CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Anahita M. Amalsad

Project Number

S1301

Project Title

Which One: Shopping Cart Handles, Doorknobs, or Drinking Fountain Handles Contains the Most Bacteria?

Abstract

Objectives/Goals

To see whether shopping cart handles, doorknobs or drinking fountain handles contains the most bacteria.

Methods/Materials

PROCEDURE:

1. Take a sample from a shopping cart handle with a sterile swab, while wearing sterile gloves.
2. Take a sample from a doorknob with a sterile swab, while wearing sterile gloves.
3. Take a sample from a drinking fountain handle with a sterile swab, while wearing sterile gloves.
4. Put each specimen in individual Petri dishes and immediately cover them.
5. Observe each Petri dish daily for 10 consecutive days and record the colonies of bacteria (spots on the soy agar).
6. Make sure that the control Petri dish contains no bacteria, to prove my results accurate.
7. At the end of the tenth day, draw a conclusion by averaging the totals of Day 10 to find out which one contains the most bacteria.
8. Repeat the same procedure 2 more times to check for the accuracy of the results.

MATERIALS:

Three shopping carts, three doorknobs, three drinking fountains, twelve 100 x 15 mm style Petri dishes with soy agar, nine sterile swabs, and sterile gloves.

Results

After 10-days of experimentation the following results were observed:

1. Shopping cart handles: 4 Spots on the Soy Agar of the Petri Dish
2. Doorknobs: 159 Spots on the Soy Agar of the Petri Dish
3. Drinking fountain handles: 316 Spots on the Soy Agar of the Petri Dish
4. Control: 0 Spots on the Soy Agar of the Petri Dish

Conclusions/Discussion

After checking the Petri dishes for ten consecutive days and logging the bacterial growth on three sets of samples it was concluded that drinking fountain handles contained the most bacteria.

Summary Statement

I tested the bacterial growth on shopping cart handles, doorknobs and drinking fountain handles to see which one contained the most bacteria.

Help Received

Parents helped me to purchase all the necessary materials; Mother helped me edit the final draft of my report; Father helped in preparing printouts that included color photocopying and enlargements; Dr. Troung inspired me to choose this topic; Dr. DeJovine gave me valuble guidance.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Evelyn K. Chan

Project Number

S1302

Project Title

The Effects of Ash from Local Wildfires on Phytoplankton Growth

Abstract

Objectives/Goals

My objective was to see if natural sources of iron: surface soil or ash, could be a significant source of iron and be beneficial to phytoplankton growth. Iron is a limiting trace metal nutrient necessary to phytoplankton for photosynthesis and growth.

Methods/Materials

Sterilized flasks, with the same constants such as temperature, light received, added nutrients (without iron) and EDTA were given 42 mg of surface soil to one flask, 42 mg of ash to another flask, and 84 mg of ash to another flask. Each flask had a double, or a second trial, and a control was also included in the experiment.

Varying factors of nutrients and ash were also conducted in a different experiment to see the different extents of nutrients that ash could supply to phytoplankton.

The effects of natural ligands vs. EDTA added to cultures was also tested. The addition of EDTA was left off in the flasks with natural ligands. All of the flasks were inoculated with one mL of phytoplankton Thalassiosira weissflogii, and the phytoplankton cells were counted daily using a hemacytometer and compound microscope.

Results

Cultures grown with different added combinations of ash, iron, nitrogen and phosphorous showed that phytoplankton were able to obtain significant amounts of iron from the ash, but not a significant amount of nitrogen and/or phosphorus. Ash was also found to be a more effective source of iron for the phytoplankton than surface soil collected from the San Diego area. Natural ligands found in seawater are much less effective chelators than EDTA, a chelator added to laboratory cultures. Chelators are necessary for the binding of iron, which is important because it keeps much of the iron available to phytoplankton.

Conclusions/Discussion

My experimental results suggest that ash supplied by the recent San Diego wildfires may have introduced a significant supply of iron to phytoplankton of the southern California coast. Although this type of iron input may be rare or occur occasionally, the regeneration or reuse of iron by phytoplankton may have influences beyond an immediate growth response. This type of nutrient input over a global scale or over long time periods may have an important effect on the marine and global carbon cycles.

Summary Statement

Iron, a scarce limiting nutrient necessary for phytoplankton growth and photosynthesis, is found in ash particles, and greatly increased phytoplankton growth.

Help Received

Used lab materials, compound microscope and hemacytometer at Scripps Institution of Oceanography; Received references from Dr. Kathy Barbeau and Andrew King, who also answered some of my questions; Mom helped to glue board

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Daniel J. Concho

Project Number

S1303

Project Title

Effects of Rhythm of Reproductive Rates of Saccharomyces cerevisiae

Abstract

Objectives/Goals

This research tested the effects of rhythm on reproductive rates of Saccharomyces cerevisiae (yeast cells). It was hypothesized that when fungi cells, Saccharomyces cerevisiae, are exposed to Native and Modern drum rhythms, they will respond with a change in their reproduction and rate of reproduction. Similar to previous study, the reproduction and reproduction rate will react with improved rates.

Methods/Materials

Native American and Modern drumming were used to test yeast cells reproduction and reproduction rates. Yeast cells were observed multiplying under normal conditions. A blind study was used to conduct the tests. First, each student groups were supplied with yeast solution and water. One student kept control of the temperature while another observed the changes in number of yeast cells under microscope. This procedure was repeated for both types of music along with the control. Data was recorded. A statistical analysis was made.

Results

Results were taken from a series of tests done over a 4-day period. From raw data, the average of all testing groups, for each minute, in the Control, Modern and Native groups were graphed. From the graphs, comparisons were made of the before and after results and a statistical t-test was created between each test group. The budding of yeast cells, when exposed to Modern rhythm, resulted in the increase of the reproduction and reproduction rate. There was a significant decrease in the reproduction and reproduction rates of the budding of yeast cells when exposed to Native drumming. Although the rhythm was not beneficial to reproduction responses, the budding process of the yeast cells did slow down.

Conclusions/Discussion

The exposure of specific drum rhythms does cause changes in the reproduction and reproduction rate of Saccharomyces Cerevisiae. As similar to previous study, the modern group resulted with the most significant results, when comparing numbers. There was a significant increase in the reproduction/reproduction rate of yeast cells when exposed to modern drumming. When exposed to Native drumming, the yeast cells resulted in a significant drop (lower than variables of control). This contradicts previous study in that it was not beneficial towards the reproduction and reproduction rate. It is similar in that the process was slowed down, just as functions of the autonomic nervous system of a human test subject.

Summary Statement

This project tested the effects of rhythm (Modern and Native drumming) on the reproductive rates of Saccharomyces cerevisiae (yeast cells).

Help Received

Mentor gave advice.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Virginia R. Dick

Project Number

S1304

Project Title

The Application of a Clay Flocculate in Mitigating a Harmful Algae Bloom: Effects on the Growth of Mytilus edulus

Abstract

Objectives/Goals

As many economically challenged countries develop commercial shellfish markets, its citizens become more susceptible to biotoxins produced by harmful algae blooms that are stored in the tissues of shellfish. The objective of the project is to obtain a viable method for clay flocculate mitigation of cells in a harmful algae bloom with little or no effect on the shellfish population. The student desired to observe the effect of Magnesium Silicate Hydroxide (Talc) applications on a juvenile culture of Mytilus edulus.

Methods/Materials

The 40 Mytilus edulus individuals were retrieved from local San Diego Bay waters, individually labeled, and placed in wire baskets. The wire baskets hung inside five-gallon drums, 20 mussels in a control drum and 20 in a test drum. Every day for four weeks, a slurry of 100 grams of Talc in 100 grams of water was applied to the test population using a kitchen baster. At the end of each week length, width, and thickness of the mussels were measured using a shellfish caliper. Comparisons in the two populations total change in growth over the weeks were calculated and compared.

Results

Results of the four-week, continuous application study, showed that Magnesium Silicate Hydroxide did not have a negative effect on the growth of the Mytilus edulus, but actually increased the growth of the treated Mytilus edulus juveniles. In effect the hypothesis stating that the Talc applications would limit the growth of Mytilus edulus, was not only proven false, but the treated mussels had a 29% increase in growth compared to the control mussels.

Conclusions/Discussion

As the result of this study, it was concluded that a daily application of Magnesium silicate hydroxide does not limit the growth of Mytilus edulus, but instead promotes growth. The results show potential for the use of Talc in mitigating toxic algae blooms in areas of commercial shellfish production. Hopefully with more research, Magnesium silicate hydroxide will become a widely used mitigating agent and through its use, help to convince society of the importance of harmful algae bloom prevention.

Summary Statement

This project is the continued study of clay flocculates and their mitigation effects on the growth of local Mytilus edulus juveniles.

Help Received

Father provided literature and knowledge; used lab equipment and cage designs from Gregg Langlois at the California Department of Health Services: Phytoplankton Monitoring Program

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Bonnie Diep; Willie Phan

Project Number
S1305

Project Title
Microorganisms in Soy-Oil Based Biodiesel Fuel

Abstract

Objectives/Goals
This project is geared towards determining the types of microorganisms present in the different phases in which biodiesel assumes. The objective is to analyze the bacterial content of the different stages of biodiesel#reactants, intermediate forms, and the final products. We are looking for possible consistencies in regards to the different life forms that may be present in the chemicals.

Methods/Materials
Fungi are characterized by chitin, which forms a salt precipitate with HCl. By mixing HCl with biodiesel, we determined whether chitin was present. For qualitative observations, we inoculated fuel samples onto Petri Dishes with tryptic soy agar. To detect sulfate-reducing bacteria, we did an olfactory test for the odor of hydrogen sulfide. Petri dishes, HCl, biodiesel fuel, methanol, soy oil, filter flasks, incubator, pipets, and test tubes were utilized.

Results
In all products and reactants, excluding the soy oil and methanol, a salt precipitated, meaning chitin was present. By observation, the Petri dishes revealed relatively similar colored growth among the samples. No scent of hydrogen sulfide was detected.

Conclusions/Discussion
The reactants did not indicate the presence of fungi, but the products did, which means that they were possibly introduced after the preliminary stages of biodiesel production. There were consistent results among different batches tested. The Petri dishes showed consistent types of microorganisms in the samples, indicated by similar physical characteristics. Results from olfactory test shows that sulfate-reducing bacteria are not likely candidates for the microorganisms growing in biodiesel.

Summary Statement
We are examining the reactants and products of biodiesel for possible consistent microbial life because it can indicate when certain bacterial or fungal strains were introduced into the fuel during production.

Help Received
Mr. Winters supplied contacts and the MMTC, Del Mar Analytical donated supplies, Ms. Della Santina allowed us to conduct experiments in her room, and we collaborated with the biodiesel team.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Jennifer A. Dowdy

Project Number
S1306

Project Title
Eek! There's a Single-Celled Microorganism on My Sponge!

Abstract

Objectives/Goals
The purpose of this experiment was to determine the most effective way to kill bacteria present on a household sponge. My hypothesis was that microwaved sponges would have less bacteria compared to sponges that had been cleaned in the dishwasher.

Methods/Materials
Household sponges were used for three days to clean up in the kitchen and the bathroom. They were then cut into pieces, which were either microwaved on high for two minutes or were washed in the dishwasher. Control groups were not treated at all. The sponge samples were hydrated with bottled water, and a sample was removed from each sponge piece. The samples were diluted up to 1:1000 with bottled water, and the dilution series for each was plated on agar plates. The plates were incubated for 48 hours at room temperature, and then resulting bacterial colonies were counted, and the plates photographed.

Results
Significantly fewer bacterial colonies were present on the plated 1:1000 dilution samples for both the microwave treatments and dishwasher treatments as compared to the untreated controls. This was true for sponges used to clean both the kitchen and bathroom. In addition, my results show that the dishwasher treatment allowed the growth of slightly fewer bacterial colonies than the microwave treatment did.

Conclusions/Discussion
My data suggest that while both the mirowave and the dishwasher treatments that I used in my experiment klll bacteria, the heat and soap in the dishwasher are more effective than microwaving. Since neither of these treatments was effective in killing 100% of the bacteria on the sponge, I would recommend further experimentation using other techniques, such as boiling, use of bleach as a cleaning agent, or possibly longer microwave times. In the meantime, putting your sponges in the dishwasher regularly should help to minimize the number of bacteria present!

Summary Statement
I took samples from sponges that I had put in the dishwasher or microwave oven, and cultured them on agar plates to quantify the amount of bacteria present in each sponge.

Help Received
My father helped me in pipetting my dilution series and in photographing my plates. He also taught me how to graph my data on the computer. San Francisco State University donated the agar plates for my experiment.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Mariah R. Erlick

Project Number

S1307

Project Title

Inducing Ultraviolet Light Resistance in E. coli

Abstract

Objectives/Goals

The objective is to determine whether exposing E. coli to a short burst of ultraviolet light before a longer exposure will increase survival by triggering the production of constitutive DNA repair enzymes.

Methods/Materials

Two strains of E. coli, K-12, or wild type, and LexA3(Ind-), a strain incapable of inducing enzyme production necessary for SOS DNA repair, were split into three groups each. Each group was exposed to one of three conditions: No UV light, 30 minutes of UV light, and five minutes of UV light followed by 30 minutes of UV light. All plates were kept out of visible light to assure photoreactivation repair was not induced. Five plates of E. coli were used for each of the six conditions in five trials, for a total of 25 plates for each condition. Plate coverage was evaluated based on histograms of digital photographs.

Results

Exposing the K-12 strain to the extra five minutes of UV light increased survival by an average of 10.2% plate coverage, while exposing LexA3(Ind-) bacteria decreased survival by an average of 2.4%. The controls, with no UV exposure, grew nearly equivalently, assuring that the only difference between the strains was their ability to fix DNA damage caused by UV.

Conclusions/Discussion

There are three basic sources of DNA repair enzymes: enzymes that exist in the cell constitutively, enzymes that are triggered by exposure to visible light, and SOS repair enzymes, which are produced when the other two sources are inadequate. In this project, photoreactivation was disabled in all bacteria, while SOS repair was disabled in the LexA3(Ind-) bacteria. Constitutive production of SOS DNA repair enzymes was triggered with a shorter UV exposure prior to a longer exposure. My results are applicable in the field of water purification, as they prove that decontaminating E. coli in water is more effective with a long, single exposure than several shorter exposures.

Summary Statement

A short exposure to ultraviolet light prior to a longer exposure increases E. coli survival by triggering the production of constitutive DNA repair enzymes.

Help Received

Mary Berlyn from the Yale E. coli bank helped me obtain the LexA3(Ind-) strain. Dr. Kendric Smith elucidated my understanding of repair enzyme control in E. coli. Tim Hanna gave suggestions and helped with statistical analysis.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Hippolyte Goux

Project Number

S1308

Project Title

The Effect of Anthropogenic Atmospheric Nitrogen Deposition on Southern California Microbial Forest Flora

Abstract

Objectives/Goals

Human activities have significantly increased the amount of biologically active forms of nitrogen released into the atmosphere that fall back down to earth as nitrogen deposition. The aim of the study was to determine how anthropogenic atmospheric deposition of Nitrogen on the forest floor affects the microbial flora of a mountain forest in southern California.

Methods/Materials

To simulate the effect of nitrogen deposition, bacteria were exposed to ammonium nitrate (NH4NO3) in the laboratory. Bacteria were sampled from the soil and leaf litter of two sites on Mt. Palomar, San Diego Co. California. The bacteria were isolated into pure colonies in petri dishes and then exposed to three different levels of ammonium nitrate (NH4NO3). The first level (low) was of 2.24878 X 104 mol NH4NO3/100mL H2O. The second level (moderate) was of 2.248781 X 103 mol NH4NO3 / 100ml. The final level (high) was of 1.1243905 X 102 mol NH4NO3/100mL. For each isolate, two dishes served as controls, one was filed with 1mL of water and the other was left untouched to verify that the extra water was not affecting the results. After 24hrs., the result of the development of the bacteria was recorded by characterizing the percent of the plate covered by the colonies.

Results

Exposure of the bacteria to ammonium nitrate affected the growth percentage (the percentage of the plate covered by the colony) of bacteria. The results of the experiment supported the hypothesis that nitrogen deposition can lead to lower biodiversity of microbial flora. The bacteria could be classified into 3 categories based on their reaction to ammonium nitrate: those that became more prolific, those that were negatively affected, and those that were unaffected.

Conclusions/Discussion

The results follow the initial prediction that nitrogen deposition would alter the abundance of individual species. In a situation in the wild, one could expect that the isolates that benefited from nitrogen deposition would become more common and extirpate the species weakened by the deposition. Mt. Palomar could be exposed to the levels of nitrogen deposition tested in this study. Such exposures and changes in microbial flora could alter symbiotic relationships and lead to higher fire danger due to disruption of decomposition of fuels.

Summary Statement

The study determined how nitrogen from human sources effects the microbial communities of a mountain forest in southern California.

Help Received

I contacted Michele Eatough and Edith B. Allen, University of California department of Entomology and Botany, respectively, in the background research of my topic; they gave helpful information and comments on the topic. However, they were not involved in the development of the procedure or in the

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Sha Reese M. Granville

Project Number

S1309

Project Title

S. cerevisiae, Bioindicator of the 21st Century: How Safe Is Our Water Supply?

Abstract

Objectives/Goals

The objective of the project is to discover if S. cerevisiae can be a bio indicater to different toxins that can be found in polluted water such as ash, fire retardant or pesticides.

Methods/Materials

1. Make a soluton of 3g yeastand 1g of sugar into 150ml of distilled water-this is your control.THis is called a 1:3 solutin.
2. Make 3 solutions of pesticides in one 1:3 solution, 5g of fire reatardant in the second and dg of ash in the third.
3. Repeat steps 1 and two 4 times for repetition.
4. Take pH of each solution and find that ash, pesticides and the yeast control are acids and the fire retardant is a base.
5. Take the initial hemacytometer test to see how many per mL are alive. With the same sample make sure that you take the percentage of dead cells.
6.Repeat steps 4-5 for the next two days. Attention: DO NOT TAKE DATA AFTER THREE DAYS DUE TO AUTOLYSIS!

Results

The results show that because of the excessive amounts of live cells in the pesticides and the excessively dead cells in the fire retardant indicates that S. cerevisiae is an indicator significantly of pesticides and fire retardant. Results show that there is a chance that s. cerevisiae can be an indicator to ash but the comparison to the control is to similar.

Conclusions/Discussion

The pesticides made the S. cerevisiae grow excessively because of the high acidic leval in the solution and because of the extra traces of glucose in the ingrediants of the pesticides. The yeast can act as an indicator to fire retardant as well because of the low traces of glucose and the weight of the solution tended to suffocate the cells and they could not respirate, arobically or anerobically.The results supported my hypothesis, though the hypothesis stated that ash would be indicated by the yeast, but the results were not significantly varied from the control so the results were not reliable. The results helped me to indicate what types of toxins that the yeast is sensitive to . The next step in this study is to take water samples from the community and apply the results to the results in this study and take the results to dicipher the water quality of the local water.

Summary Statement

The experiment is exposing S. cerevisiae to ash, fire retardant and pesticides to see which toxin has the greatest affect on the life cycle of the cell.

Help Received

Dr. Melitz of UCI gave supplies, Father helped transport the equiptment, Ms. Jimenez provided supervision.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Allie I. Harrison

Project Number

S1310

Project Title

Identification of an Unknown Pathogen Causing Crown Rot in Castroville Artichokes, Cynara scolymus

Abstract

Objectives/Goals

The purpose of this project is to find the cause of crown rot disease in artichokes, Cynara scolymus, particularly in a Castroville, California field. There are many different kinds of bacteria on plants; some bacteria are pathogenic and others are nonpathogenic. Bacteria must be isolated until pure cultures are obtained and then tested for pathogenicity. The secondary goal of this project is to find a solution to manage the spread of this disease.

Methods/Materials

Following Koch#s postulates, experiments were conducted to determine the cause of soft rot disease in artichokes. 1) Disease symptoms on artichokes were described and samples taken from a production field in Castroville, California and tissue of the diseased artichokes was compared to healthy artichokes. 2) The bacteria were isolated several times, on different kinds of media, until pure cultures were obtained. Once the pure cultures were obtained, the cultures were characterized as to their properties. 3) Healthy artichokes were then injected with suspended colonies of bacteria and observed for development of the disease symptoms. 4) Finally, new cultures, taken from the infected laboratory plants, were compared with the production field plants. PCR was also conducted for further identification to the strain of bacteria.

Results

In order to obtain a pure culture of bacteria, several different tests needed to be performed: CVP (Crystal Violet Pectate) medium; Erwinia Enrichment medium; Erwinia D3 Agar; Tryptic Soy Agar, and Potato Assay. The final isolates were then suspended in a sterile solution and injected into healthy artichokes. The bacteria grown on Plate 10 caused a definitive yellowing on the leaves of the healthy artichokes.

Conclusions/Discussion

It appears that the isolated culture, an Erwinia, is a primary pathogen that has infected the Castroville artichokes. Additionally, the bacteria seems to be an opportunist one that is transfered during harvest season by the field equipment.

Summary Statement

This project was identification of an unknown pathogen that causes crown rot in Castroville artichokes, Cynara scolymus.

Help Received

Mrs. Harrison, my Biology teacher, taught me the basics of sterile laboratory technique. Dr. Carolee Bull showed me the additional tests and demonstrated how to do them. I performed all the microbiology tests myself. I also did inoculations of the healthy artichokes.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Jacqueline M. Havens

Project Number

S1311

Project Title

Isolation, Identification, and Characterization of Four Antibiotic-Resistant Soil Bacteria

Abstract

Objectives/Goals

I isolated four different strains of antibiotic resistant bacteria and wanted to isolate the plasmids to determine the nature of the acquiring antibiotic resistance.

Methods/Materials

I grow the bacteria on agar plates with Tetracycline, Kanamycin, or Amphicillin. If the bacteria grew on the plate,it is antibiotic resistant. To find if there is any multiple resistance, I grew each bacteria (12 samples from each plate) on the other two antibiotics. I purify plasmids with a Qiagen kit (which didn#t work) or with the alkaline-lysis method. I use a spectrophotometer to see how much DNA there is. I then try to transform the plasmids into competent bacteria unsuccessfully. I run the results from the alkaline lysis in gels to try to see the plasmid. Since the plasmid didn#t run far in the gels, I use restriction enzymes to cut the plasmids and re-run the gels next to uncut samples.

Results

I identified four different strains of antibiotic resistant bacteria based on types of antibiotic resistance: amp, tet/amp, kan, and kan/amp.

Conclusions/Discussion

It is unclear how these bacteria acquired antibiotic resistance. Once I have isolated the plasmid as a source of antibiotic resistance, I plan to sequence the plasmid to see if the genes carried are natural or synthetic when compared to genetically engineered agriculture.

Summary Statement

I have found bacteria with antibiotic resistance and trying to determine how they got it.

Help Received

Used lab equipment at UCI under the supervision of Dr. Gardiner.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Ken Leonard M. Lozano

Project Number

S1312

Project Title

Antibiotic Like Effects of Garlic, Onion, and Ginger against Bacillus cereus

Abstract

Objectives/Goals

The purpose of this project was to determine to what extent alcohol extracts of spices like garlic, onion, and ginger exhibit antibiotic-like effects on the growth of Bacillus cereus, a common agent of food poisoning.

Methods/Materials

The materials used are garlic, onions, ginger, Bacillus cereus, Ampicillin, Erythromycin, Neomycin, isopropyl alcohol, distilled water, nutrient agar, balance, modified incubator, thermometer, alcohol lamp, microwave oven, stove, test tubes, watch glass, graduated cylinders, Petri dishes, pipettes, beakers, test tube rack, filter paper, 1-hole puncher, forceps, chopping board, knife, mortar and pestle. The major steps are Preparation of spice extracts; Preparation of agar plates; Preparation of spice and antibiotic discs; Inoculation with Bacillus cereus; Placement of discs on plates; Incubation of plates at 37 C for 24 hours; and Visual analysis and measurement of zone of inhibition. Two experimental batches of three trials each were conducted using the spice extracts and antibiotic discs as variables with alcohol discs as control for a total of 24 plates. The average and the range of values were computed. Mode analysis was done with the measurements of all the plates containing spice extracts.

Results

The results of the trials showed that among the spice extracts, garlic had the widest range (0-32 mm) and highest average (5.6 mm), then ginger (0-28 mm; 3.7 mm), and onion (0-10 mm; 1.2 mm). For the antibiotics, Erythromycin had the highest average of 13.4 mm, Neomycin 9.1 mm, and Ampicillin 1.4 mm. Mode analysis of 24 spice extract plates showed 17 plates of garlic had a zone of inhibition of 1-30 mm while ginger had 15 plates, and onion 11 plates. Mean analysis of the spice extracts and antibiotic relative to control plates (average: 1.8 mm) showed that garlic and ginger results were higher than the control, while Erythromycin and Neomycin results were also higher than the control.

Conclusions/Discussion

The alcohol extracts of the spices garlic, ginger, and onion do exhibit noticeable antibiotic-like effects on the growth of Bacillus cereus. However, the effects were less than Erythromycin, an antibiotic specifically produced for gram positive bacteria like B. cereus. As an application, garlic, ginger, and onion can be used not only to enhance the flavor and aroma of food, but also to help retard the spoilage of foods like cooked meat and vegetables.

Summary Statement

This project deals with the determination of antibiotic-like effects of garlic, onion, and ginger against Bacillus cereus.

Help Received

Mrs. Ruth M. Villareal, a retired chemist/plant pathologist for project planning advice, Mr. Leonardo C.P. Lozano for helping me put together the wood stands, and Mrs. Joji M. Lozano for guiding me through all the steps of making a science project.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Jamie E. Mellert

Project Number

S1313

Project Title

Assessment of Enteric Oral Flora of Dogs

Abstract

Objectives/Goals

The objective is to determine the types of bacteria in dog's mouths.

Methods/Materials

Ten dogs that had similar habits were selected from my neighborhood. Once permission was obtained, the dogs were swabbed with a BBL Culture Swab Plus through two phases. The swabs were then transferred onto different agars using the streak-plate method. For every dog, there were a total of seven Perti dishes. The agars used in phase one were Triptic Soy, Nutrient, and MaConkey#s Agar. In phase two, Blood Agar, Triptic soy, Eosin Methylene Blue (EMB), and Manatal Salt Agar were used. The Petri dishes were incubated for three days at thirty-seven degrees Celsius. Results were then noted.

Results

On the EMB agar alone, an average of four colonies of E. coli were present. Sixty percent of the dishes showed E. coli growth. Two mold or fungi colonies were present on the Triptic Soy agar and streptococcus was on eighty percent of the Blood agar dishes.

Conclusions/Discussion

The purpose of my project was to attract people#s attention to the fact that potentially dangerous bacteria could be transferred from dog#s mouths to the humans through the common bonding of owner and pet. Some of these bacterium can cause diseases and can create problems such as fatal bloody diarrhea, abdominal cramps, chills, cyanosis, cardiac infections, kidney infections, infected joints, brain abscesses, and death. I hope that this research report will encourage people to wash their hands after dealing with dogs and not let dogs lick them in the mouth.

Summary Statement

My project analized the bacteria from dog's mouths and found that pathogenic bacteria were found in sixty percent of dog's in the study.

Help Received

Neighbors allowed me to study their dogs; family allowed me to turn a portion of the garage into a labratory; i borrowed a camera from my father.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Carynn M. Milne

Project Number

S1314

Project Title

What Inspired Alfred Hitchcock? Toxic Phytoplankton Monitoring

Abstract

Objectives/Goals

To monitor the populations of marine phytoplankton (especially Psuedo-nitzschia, Alexandrium, and Dinophysis) in the Santa Cruz Harbor and watch what affects their fluctuations over the course of two collecting seasons and see what trends arise. Because equipment efficient enough to monitor oceanic weather patterns is unavailable along with records of terrestrial weather patterns, salinity, turbidity, and temperature are the only factors that will be effectively monitored.

Methods/Materials

A sample is taken at the Santa Cruz harbor using a 20 micron netand then bottled and perserved with an iodine solution. Recording data in the lab book such as weather and other qualitative observations, temperature (taken with a thermometer), salinity (taken with a refractometer), and turbidity (taken with a secchi disk). Once in the lab, 2ml or so of the sample is put into a petri disk, used as a slide, and then is looked at under a microscope where relative abundance is recorded into the notebook along with scientific illustrations of the specimens.

Results

In conclusion, I was unable to prove that salinity, turbidity, and temperature had any relation to the populations of these toxic phytoplankton in the past two years.

In the previous year there were three harmful blooms recorded. These blooms mainly consisted of Psuedo-nitzschia and occasionally Dinophysis. Alexandrium was never specified as being found in the Santa Cruz Harbor. This current year resulted in a bloom of Dinophysis in the early fall which was not expected because the event did not correlate with the previous year. From October 2003 to the present no harmful blooms of Psuedo-nitzschia have been found, only a single larger bloom of Dinophysis and some appearances of both. Once again, Alexandrium was never considered found.

Conclusions/Discussion

Compared to the previous year in general, the appearances of the three plankton were relatively similar. I was unable to pinpoint that storms or dredging in the harbor had an influence because there was never any apparent pattern.

Summary Statement

Monitoring what effects three toxic species of phytoplankton in the Santa Cruz Harbor

Help Received

April Milne (transportation) Jane Orbuch (Mentor, instructor) Gregg Langlois (Mentor) Susan Coale (Mentor) Lea Bond (Former Partner)

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Oanh K. Nguyen

Project Number

S1315

Project Title

Varying Concentrations of Bilobol and Cardanol

Abstract

Objectives/Goals

The purpose of my experiment was to test which acid, bilobol or cardanol, in the epidermis of the Ginkgo biloba seed contributes most to the inhibition of Mycobacterium smegmatis' growth rate. My hypothesis was that both the bilobol and cardanol will have an effect on the growth rate of M. smegmatis and that the stronger the concentration the more it will inhibits. Furthermore, the bilobol will be the most effective out of the two.

Methods/Materials

I created the 0.5mg/mL, 0.05mg/mL, 0.005mg/mL, and 0.0005mg/mL from a serial dilution of 5mg of bilobol, and the 0.1mg/mL, 0.01mg/mL, 0.001mg/mL, and 0.0001mg/mL from a serial dilution of 1mg of cardanol. I pour 15 plates of each dilutions, resulting in 120 plates, and 50 plates for control of nutrient agar, for a total of 170 plates. I placed the colony of Mycobacterium smegmatis on each of the 170 plates, then incubate them at 27 degrees C. I let the plates establish the growth bacteria and measure their subsequential growth. I record my data in a series of 7 days for four weeks.

Results

The results of the experiment show that the 0.5mg/mL of bilobol and 0.1mg/mL of cardanol inhibit the most M. smegmatis from their respective series. The control average growth rate over four weeks was 4.22mm, while the 0.5mg/mL bilobol was 2.68mm and 0.1mg/mL cardanol was 2.31mm. The two weakest dilutions from each series (bilobol: 0.005mg/mL, 0.0005mg/mL, cardanol: 0.001mg/mL, 0.0001mg/mL) show no sign of inhibition the first week, but after the second week they were all more effective than the control.

Conclusions/Discussion

The results of my experiment only support my hypothesis partially. It was true that both the bilobol and cardanol had an effect on M. smegmatis, and the higher the amount of concentration, the lower the bacterial growth rate. However, cardanol proved to be more effective than bilobol when inhibiting M. smegmatis. There is a difference in the amount of acid in the dilution to begin with, therefore if both acid were to be compare on the same scale, there would be a significant difference of inhibition between cardanol and bilobol. Further research is needed to determine at which dilution combinations between these acids would be most effective in inhibiting M. smegmatis without overdoing it. Further studies in this subject would be able to prove if the chemicals in the ginkgolic seed coat would be effective on human tuberculosis.

Summary Statement

This study determined the effects of various bilobol and cardanol dilutions upon Mycobacterium smegmatis.

Help Received

Used lab equipment at Fresno State University under the supervision of Dr. Wright

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Laila M. Nikaien

Project Number

S1316

Project Title

The Effect of Ultraviolet Light on Yeast Colonies

Abstract

Objectives/Goals

The initial purpose of this experiment was to develop a strain of yeast immune to ultraviolet (UV) light, by means of continuous exposure of the yeast to UV light. This objective couldn#t be fulfilled because the period of time in which 99.9% of the yeast would be killed under the UV light couldn#t be determined. As a result, the objective altered to determine the length of time in which 100% of the yeast would be killed under the UV light.

Methods/Materials

Active Dry Baker#s yeast was #waken up# from its dormant stage by adding it to three ounces of warm water containing two tablespoons of sugar. A cotton swab was dipped into this solution and used to make a smear onto an agar plate. This plate was placed into a 33.6˚C incubator for 36 hrs. A sample of this yeast culture was taken and diluted using 50 ml of distilled water. A cotton swab was dipped into this dilution and used to make a single smear onto each agar plate being put under the UV light for the different lengths of time, ranging from 20 mins. to 10 hrs. Similarly, a control plate was prepared that wasn#t exposed to UV light. Each agar plate was placed under the UV light for its specified period of time. Then, all the agar plates including the control were placed into the 33.6˚C incubator for an average of 16 hrs.

Results

Based on the experiments conducted, the number of yeast colonies was noticeably reduced due to exposure to UV light. The correlation between the lengths of time the yeast was under the UV light and the resulting colony growth was shown by numerically ranking the agar plates. The highest rank is the plate with the greatest number of yeast colonies and therefore, the lowest rank is the plate with the least number of yeast colonies. The control has a ranking of 8, and the agar plate exposed to UV light for 10 hrs. has a ranking of 1. This indicates that as the number of hrs. in which the yeast was under the UV light increases, the number of the yeast colonies decreases.

Conclusions/Discussion

Overall, this experiment has revealed that yeast cells can endure the abusing effects of UV light for up to 10 hrs. Since 100% of the yeast cells couldn#t be destroyed, a strain of UV-immune yeast couldn#t be formed. During this experiment, it became apparent that UV light has a significant effect in decreasing the yeast colonies.

Summary Statement

The initial purpose of this experiment was to develop a strain of yeast immune to ultraviolet light; therefore, the objective altered to determine the length of time in which 100% of the yeast would be killed under the UV light.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Cecilia T. Ong

Project Number

S1317

Project Title

The Use of Potassium Release Electrodes to Detect Bacterial Cell Death

Abstract

Objectives/Goals

To determine effectiveness of antimicrobial peptide using potassium release during bacterial cell death. Two peptide conformations tested at different concentrations in varying salt levels.

Methods/Materials

synthesis machine
resin, residues
speed vac
HPLC
MALDI machine
MRSA bateria
trypticase
tris-acetate
salt bridge
potassium electrode

1) Add residues to resin per sequence of native form. Add cleavage mixture, filter, speedvac
2) Run peptides through HPLC
3) Confirm identity by MALDI analysis
4) Protein quantification using BCA
5) Potassium release-
   a) incubate MRSA in trypticase overnight
   b) wash and resuspend in 10 mM tris-acetate buffer with 100 mM NaCl
   c) set up salt bridge, potassium electrode
   d) wash electrode with distilled water, detergent
   e) calibrate electrode
   f) add bacteria and peptide to chamber, measure voltage with computer.

Results

The SAP29 (native conformation) peptide had better results than synthetic "hi-hi" form. Both worked better in low salt. Native peptide conformation also proved more potent than the synthetic, because at a lower concentration, causing more potassium release than the synthetic at a higher concentration.

Conclusions/Discussion

Summary Statement

My project tests the effects of protein conformation, protein concentration, and salt concentration in the environment on the lysing of the bacterial cell membrane; bacterial cell death was measured using a potassium release electrode.

Help Received

My parents drove me to the Host Defense Lab in UCLA, where I worked under the guidance and supervsion of Tung Nguyen.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Su F. Ong

Project Number

S1318

Project Title

Effects of Phosphate on the Biological Processes of Trichodesmium: Links to Reducing Global Warming

Abstract

Objectives/Goals

Marine cyanobacteria Trichodesmium are unusual in their ability to convert atmospheric nitrogen (N2) into ammonium (nitrogen fixation) and are responsible for the majority of the nitrogen supply in the open oceans. In exploiting this ability, the use of the oceans as a carbon dioxide sink can be maximized, helping to alleviate global warming. This research focused on the role of phosphate in the biological processes of Trichodesmium. It is postulated that Trichodesmium has the ability to hydrolyze inorganic molecules to obtain an additional source of phosphate, known as alkaline phosphatase activity (APA). The experiment also analyzed the relationship between the amount of phosphate available and Trichodesmium's nitrogen fixation rates.

Methods/Materials

In determining APA responses, Trichodesmium were cultured under 6 phosphate concentrations (0.1uM - 50uM). 3 mL samples were pipetted into a vial. 10 uL of 100 uM MUF-P and 1 mL of 50 mM borate buffer were added. When MUF-P is hydrolyzed, the remaining MUF molecule fluoresces. The fluorescence of the vials (and therefore the consumption rates) were measured at 30-minute intervals.
In nitrogen fixation rates, the use of the acetylene reduction procedure was implemented. This process uses acetylene as a substitute for nitrogen. 10 mL samples from the 6 cultures were pipetted into a gas tight vial and 1.5 mL of acetylene gas was added. Samples were placed in an incubator and after 2 hours, the amount of ethylene gas present (nitrogenase "fixes" actylene into ethylene) was measured using a GC. Nitrogen to acetylene fixation is a 4:1 ratio.

Results

Average MUF-P consumption rates were at 0.213 pmol/trichome/hr at 0.1 uM phosphate levels, 0.076 at 1 uM, 0.032 at 2.5 uM, 0.005 at 5 uM, 0.002 at 10 uM, and 0.001 at 50 uM.
Average nitrogen fixation rates were at .567 pmol/trichome/hr at 0.1 uM phosphate levels, 3.571 at 1 uM, 4.286 at 2.5 uM, 5.355 at 5 uM, 5.684 at 10 uM, and 6.078 at the 50 uM.

Conclusions/Discussion

An inverse relationship between phosphate concentrations and the amount of MUF-P hydrolyzed was found, confirming the theory that Trichodesmium can provide itself with additional phosphate if needed. A direct relationship between phosphate concentrations and nitrogen fixation rates was also found, verifying the role of phosphate as a limiting nutrient.

Summary Statement

This project explores the effects of phosphate on the biological processes of Trichodesmium and Trichodesmium's role in reducing global warming

Help Received

Used equipment at the University of Southern California under the supervision and guidance of Jill Sohm and Dr. Douglas Capone.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Rachel L. Phillips

Project Number

S1319

Project Title

Let's Blow Up Balloons with Culture: A study of Saccharomyces cerevisiae under Different Environmental Conditions

Abstract

Objectives/Goals

The purpose of this experiment was to examine yeast colonies under different storage and environmental conditions to see when they produce the most live and active cultures.
It was thought that the control would exhibit the most activity. Next would be the orange juice mixture followed by the mixture with salt. After those would be the frozen yeast mixture and the mixture subjected to UV rays was thought to produce the least amount of cultures.

Methods/Materials

When yeast and sugar are combined they go through the process of alcoholic fermentation. One of the products of alcoholic fermentation is CO(2), now, because CO(2) is invisible, the balloons are placed on the outlet of the bottles to catch the CO(2) and are therefore blown up according to the amount of CO(2) that is produced. The amount of active cultures present is relative to the amount CO(2) present which also is relative to the circumference of the balloon. Because of this process the following method will show how many cultures are produced.
Three sugar cubes were dissolved into a cup of warm liquid, which was water in most cases. It was then funneled into a one-liter bottle. A one-quarter ounce packet of baker#s yeast was added to the mixture and shaken around. The bottles were then capped with a 9-inch round party balloon. Every fifteen minutes the circumferences of the balloons were measured with a cloth measuring tape.

Results

The results of this experiment suggest that sugar is the main factor involved in production of healthy yeast cultures. The orange juice produced the most cultures (average ending circumference: 48.7 cm), followed by the UV rays (40.7 cm). Next were the control (38.1 cm) and freezer mixtures (37.8 cm) and the culture that produced the least amount of cultures was the salt mixture 28.1 cm).

Conclusions/Discussion

It seems as if sugar is a great way to stimulate yeast culture growth. Storing yeast in the freezer is good for the yeast too, so that the cultures do not activate before it is necessary. UV ray exposure is a stimulant as well, but a UV lamp is not a common tool lying around. Salt is definitely not a good thing for the production of active cultures. Therefore, one should store their yeast in the freezer, and whenever possible, use sugar in conjunction with Saccharomyces cerevisiae.

Summary Statement

This experiment is about seeing under what environmental and storage conditions yeast colonies produce the most live and active cultures using balloons and other common household items.

Help Received

none

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Rachelle N. Selbicky

Project Number

S1320

Project Title

Variations in Phytoplankton and Zooplankton Abundance between Three Sampling Sites

Abstract

Objectives/Goals

My objective was to learn if plankton was evenly distributed throughout the Monterey Bay. My hypothesis was that plankton would not be distributed evenly throughout the bay because many factors affect the amount of plankton that can be found in an area. These factors include weather conditions, the environment, and physical characteristics of an area.

Methods/Materials

For my project, I measured the amount of plankton that was found from three locations in the Monterey Bay, which were the Coast Guard Pier, the one-mile buoy, and Point Pinos. To do this, I went out in my dad's fishing boat on five different dates and collected plankton. I placed a plankton net in the water behing my dad's boat and then we trolled around the location for four minutes. I then observed, analyzed, and compared the plankton from the three locations. I was able to calculate the number of plankton at each location by counting the number of plankton specimens on ten different slides under a microscope. I also identified the different species that could be found at each location.

Results

I found that the Coast Guard Pier had the most plankton, the one-mile buoy had the second highest amount of plankton, and Point Pinos had the least amount of plankton. I also found out that phytoplankton is more abundant than zooplankton in these three locations. Diatoms, Dinoflagellates, and copepods were the most common specimens found.

Conclusions/Discussion

In my conclusion, my hypothesis proved to be correct. Plankton is not distributed evenly throughout the Monterey Bay. Each location had a different number of plankton because each location was subject to different weather conditions and their environments were slightly different. The most protected location had the most plankton, the second most protected location had the second highest amount of plankton, and the least protected location had the lowest amount of plankton. The locations that are not as protected are more susceptible to winds, waves, currents, and swells and these factors affect and lessen the amount of plankton that will be found.

Summary Statement

The purpose of my project was to gather and analyze the species abundance and diversity of plankton in the Monterey Bay.

Help Received

Father drove fishing boat;Borrowed plankton net from my biology teacher Ms. Elder, Interviewed Jeff Fields, a Marine Biologist; and used Notre Dame High School's microscope.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Kaleigh E. Solow

Project Number

S1321

Project Title

The Bacteriological Study of Bacteria from Public Restrooms Transferred onto Hands

Abstract

Objectives/Goals

The purpose of his experiment was to determine if people leave public restrooms with more bacteria on their hands then when they entered.

Methods/Materials

To carry out the experiment, ten people were tested and each person represented one trial. Each person#s hand was swabbed before entering the restroom, and (with a new sterile swab) after leaving the restroom. The sterile swabs, now contaminated, were plated in two different methods to ensure accuracy. One swab was plated directly, and the other swab remained in a sterile broth for three hours and was then plated. Also tested were eight independent areas in the restroom: the outside door handle, the inside door handle, the light switch, the towel dispenser, the toilet seat, the soap dispenser, the flush handle, and the toilet paper dispenser.

Results

The results of the experiment indicated that the original hypothesis, which stated that people would leave the public restroom with more bacteria on their hand, was correct. The final conclusion was determined by calculating the average number of bacteria grown in the before and after trial of each method used. Furthermore, the toilet seat and paper towel dispenser were the most contaminated areas of the restroom.

Conclusions/Discussion

Overall it can be concluded that the restroom is indeed a frightening place filled with transferable bacteria from the thousands of others who have #relieved# themselves in the same exact place. Observe good sanitary practices while in the restroom because most likely you will #pick up# bacteria left by another person. Although the bacteria may not be harmful, it very likely could be harmful bacteria that could cause disease.

Summary Statement

The purpose of his experiment was to determine if people leave public restrooms with more bacteria on their hands then when they entered.

Help Received

used lab equipment at University of California Irvine under the supervision of Dr. H. Beismann

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Nicole A. Sousa

Project Number

S1322

Project Title

Commensal E. coli Mutants, Biotypes, and You

Abstract

Objectives/Goals

The purpose of this project is to look at the normal human flora of the intestine for multiple E. coli strains and mutant strains in order to warn doctors of mutant strains residing within the human intestine, indicating a growing trend of antibiotic resistance.

My hypothesis is that if genetic variation and mutations are the cause of different strains, then multiple strains of E. coli and mutant strains will be found, along with new strains over a period of time, within my intestine.

Methods/Materials

In conducting this experiment, a variety of techniques associated with isolating certain microscopic organisms were used. Also used was a variety of tests to confirm that the isolated organism was that of E. coli. This included a TSI, MRVP, Simmons Citrate, MUG/Indole Test, Oxidase test, Urease test, MIO, and an api20E test. All samples were proven to be E. coli

Results

In conducting this experiment, three different strains of E. coli were found residing within my intestine, and also isolated were two samples that are a mutant strain of E. coli resistant to four different antibiotics. Of the three strains found, two were found in the first trial of E. coli biotyping, and a third one was identified in the second trial of E. coli biotyping.

Conclusions/Discussion

In conclusion, these results support my hypothesis, and are a warning to doctors that when a patient is infected with an E. coli-related disease, an antibiogram should be done to ensure that the dispensed antibiotic will be effective against eliminating the infection, ultimately diminishing the chance of complications.

Summary Statement

The purpose of this project is to look at the normal human flora of the intestine for multiple E. coli strains and mutant strains in order to warn doctors of mutant strains residing within the human intestine.

Help Received

Used lab equiptment at San Jose State University; I was supervised in lab by undergraduates Sherry Li and Cheryl D'Souza; Dr. Murray and Darcy Levee of San Jose State University and Belinda Schmahl of Schmahl Science Workshop advised me on certain techniques and issues

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

David V. Thai

Project Number

S1323

Project Title

Bioactive Compounds in Marine Bacteria

Abstract

Objectives/Goals

Marine bacteria sustain life in conditions that may be detrimental to humans. This project was designed to find marine bacteria with bioactive compounds that could be beneficial for human health. It was hypothesized that at least one set of marine bacteria taken from various seemingly extreme conditions at the Golden Gate Ocean Beach would exhibit signs of beneficial bioactive compounds.

Methods/Materials

Marine samples were collected, cultured, isolated with gram-staining, and cultured again. The samples were pelleted and then sonicated/frozen to burst the cells, releasing bioactive compounds. Microbial assays were run against yeast/Ecoli bacteria to test for zones of inhibition.

Results

The first trial displayed zones of inhibition for all marine bacterial samples, but it would be disproved by further experimentation. Additional testing led to the conclusion that the collected samples (Cliff Mussels, Water Mussels, Ocean Water, Green Algae, and Brown Algae) did not exhibit any signs of beneficial bioactive compounds that would inhibit the growth of yeast/Ecoli bacteria.

Conclusions/Discussion

The marine bacteria samples collected from the Golden Gate Ocean Beach are not bioactive against yeast and Ecoli bacteria. Since the bacterial samples were grown in a 3.3% Instant Ocean marine broth and the pelleting process was skipped, high concentrations of salt remained in the supernatant after sonicating/freezing the tube. Thus, when each disc was dipped and tested against Ecoli/yeast, kill zones resulted due to the salt. Further experimentation showed no kill zones, indicating that the samples do not possess the desired bioactive compounds that may inhibit growth of yeast and Ecoli.
If this project were to be extended, more marine samples would be collected and tested. Samples would be taken at more extreme environments.

Summary Statement

This project was designed to find marine bacteria with bioactive compounds that could be beneficial for human health.

Help Received

Mark Okuda helped supervise project at Silver Creek high school.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Ariane C. Tom

Project Number

S1324

Project Title

Plant Immunology: Do Bacteria on the Surface of Leaves Protect Them from Fungi?

Abstract

Objectives/Goals

To examine the bacteria and fungus growing on leaves and test whether or not bacteria can protect them. My hypothesis is that if there are bacteria that protect humans from infection through pores on their skin, then there must also be bacteria that play the same role on the surface of plant leaves. It is supported with the fact that species of bacteria have been found on both the openings of human skin and the surface of plant leaves. It is possible that these bacteria protect us from skin infections and must also protect plants.

Methods/Materials

Two related experiments were conducted. In Experiment 1, I compared the bacterial and fungal growth in natural and sterilized conditions on both the outside and inside of leaves. It was divided into 2 Cultures and 2 groups: A and B. Group A leaves were left in a natural condition while group B leaves were sterilized and rinsed with distilled water. I assumed that this sterilization process decreased the surface bacteria and fungus. Culture 1 was of the outside and Culture 2 was of the inside of the leaves. In Experiment 2, I isolated the microbes separately in Petri dishes and determined if the various bacteria found on leaves in Experiment 1 had an effect on the growth of the fungi found.

Petri dishes, sterile cotton swabs, Chicken bouillon cubes, and Knox gelatin, 200 leaves

Results

All leaves showed much higher bacteria to fungi ratios on the inside of the leaves than outside. The fungal growth rate was slowed dramatically in Culture 2. One particular species of bacteria (B3) is interesting because of its highly exterminating effect on fungus and other bacteria. This bacteria destroyed/liquefied the agar and may have excreted a chemical to do so. I assume that this chemical is used in the plant to protect it because it retarded fungal growth.

Conclusions/Discussion

The results showed that bacteria on the inside of leaves retarded the growth of fungus on the inside of the leaf. The results for only one plant were consistent with my hypothesis that bacteria on the outside of the leaf protected the inside of the leaf because after bleaching, there was a larger population of fungus inside than outside.

Summary Statement

My project shows that there are bacteria either outside or inside the leaves that protect the inside layers from fungi.

Help Received

My father helped me place the tags on tested leaves.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Jennifer C. Wang

Project Number

S1326

Project Title

The Effect of a Calcium Solution on an Aquatic Plant's Ability to Withstand Acid Rain

Abstract

Objectives/Goals

My objective was to see whether a soluble calcium compound impacted Ulva's ability to withstand acid rain.

Methods/Materials

I had three tanks, 1.5 gallons each. All three tanks had salt water make-up and were at 25 degrees celcius. The pH of the control was kept at 8.2, and the experimental tanks both had a pH of 5.0. This was to simulate the effects of acid rain on aquatic marine ecosystems. A soluble calcium solution that does not change the pH of the water was added to one of the experimental tanks. The experiment ran for 24 hours per trail, with three trials.

Results

I was successful in finding that a soluble calcium solution does indeed increase the chances of survival for an aquatic algae living in natural acidic conditions. The control showed no signs of change for all three trials, which means that the ulva was healthy and changed only due to the decreased pH. The experimental algae that recieved the calcium solution was significantly healthier than the algae that did not recieve the calcium. The algae lacking the calcium solution was brittle, discolored, and showed signs of depletion.

Conclusions/Discussion

The depletion that the experimental algae experienced was due to the decreased pH. The other algae that recieved the calcium solution was almost as healthy as the control. Both experimental algaes were kept at a very low pH of 5.0, the recorded standard pH of severe acid rain. The pH was kept at this low level to simulate the long term effects of acid rain.

Summary Statement

My project studies the effects of a soluble calcium solution on Ulva's ability to withstand an acidic environment due to acid rain.

Help Received

Long Beach Aquarium of the Pacific allowed me to use their facilities, tanks, and salt water make-up; Science advisor gave me tips on making a great presentation and display board; Cabrillo Marine Aquarium allowed me to use their healty Ulva.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Melissa A. Ward

Project Number

S1327

Project Title

Identifying and Treating Bovine Mastitis

Abstract

Objectives/Goals

I grew bovine mastitis bacteria on trypic soy agar. I put the bacteria on slides and identified them. I used nine different antibiotics and tried to see which one worked the best. The majority of the bacteria were gram-negative, and rod-shaped, and some were in coccus. Nuflox antibiotic prevented and stopped the growth of the baacteria.

Methods/Materials

I used fifty petri-dishes with trypic soy agar, one-hundred sterile individually wrapped cotton swabs, five ounces of bovine mastitis milk, sterile jar, permanent marker, table, sterile slides, microscope, 5cc of different antibiotics, stickers, and stains, optical lens paper, alcohol, camera, plastic gloves, and a tablecloth.

I dipped one cotton swab in the milk and plated each petri dish. I took six petri dishes to school to try and identify the bacteria. I used the gram stain. I lightly smeared the bacteria on the center of a clean, blank microscope slide. I allowed the smear to air dry for about three minutes. After the smears had dried, I covered them with several drops of a crystal violet solution and I let it stand for one minute. I carefully rinsed the slide in tap water. I applied Gram's Iodine Stain for one minute. I held the slide over the sink and allowed the acetone/alcohol solution to flow across the stained area until no more stain was coming off of the slide. I counterstained the bacteria with safranin for fifteen seconds. I carefully rinsed it with tap water. I dried the slide with optical lens paper. I looked at the bacteria under a microscope.

I then placed two drops of the different antibiotics on two spots on the petri dishes. For every five petri dishes that I plated with the milk and the the antibiotic, I put a labeling sticker on.

Results

The Nuflox antibiotic worked the best. My control were the petri dishes #46-#50. The most dominant bacteria were the beige ones. They were smaller and mostly gram-negative which meant that they were e.coli. The next were the orange bacteria which had both. The yellow had mostly gram postive which meant that they where either streptococcus or staphylococcus.

Conclusions/Discussion

My hypothesis was refuted because the penicillin did not work the best. This is because some bacteria build up immunity against Penicillin by producing penicillinase.

I could have let too much of the bacteria in the air in the petri dishes when I was plating them.

Summary Statement

My project is how to treat and identify bovine mastitis bacteria.

Help Received

used lab equipment at Notre Dame High School, Mr. Rob and Ms. Elder helped with any questions I had, Robbie Gilory gave me the antibiotics.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Alexander N. Zere

Project Number
S1328

Project Title
The Effectiveness of Antibacterial Agents on Different Types of Bacteria

Abstract

Objectives/Goals
The effect an antibacterial agent will have on limiting the reproduction of bacteria, will differ heavily, depending on what bacteria it is being introduced to. Of the three antibacterial agents used, Lysol disinfectant and spray was the most effective in limiting the reproduction of bacteria, with the exception of Escherichia coli, which proved to be immune to all antibacterial agents. Also Windex window cleaner seemed to be the least effective in limiting the reproduction of bacteria, and Listerine mouth wash fell in between the other two antibacterial agents. E. coli proved to be the strongest of the bacteria, having no zone of inhibition for Windex, Listerine, and Lysol.

Methods/Materials
Bacteria. The bacteria used were; Escherichia coli, Pseudomonas fluorescens, and Staphylococcus epidermidis. Escherichia coli was packaged in a broth solution, while Pseudomonas fluorescens and Staphylococcus epidermidis were both packaged in an agar treatment. All three were incubated at 37 degrees Celsius.Antibacterial Agents. Lysol disinfectant and spray, Windex window cleaner, and Listerine mouthwash.To begin experiment one liter of broth is prepared and 3 ways, using a sterile loop, then the incubated bacteria is introduced to broth. These are also to remain at the recommended temperature (above), for 24 hours. After agar has been prepared and cooled, all of the four broth solutions are ready to be plated in agar. Each will be plated twelve times (The bacteria will have four plates for each antibacterial agent, while the control will not be treated). Every plate will be introduced to (.5 ml) of bacteria, and the control plates will be introduced to (.5ml) of a broth solution. After plating you introduce micropore disks (approximately 1 inch in diameter), that have been presoaked in antibacterial agents. Every bacteria will have four plated that are introduced to all three antibacterial agents. All plates are to be sealed shut, and incubated at recommended temp (above) for 24 hours. Observation. The plates are recorded on a grid system in which (1sq. unit) is equivalent to (.25sq. cm.)

Results
Some antibacterials were not as effective as they had claimed. E. coli, was untreatable.

Conclusions/Discussion
Many problems can arise with this experiment some of which, and the biggest one as well, is sterility. Key in a thorough experiment.

Summary Statement
Contrasting several antibacterial agents, on different types of bacteria.

Help Received