orbuch, a science teacher, helped us be prepared for the science fair by providing us with necessary

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Joseph A. Huitt

Project Number

S2203

Project Title

Honey, Who Shrunk the Bee Population? Investigating Colony Collapse Disorder

Abstract

Objectives/Goals

The objective of this study is to see if I can completely eliminate or control Colony Collapse Disorder (CCD) by killing Tracheal mites (Acarapi Woodi, throat mites) and Varroa mites (Varroa Destructor, parasitic mites) by using natural ingredients, keep my hives strong for pollination, overwintering and not contaminating my honey.

Methods/Materials

Tested different chemicals on treating Varroa mites and Tracheal mites to find the most natural way to treat the mites to solve Colony Collapse Disorder. Used HopGuard (natural beer hops to treat the Varroa mites and menthol to treat the Tracheal mites in a natural way on my 96 of 144 hives of bees. The other 48 hives were the control group to compare the treatments.

Results

The testing of the Varroa and Tracheal mites was compared to the control group after the chemicals were applied. There was a slight drop of mites in the hives and the chemicals were detected in the honey. There was a huge drop in bee strength and there was more Colony Collapse. When using natural HopGuard the first application was 92% efficient, the second application was 97% efficient. Pre-treatment for every 100 bees there were 10 mites. Post-treatment for every 100 bees there was 1 mite, with no residue in the honey.

Conclusions/Discussion

The menthol and HopGuard treatments killed only the mites, not the bees. It was 97% efficient in killing the mites and Colony Collapse was minimal or eliminated 100%. I found HopGuard used beta plant acids from hop plants and does not harm bees or brood, and leaves no residue in the honey. My hives were stronger when overwintering. When using chemicals to treat my bees I found it had neonicotinoides which are found in chemicals the farmers are spraying on their orchards, this is taken back into the hives and causes Colony Collapse.

Summary Statement

My project showed how using natural ingredients to eliminate Varroa and Tracheal mites eliminated Colony Collapse Disorder.

Help Received

My mom worked with me as she is a beekeeper, and I had the Bee Diagnostic Team help with my testing.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Robert Jeffrey; Chloe Zehr

Project Number

S2204

Project Title

The Relationship between Terrestrial Salamanders and El Nino Soil Moistures

Abstract

Objectives/Goals

To compare the effects of El Niño conditions on two different ecosystems in Henry Cowell State Park, determining if increased soil moisture as a result of additional rainfall increases salamander abundance.

Methods/Materials

Measured macro- and micro-climatic factors through Vernier LabQuest interface and probes; counted salamanders under artificial cover objects in five stations categorized by species. Data consolidated with historical data to compare salamander counts in past years.

Results

We compared our data to those of past years with a two-way ANOVA and a linear regression. From these models we found that the salamander counts appear to drop as percent soil moisture drops, and counts appear to peak when soil moisture peaks. We found a small increase in average salamander counts this year as compared to previous years.

Conclusions/Discussion

We did not find a strong correlation between soil moisture and salamander counts in our short term data. From our statistical analyses, we found a moderate correlation between salamander counts and soil moisture. Therefore, we project that with continued data collection, we will find stronger positive correlations in longer-term data.

Summary Statement

We compared climatic data to four years of salamander counts to find no major recoveries from the California drought.

Help Received

Our mentor taught us a statistical analysis and our science teacher taught us how to use some of our equipment.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Edhel Marie Joseph; Nahomy Pinedo

Project Number

S2205

Project Title

Sweet Potato Whitefly Infestation in Agriculture: Examining the Effects of Nitrogen Fertilizer on Whitefly Fecundity

Abstract

Objectives/Goals

The objective of this project is to determine which amount of nitrogen concentration is the most effective to reduce whitefly fecundity while benefiting the host plants.

Methods/Materials

Plant the Top Mark seeds into "Sunshine all-purpose potting soil." Add 25 ppm, 50 ppm, 100 ppm, 200 ppm, and 300ppm of nitrogen concentrations to the plants. Collect 200 whiteflies using an retrofitted hand-vacuum. Using a second adapted vacuum in a glass chamber, vacuum one whitefly into an improvised clip cage, and place on separate and healthy leaves. Monitor the cages, and keep the cages on each leaf for a total of six days for each trial. After removing the clip cage, count the eggs on each plant. After five weeks from planting the crops, measure the length of the plants, the length of the leaves, and count the number of leaves on each plant. After all the data is collected, put the data together in an excel spreadsheet for analysis.

Results

The dilution containing 50 ppm N produced the most acceptable levels of nutrients for the whiteflies, since they produced the highest average number of eggs in two trials. The 25 ppm N treatment resulted in the least amount of eggs. The tallest plants had 200 ppm treatment with an average length of 73.8 cm, while the shortest plants had 25 ppm treatment with the average length of 38.4 cm. The length of each leaf also had a direct connection to the nutrients that were supplied.

Conclusions/Discussion

The experiment illustrated that the lower nutrient concentration added to the plants, the shorter and unhealthy they get; likewise the higher the nutrient concentration, the taller and healthier the plants are. The significance of this project is since whitelfies are highly resistant, every year the application of pesticides and insecticides are drastically increasing, in order to control whiteflies. The effects of these toxic chemicals and organisms are known to cause many health and environmental issues, such as; cancer, autism, kidney failure, birth defects, damaged organs and immune systems. We especially, are most prone to have health complications, as a result of the high rate of toxins in our food. The most appropriate nutrient concentration proved to be 200 ppm, since it produced a low amount of eggs while causing the plants to grow long and healthy.

Summary Statement

We examined the effects of nitrogen fertilizer on whitefly fecundity and the host plants; in conclusion, the whiteflies are unable to thrive in a nitrogen rich environment, yet nitrogen fertilizer is greatly beneficial to the host plants.

Help Received

Scott Blanco was the scientist who supervised us during the conductment of our project. The USDA is the institution where we performed our research.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Vivek V. Kamarshi

Project Number

S2206

Project Title

In Search of a Better Fever Drug: Effect of Heat-Sensing Mutations on Behavioral Fevering in Drosophila melanogaster

Abstract

Objectives/Goals

Fevering occurs when chemicals produced by the body interfere with the proteins in the brain which regulate body temperature. Current fever-reducing drugs work by preventing formation of these chemicals - however, they are also important in digestive homeostasis, which is why heavy users of such drugs are prone to getting peptic ulcers. A better approach to prevent fevering would be to directly inhibit these thermoregulatory proteins. I investigated fevering behavior in Drosophila melanogaster to find out whether specific proteins are necessary for fevering. My aim was to identify protein targets for a more fever-specific drug.

Methods/Materials

Flies without the heat-sensing proteins TRPA1, pyx, and GR28B.D were obtained from various labs, along with wild-type flies as controls. Flies were infected with the fungus Beauveria bassiana. Each sample of flies was then put into a self-made enclosure sequentially. The enclosure included a circular heat gradient (26-31 degC). Images of flies sitting on the gradient were taken every 15 minutes for one day. These images were analyzed using open-source government ImageJ software to record the number of flies on the gradient and their locations, which were translated into the temperature selected.

Results

On average, infected, wild-type Drosophila preferred a higher temperature than healthy wild-type flies (P=0.0074). GR28B.D-mutant flies selected temperatures similar to the wild-type flies. Infected TRPA1-mutants preferred a similar (slightly higher) temperature to infected wild-type flies (P=0.116). However, infected pyx-mutant flies chose much lower temperatures than infected wild-type flies (P=0.0001).

Conclusions/Discussion

Flies were shown to get a fever by selecting higher temperatures when infected, making them a good model organism for fever research. Additionally, infected TRPA1-mutant flies preferred a slightly higher temperature than infected wild-type flies, indicating that a drug limiting TRPA1 function would not significantly affect an infected fly's fever. However, infected pyx-mutants selected much lower temperatures than infected wild-type flies, meaning that the flies did not fever. Thus, the pyx protein in flies does in fact modulate fevering in Drosophila. Therefore, human brain proteins should be studied to determine which proteins play a similarly important role, and whether they could be targets for a future fever drug.

Summary Statement

In the first experiment to date about the fevering reaction in Drosophila, I demonstrated that infected flies do select higher temperatures than healthy flies and identified that the heat-sensing protein pyx was crucial to fevering.

Help Received

Mentor/teacher Renee Fallon. Drosophila flies from Dr. David Schneider (Stanford), Dr. Lina Ni (Brandeis), and Dr. Craig Montell (UCSB), B. bassiana fungus sample from Laverlam Intl. Discussed parts of project with Dr. Schneider and Dr. Nina Jenkins (Penn State).

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Shakil A. Matin

Project Number
S2208

Project Title
The Effect of Naproxen on the Respiration of Brine Shrimp

Abstract

Objectives/Goals
To examine the overall result of applying an abundant pharmaceutical (naproxen) into an environment that can be easily susceptible to any amount of changes.

Methods/Materials
Prepared the naproxen stock solution and serial dilutions using deionized water and a hotplate/stirrer
Utilized an autoclave to sterilize test flasks and air tubing
Created a 3.6% salt water solution to hatch brine shrimp eggs and provide a habitat for them to live in
Provided an air pump and air tubing to run through each of the experimental flasks containing the brine shrimp
After calibrating the dissolved oxygen probe, the probe could read and detect the amount of dissolved oxygen in ppm (mg/L)
Ran two trials, each 72 hours long- obtaining data in increments of 0, 6, 12, 24, 48, and 72 hours, respectively per each trial

Results
My data was interesting, in that the common initial trend was that higher concentrations of naproxen increased the amount of dissolved oxygen for the first hours, but levels eventually dropped significantly lower than the control group by the end of each trial, as seen in the results section. Both trials indicate that all concentrations of naproxen decrease the respiration of the brine shrimp over just short periods of time.

Conclusions/Discussion
Results showed that the control group of brine shrimp had much higher respiration rates than the brine shrimp treated with varying concentrations of naproxen.

Summary Statement
Analyzing the effect of naproxen on the respiration of brine shrimp through data consisting of dissolved oxygen levels.

Help Received
Dr. Malhotra guided me and pushed me to try my hardest to achieve a project that had valid results to confirm my hypothesis.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Elizabeth M. Salmond

Project Number

S2209

Project Title

Livin' the Hydra Life: Hydra Regeneration as Affected by Various Symbiotic Algae

Abstract

Objectives/Goals

To determine if speed and extent of regeneration of brown Hydra heads is affected by exposure to three different types of green algae.

Methods/Materials

Obtain three different species of green algae such as Chlorella Vulgaris, Arthrospira Platensis, and Nannochloropsis. Obtain 4 Petri dishes. Fill each dish with Hydra Media. Using digital microscope, dissect a Hydra at mid-body, separating foot end and place it in first dish. Repeat until there are 5 Hydra foot ends in each of the 4 dishes. First dish is the control. Add 75 ml of first algae to dish 2, 75 ml of next algae to dish 3, and 75 ml of last algae to dish 4. Place lids on all. Using the microscope, check each of the dishes at regular intervals post amputation: 6, 9, 18, 24, and 36 hours. Using a regeneration chart, track counts of Hydra at each of the 6 regeneration stages.

Results

I did 2 trials of 10 total per dish. Tracking the final head count regeneration, Chlorella Vulgaris algae had 9 out of 10 heads fully regenerated with tentacles. Control group had 6 of 10 heads regenerated as did the Nannochloropsis dish. The Arthrospira Platensis dish was last with only 3 heads. Most Hydra take between 24-36 to become fully regenerated. But Chlorella Vulgaris was the first and only algae to have a fully regenerated Hydra by 18 hours. Next best was a tie between control group and Nannochloropsis algae, although the algae group was a bit faster. Slowest rate of regeneration was Arthrospira Platensis algae. It regenerated only 3 heads, half of what control did. Arthrospira was also the only one that after 36 hours still had Hydra in the 4th stage. All of the other groups had regenerated to at least the 5th or 6th stage at this time.

Conclusions/Discussion

The different kinds of algae had major effects on Hydra regeneration. Chlorella Vulgaris algae had positive symbiotic relationship with the Hydra # the Hydra took on the green color of the algae and grew to much larger proportions. The worst was Arthrospira Platensis algae which surprised me as it underperformed even the control group. Upon further study, I learned that because of the peculiar shape of the particular strain of cyanobacteria known as Arthrospira Platensis, having a symbiotic relationship with another microorganism can be very difficult. The spiral shape of the Arthrospira Platensis could be the reason why the Hydra did not thrive in this environment, but more research is needed.

Summary Statement

Recognizing the symbiotic relationship between Hydra and green algae, this projects tracks both the speed and effects of regeneration of Hydra heads when exposed to three different species of algae.

Help Received

Felix Grün, Ph.D., at the Center for Complex Biological Systems at University of California, Irvine, provided me the Hydra and the Hydra media. I obtained the algae from Algae Research Supply in Carlsbad, California. My mom helped me set up the Excel file for making the charts.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Rujuta S. Sathe

Project Number

S2210

Project Title

Diagnosing Neurodegenerative Diseases (ALS): Using Infrared Spectroscopy to Test for Neurodegeneration in C. elegans

Abstract

Objectives/Goals

Current methods for diagnosing neurodegenerative diseases like Amyotrophic Lateral Sclerosis are time-consuming and tedious as they require patients to undergo multiple invasive and painful blood and cerebrospinal fluid tests. The purpose of my project was to develop a minimally invasive, one-test diagnostic tool for diagnosing neurodegenerative diseases like ALS. The test uses the concept of infrared spectroscopy as it involves projecting infrared light on healthy and degenerated neurons and comparing the vibrational frequencies they each produce, as a result of being exposed to IR light, to determine the level of neurodegeneration.

Methods/Materials

Experiment involved use of C.elegans as a model organism. Control Group (3 plates of wild type C. elegans exposed to 5min of infrared light), Experimental Group (9 plates of C.elegans infected with Levamisole hydrochloride chemical and exposed to 5min infrared light). Tested for neural vibrational frequencies by observing movements of wild type C.elegans and infected C.elegans with neurodegenerative disease, under IR light LED projection. Used DinoLite microscope to capture the movements of C.elegans, and used WormLab software to analyze them.

Results

An exposure to IR light caused the neurons of control group C.elegans to produce a vibrational frequency that promoted a sinusoidal wave motion with greater mobility and speed(45um/sec-120um/sec). An exposure to IR light caused the neurons of the experimental C.elegans to produce a vibrational frequency that promoted rapid fluctuations in movement(Num of reversals: 2-12) and muscular bends(Center Points(deviation from normal body position): 4 units-15 units).

Conclusions/Discussion

My experiment proves that there is a distinct difference between the vibrational frequencies produced by healthy neurons and degenerated neurons of C.elegans when they are exposed to infrared light. This experiment has a direct relation to diagnosing neurodegenerative diseases(ALS) in humans since the vibrational frequencies of the degenerated corticospinal neurons in ALS patients will differ from the vibrational frequencies of the corticospinal neurons in a healthy individual when both neurons are exposed to IR light. The experiment proves that the vibrational frequencies can be used to determine the shape, structure, and condition of the neurons and can serve as diagnostic markers for diagnosing neurodegenerative diseases like ALS.

Summary Statement

A novel approach towards developing a minimally invasive, one-test diagnostic tool for diagnosing neurodegenerative diseases like ALS using infrared spectroscopy.

Help Received

I conducted the experiment in my school's STEM class, under the supervision of my mentor, Mrs. Renee Fallon, who guided me through methods such as pouring plates and provided me with necessary materials such as Petri dishes, micropipettes, and Nematode Growth Medium.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Colin B. Virgines

Project Number
S2211

Project Title
The Effects of Calorie Restriction on Drosophila melanogaster Longevity

Abstract

Objectives/Goals
To study the effects of calorie restriction on the longevity of drosophila and to compare these results with a control group.

Methods/Materials
Drosophila, culture tubes, drosophila medium, CR Mimetic Longevity Formula

Results
The Drosophila the CR Mimetic Longevity Formula showed a lower death rate when compared to the other diets.

Conclusions/Discussion
Calorie Restriction is a viable method for dieting as well as increasing your longevity.

Summary Statement
I studied the effects of calorie restriction on drosophila longevity

Help Received
Dr. Maholtra helped advise me throughout the project by helping me look up articles on culturing drosophila.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Isabella C. Welch

Project Number

S2212

Project Title

How Weight Affected the Flight Dynamics of Quetzalcoatlus northropi

Abstract

Objectives/Goals

Using "off the shelf" 3D & flight simulation software, I attempted to discover how weight effected the flight distance of Quetzalcoatlus Northropi.

Methods/Materials

Laptop Computer with Unity3D (3D Software) and a Flight Simulator plugin. Tested two different scientific weight models, Witton and Chatterjee & Templin, of the Quetzalcoatlus along with different flight wing positions.

Results

I found that a heavier model such as Witton#s, would fly the best and furthest. Quetzalcoatlus is thought to have migrated very long distances and my data seems to support this theory.

Conclusions/Discussion

By making use of inexpensive and open source virtual reality software and tools, I used my research data from previous years and visualize the results. This provided a way to understand the complexities of Quetzalcoatlus flight dynamics.My results found that a heavier model such as Witton#s, would fly the best and furthest. Quetzalcoatlus is thought to have migrated very long distances and my data seems to support this theory.

Summary Statement

Using "off the shelf" 3D & flight simulation software, I attempted to discover how weight effected the flight distance of Quetzalcoatlus Northropi.

Help Received

Michael Bruce Habib, PhD: Research Associate at the Dinosaur Institute at the Los Angeles County Museum of Natural History

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Brian S. Xia

Project Number

S2213

Project Title

Single Molecule Based Transgenerational Therapies to Extend Healthspan and Prevent Multiple Aging Related Diseases

Abstract

Objectives/Goals

The objective of this study was to examine whether E(z)/EZH2-dependent H3K27me3 may be one epigenetic mechanism underlying transgenerational programming of longevity, and EZH2 inhibitors (e.g., EPZ-6438) may extend longevity by preventing multiple aging-related diseases (ARDs) in a transgenerational manner.

Methods/Materials

Antibodies and EPZ-6438 are commercially available. The dietary manipulations were developed through publicly available nutritional data and literature research. Integrative methods were employed for longevity analysis, western blotting, disease and behavioral characterization after various post-eclosion treatments.

Results

My results have 1) revealed E(z)-dependent H3K27me3 as the first such epigenetic mechanism, 2) identified EPZ-6438 to extend longevity and prevent multiple ARDs, and 3) provided the first-ever proof-of-concept for transgenerational epigenetic therapy with individual molecules for simultaneous prevention of multiple ARDs.

Conclusions/Discussion

Longevity-improving epigenetic therapies may prove to be revolutionary, in combination with personalized medicine (i.e., therapy decisions tailored to individual patients based on genetic risk information and molecular characterization) and DOHaD (Developmental Originals of Health and Disease) approach. First, therapeutic interventions delivered at an early developmentally-appropriate time may be very effective to prevent the onset of ARDs in adults and even cross generations, especially considering that current disease-risk-reduction interventions have been primarily targeted to adults while are not necessarily effective. Second, the single compounds which extend longevity by delaying multiple ARDs could prevent many diseases simultaneously and thus greatly extend healthspan of life. Third, one important trend for drug discovery is the ongoing shift from single-target-oriented molecules to network- or biological system-active compounds and to 'epi-drugs'. Finally, my results also provided a new avenue to combat genetic diseases. E(z) regulates a large number of genes through the PRC2-mediated repression mechanism, and thus its inhibitor may achieve network-active purpose on their own. Such knowledge can also be combined with personalized medicine and DOHaD approach to promote appropriate risk reduction interventions in early life, and motivate healthier choices and meaningful behavior changes in adults.

Summary Statement

This project has demonstrated the efficacy of early-life administration of a single-molecule therapy in extending healthspan and preventing multiple aging-related diseases in a long-lasting cross-generational manner.

Help Received

My mentor provided laboratory space, reagents, and equipment; and guidance in experimental design and data analysis. I independently performed literature research, formulated a novel idea, collected data, and drew conclusions.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Hongjia (Ashley) Yang

Project Number

S2214

Project Title

Humanin and Daf-2 Increase C. elegans Lifespan and Memory Functionality

Abstract

Objectives/Goals

The objective of this study is to determine the effects of humanin and daf-2 on C. elegans' longevity and memory function, as a preliminary study in understanding their effects on human longevity and memory function.

Methods/Materials

Use C. elegans with and without humanin and daf-2 genes as a model system to examine the lifespan and memory function in response to chemotaxical cue (butanone) at various time points.

Results

Results show C. elegans expressing humanin and daf-2 had increased lifespan and momory functionality, and even more so for C. elegans with the crossed humanin/daf-2 genes.

Conclusions/Discussion

These findings indicate that humanin and daf-2 can improve C. elegans' lifespan and momory function. It also suggest from this study that humanin and daf-2 or equivalent proteins in human may plan important roles in anti-aging.

Summary Statement

Humanin and daf-2 increase C. elegans lifespan and memory functionality

Help Received

I designed and performed the experiments by myself. I got help in understaining the science about C. elegans and relevant genes from Dr. Pinchas Cohen, Dean, USC Davis School of Gerontology and Dr. Kelvin Yen, Research Assistant Professor, USC Davis School of Gerontology

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Lauren M. Yen

Project Number
S2215

Project Title
Calcium Content in Neuron Changes with Light Stimulation

Abstract

Objectives/Goals
Based on last year#s research, light at 630 nm and a power density of 3.42 J/sec cm2 slowed down an action potential along the giant axon in the earthworm.. The hypothesis for this experiment states that light alters calcium levels in the giant axon, a possible mechanism for the change in nerve conduction velocity.

Methods/Materials
This experiment is based on Calcium green, a calcium binding dye that fluoresces 14X above baseline after binding calcium in a special in vivo light detection chamber, the XENOGEN IVIS-200 system. Calcium green signal was optimized by testing serial dilutions of free calcium in buffer solutions for fluorescence. Six earthworms were dissected and injected with Calcium green and examined at three different time points: pre-injection baseline, post-injection of the calcium green dye, and after light treatment.

Results
There was an average decrease by 0.256 +/- 0.07 (SD) luminosity units after 635nm light treatment ($p<0.5$, paired t-test). The reduction in Calcium green signals suggests there was less calcium in the nerve binding the dye after light treatment.

Conclusions/Discussion
These results support the original hypothesis: red light can induce changes in intracellular calcium in the giant axon. Clinically, this experiment may lead to ways to alter nerve function and possibly, alter the sensory nerve pathways for pain and touch.

Summary Statement
I discovered that red light illumination changes the intercellular calcium content within nerves,

Help Received
I borrowed the Xenogen IVIS-200 system from the USC Molecular Imaging Center