CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Ariej B. Alkowni

Project Number
J1501

Project Title
Would You Like Some Bacteria with That? Which Area in a Restaurant Contains the Most Bacteria?

Abstract

Objectives/Goals
The project "Would you like Some Bacteria with That?", was developed by testing a whole restaurant to see which area contains the most bacteria.The main goal of this project is to make restaurants better for their customers' health.

Methods/Materials
1. Gloves
2. Cotton swabs
3. TSA plates
4. Incubator
5. Tape
6. Refrigerator
7. Local restaurant

Results
Several areas of the restaurant were tested for bacteria. Among the category of doors, the main door had the most bacteria. After that came the inside bathroom handle, then the outside bathroom handle. In the second procedures of tables and chairs, the table chair had the most bacteria, followed by the table surface, and then the high chair. Of the dishes and utensils in the third procedure, the teacups had the most bacteria. Then came the plates, bowls, eating utensils, and the drinking glass. For the fourth procedure which tested random accessories, it was found that the most bacteria was on the pepper shaker, followed by the menu, salt shaker, soy sauce bottle, and lastly the signature pen. In the bathroom, the last area tested, the toilet seat had the most bacteria. This was followed by the faucet handle, toilet flusher, and then the soap dispenser.

Out of all these areas combined, the the toilet seat had the most bacteria overall.

Conclusions/Discussion
The hypothesis that in a restaurant, the high chair and then the toilet seat will have the most bacteria was proven incorrect. In the end, the toilet seat, then a regular chair contained the most bacteria. Therefore, restaurant owners should pay extra attention to cleaning these areas. They could have more shifts for cleaning the bathrooms and have employees wipe the table chairs with disinfecting wipes after each customer.

Summary Statement
The project "Would you like Some Bacteria with That?", was developed by testing a whole restaurant to see which area contains the most bacteria. The main goal of this project is to make restaurants better for their customers' health.

Help Received
Sister took me to the restaurant for the bacteria samples; Used local restaurant for bacteria samples; Used lab equipment at school under the supervision of Mrs. Arwa Alkhawaja.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Shreya Banerjee

Project Number
J1502

Project Title
Hand Hygiene

Abstract

Objectives/Goals
The purpose of my project was to find which brand of hand soap/sanitizer will kill the most bacteria. My hypothesis was that Dial soap would be the best and Bath & Body Works hand sanitizer would be the worst.

Methods/Materials
First, I created a culture medium for bacterial growth. From a commonly touched surface around the office, I transferred the possible bacteria to the culture medium using my fingertips. I repeated the process, but before inoculation, I clean my hands with either hand sanitizer or hand soap. Then, I observed bacterial growth for five days. I did not touch the culture medium during this period.

Results
The sample where the most bacteria grew was the Up & Up Hand Sanitizer and the sample where the least bacteria grew was Dial Soap. The hand soaps were generally better than the hand sanitizers.

Conclusions/Discussion
The hand soaps were generally better than the hand sanitizers.Dial brand handsoap was the best of all the tested brands. Hand washing with soap is extremely important in preventing the spread of disease. If soap is not available use hand sanitizer.

Summary Statement
I tested different hand soaps and hand sanitizers to determine which one was the most effective in killing bacteria and therefore protecting health.

Help Received
My parents helped me by editing my work, and Dr. Anupom Ganguli was the qualified scientist who supervised the project.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Amanda F. Cohn

Project Number
J1503

Project Title
At What Distance Will an Amoeboid Choose to Ignore a Healthy Food Option over a Close Food Option, When Starved?

Abstract

Objectives/Goals
The objective of my project is to deduce whether an Amoeboid organism will consume the healthiest food option for itself, and potentially starve, or choose to consume the closest food option, even if it's health benefits are much less.

Methods/Materials
Balsa wood and hot glue were used to create eight different maze structures with columns measuring different lengths. Oats were placed on the right side of the maze while sugar was placed at the left. Physarum Polycephalum were cultured in Petri dishes with non-nutriented agar, and then placed at the start of the maze. An agar-water solution was poured into the maze before the organisms were placed. They were then allowed to grow.

Results
The Physarum Polycephalum consistently grew to the healthiest food option, or the oats, when the oats were placed three and six inches away from the starting point. At nine and twelve inches, the organism grew once to the oats, or healthy food, and once to the sugar, the unhealthy food.

Conclusions/Discussion
In conclusion, the Physarum Polycephalum did grow to the healthy food option, or the oats, more often than it did to the unhealthy option, the sugar. My hypothesis was partly supported because it consistently grew to the oats when they were placed three and six inches away. This had been my first hypothesis. My next hypothesis had been that if the organism attempted to reach the healthy option at twelve inches, it would die, but it actually survived when it reached the healthy food at twelve inches.

Summary Statement
My project is the study of Amoeboid organisms' behavior when placed in a situation where two of their survival insticts may contradict each other.

Help Received
My father assisted me with the construction of the mazes.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Mary Travis H. Doepner

Project Number

J1504

Project Title

Salt vs. Bacteria: The Effects of Salt Concentrations on Bacteria in Santa Ana River Water

Abstract

Objectives/Goals

The purpose of this project is to see if the salinity level of Santa Ana River water samples has an effect on bacterial growth, particularly to see if a lower salinity level increases the level of bacteria (esp. potentially harmful E.coli & other coliforms).

Methods/Materials

Collect samples from 2 locations of the Santa Ana River & mix equal parts for standard river water. Keep 1 standard 100ml sample. Dilute 1 sample by 1/2 & one by 1/4 using distilled water. Concentrate samples by 3X, 11X, & 31X by adding NaCl to standard samples. Measure all samples for TDS (salinity proxy) using a multi-parameter tester. In a lab add Colilert media to each sample & shake. Pour samples into Quanti-tray & incubate for 24 hrs. Count total coliform & fluorescing E.coli using a black light. Calculate results using IDEXX Quanti-tray MPN table.

Results

All samples were positive for coliform bacteria & E.coli bacteria. All samples had very high levels of coliform bacteria with the 1/4 dilution being 2400MPN/100ml (MPN=most probable #) & all other samples being >2400MPN/100ml. The sample diluted by 1/4 had the least amount of E.coli, 1/4 the amount found in the standard river sample. The E.coli found in the 1/2 dilution through the 11X concentration remained within a range of 60MPN/100ml. The bacterial level at the 11X concentration began to decline slightly while the 31X concentration had an even greater decrease. If the bacterial concentrations for the 1/4 & 1/2 dilution samples were multiplied (adjusted) by 4 (for the 1/4 dilution) & by 2 (for the 1/2 dilution), then the 1/4 sample's bacterial concentration would be 384MPN (4 X 96MPN) (close to the standard river water concentration, 378MPN) & the 1/2 sample would be higher, 656MPN (2 X 328MPN).

Conclusions/Discussion

Because there is little difference in the amount of bacteria from the 1/2 dilution to the 11X concentration of NaCl, it appears that the E.coli bacteria can tolerate salinity levels within a broad range above & below the standard river sample. It appears that NaCl is necessary in some concentration to promote bacterial growth & that in the 1/2 concentration [151.7ppm] the NaCl is closer to being optimal for coliform growth. By repeating the experiment with the 31X concentration of NaCl, I found that the increasing salinity levels do appear to have negative effects on bacteria. I believe an even greater increase would result in a greater decrease in bacteria.

Summary Statement

My project is intended to illustrate the relationship between salt (NaCl) concentrations and the presence of various bacteria using the Santa Ana River as the base line.

Help Received

Used materials & equipment at Babcock Labs under supervision of Carol Kase; Used multi-parameter tester at UCR with Dr. Michael Anderson; Used measuring equipment at SIHS; Dr. Kay Mukergee & Raincross donated sterile bottles; Riv. Co. Parks & Rec. gave permission to collect samples

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Manreet K. Dosanjh

Project Number
J1505

Project Title
Banking Your Bacteria: Examining the Correlation between Passcode Security and Bacteria Growth on Numerical Keypads

Abstract

Objectives/Goals
The purpose of this investigation was to analyze if bacteria culturing can allow for an accurate prediction of a four-digit pass code. This was determined by the growth of bacteria from numerical keypads.

Methods/Materials
All the needed materials for my experiment were agar plates, sterile cotton swabs, a numerical keypad, a bottle of bleach, a timer, a human volunteer, a pair of gloves, a pack of cotton balls, Sharpie, and an incubator.
The methods for my experiment were to first remove all the bacteria from the keypad by bleach. Second, obtain a volunteer and ask them to type in a four-digit pass code and then right their number down on a piece of paper. Next, obtain a sterile cotton swab and swab key #1# for 20 seconds. Then, swab the sterile cotton swab on the agar plate for one minute. Do this for the remaining nine keys on the keypad. After that, place all the finished agar plates in an incubator. Finally, after two days, take the agar plates out of the incubator and count the colonies and record the results.

Results
The results from my investigation indicates that 85% of the time you will be able to get an accurate pass code from bacteria. The highest number of colonies was 178 and the lowest number of colonies was 8. The average for the highest number of colonies out of the four agar plates was 83.46 and the average for the lowest number of colonies was 29.32.

Conclusions/Discussion
In conclusion, I successfully found the results from my investigation. I learned that 85% of the time, bacteria culturing could allow for an accurate prediction of a four-digit numerical pass code. I also learned that it is important to keep your hands clean before typing in your pass code. The cleaner your hands are, the harder it will be to predict your code.

Summary Statement
The purpose of this investigation was to determine if bacteria culturing can allow for an accurate prediction of a four digit pass code.

Help Received
Mother provided transportation to needed destination. Mr. Whittington taught sanitizing methods.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Danika R. Flemming

Project Number
J1506

Project Title
Comparing the Contamination Levels of Various Meats on Different Surfaces

Abstract

Objectives/Goals
To determine which meat causes the most bacteria to grow on the four specific surfaces, and which surface allows the most bacteria to grow from the three specific meats.

Methods/Materials
-raw chicken
-raw beef
-raw fish
-glass cutting surface
-wood cutting surface
-metal cutting surface
-plastic cutting surface
-incubator
- Petri dishes
- cotton swabs
- bleah

Results
The glass cutting surface allowed the most bacteria to grow from the three specific meats. The fish caused the most bacteria to grow on the four specific surfaces.

Conclusions/Discussion
Fish caused more bacteria to grow on my specific surfaces even though there is not a specific disease associated with fish. Glass cutting surface allowed more bacteria to grow than all the surfaces.

Summary Statement
I compared the contamination levels of various meats on different surfaces.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Isela Huerta

Project Number
J1507

Project Title
Determining the Amount of Bacteria on New and Used Silly Bands

Abstract

Objectives/Goals
My objective was to determine the amount of bacteria silly bands contain and if they can be dangerous.

Methods/Materials
10 new petri dishes,new cotton swabs,1 pen,1 sharpie,5 randomly picked used silly bands,5 randomly picked new silly bands,clear cellophane tape,new latex gloves.First I rubed the silly band with a cotton swab.Then I s-streaked the petri dish with the affected cotton swab.Sealed the petri dish,and let it sit for 48 hours.After 48 hours I finnaly counted the number of bacterial colonies and recorded the results.

Results
My results were that over all used silly bands contain more bacteria than new ones.Although new silly bands do contain bacteria.

Conclusions/Discussion
My hypothesis was correct used silly bands had more bacteria.Silly Bands are dangerous,contain bacteria,and could cause serious problems.

Summary Statement
My project is about determining the amount of bacteria on new and used silly bands.

Help Received
My mom took pictures while I was doing the steps,and my coach helped me tape the info. on to my board.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Andrew C. Jin; Stanley Xie

Project Number

J1508

Project Title

Effects of Triclosan on Resistance in Household Bacteria

Abstract

Objectives/Goals

Triclosan is an antibacterial and antifungal agent commonly used in consumer products such as soap. It exhibits antibiotic characteristics, and is currently under FDA review for the possibility of causing resistance in bacteria. The hypothesis we formed was that if we expose household bacteria from areas where Triclosan-based antibacterial soaps are used to Triclosan, then there will be resistance shown in the bacteria, and they will not be affected or killed.

Methods/Materials

First, we collected bacteria that have been exposed to Triclosan. They were from a sink where Triclosan soaps are used. We also collected similar bacteria that have not been exposed to Triclosan. They were from a sink where Triclosan soaps are not used. Then, we exposed these bacteria to Triclosan, by letting them grow in Petri dishes with 0.3%, 0.15%, and 0.075% Triclosan-agar. The agar was made by adding the correct concentrations of purified Triclosan to nutrient agar. After incubating for 48 hours and 96 hours, we observed the number and size of surviving colonies to measure the resistance level of each group of bacteria. We repeated the experiment twice.

Results

In the two rounds of experimentation, bacteria from the sink where Triclosan-based soaps are used were able to successfully grow and reproduce, barely being affected. In round 1 of the experiment, 6 colonies grew in the 0.3% Triclosan concentration, 22 colonies grew in the 0.15% concentration, and 3 colonies grew in the 0.075% concentration. There was no bacterial growth in the Petri dishes with bacterial from the sink where Triclosan-based soaps are not used, except for one colony in the 0.15% concentration. In round 2, 189 colonies of the bacteria from the sink where Triclosan-based soaps are used grew in the 0.3% Triclosan concentration, 3 colonies grew in the 0.15% concentration, and 163 colonies grew in the 0.075% concentration.

Conclusions/Discussion

The results supported our hypothesis, and proved that bacteria that are commonly exposed to Triclosan will develop resistance. The bacteria from the sink where Triclosan-based soaps are used were able to grow, barely being affected by the antibacterial agent. This proves to be very dangerous to the health of Triclosan users. They will be at increased risk of diseases for the soaps and other products will be ineffective to kill bacteria.

Summary Statement

Our project tested the effects of Triclosan, a common antibacterial agent in consumer products, on creating resistance in household bacteria.

Help Received

Used lab equipment at the Harker School under the supervision of Mr. Scott Kley-Contini

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Rachel L. Jolly

Project Number
J1509

Project Title
Packaged or Fresh? Determining if the Packaging Process Used on Fruit & Vegetables Causes Them to Collect More Bacteria

Abstract

Objectives/Goals
My objective is to determine whether or not the packaging process used on fruit and vegetables causes them to collect more bacteria.

Methods/Materials
I used packaged carrots, apples, lettuce, and watermelon to represent the packaged fruit and vegetables. The carrots and the apples are both bagged and commonly served at schools for lunch or packed by moms for lunch. The lettuce is commonly served at dinners by families, and the watermelon is often served at parties. My control was the fresh fruit and vegetables (carrots, apples, lettuce, and watermelon). I used the fresh fruit and vegetables to determine if the packaged fruit and vegetables do collect more bacteria during the packaging process. First, I added ten (10) milliliters of distilled water to the test tube labeled #sample#, then cut a two (2) centimeter slice off the fruit or vegetable and place it into the test tube. Then I performed a serial dilution to 1/1000 to dilute the bacteria. I used the pipette to place 1/10 milliliter of the dilution onto an agar plate. I did this for ten trials. Then I repeated this process in order to test all the other fruit and vegetables.

Results
The results of my investigation on whether or not the packaging process used on fruit and vegetables causes them to collect more bacteria indicates that the packaged products had less bacteria than the fresh, 75% of the time.
Fresh Carrots: Average Amount of Bacteria Colonies: 888.8
Packaged Carrots: Average Amount of Bacteria Colonies: 154.5
Fresh Apples: Average Amount of Bacteria Colonies: 1,096.6
Packaged Apples: Average Amount of Bacteria Colonies: 1,160
Fresh Lettuce: Average Amount of Bacteria Colonies: 23.4
Packaged Lettuce: Average Amount of Bacteria Colonies: 38.4
Fresh Watermelon: Average Amount of Bacteria Colonies: 12.9
Packaged Watermelon: Average Amount of Bacteria Colonies: 11.4

Conclusions/Discussion
In conclusion, fruit and vegetables that are packaged collect less bacteria colonies than fresh fruit and vegetables, unless you are dealing with lettuce, which is healthier to eat fresh. The reason for such a low amount of bacteria on the packaged carrots, apples, and watermelon, is probably the process of washing and peeling of the fruit and vegetables before they are packaged. In addition, fruit and vegetables that are

Summary Statement
Whether or not packaged fruit and vegetables collect more bacteria than fresh.

Help Received
Father helped test my experiment; Mother helped with my display and creativity; Nathan Whittington helped with experiment supplies & lab equipment.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Jonathan A. Jurevich

Project Number
J1510

Project Title
Algae Growing Pipes

Abstract

Objectives/Goals
My project was to determine which type of pipe material (copper, pex, or PVC) was prone to algae growth. I believe algae would not establish on copper piping to the same degree as either pex or PVC pipe materials.

Methods/Materials
One of each pipe material, copper, pex, and PVC, was contained in a basket and submerged in a constant flow of water from an artesian well for a period of five weeks. Each week I observed and cataloged the algae growth of each pipe material.

Results
Algae rapidly established within the first week on and inside the pex. The PVC pipe had minimal growth on the exterior and none had established on the copper pipe. After five weeks, Considerable growth was evident on the inside of both pex and PVC, while the copper pipe had no growth on the exterior or interior surfaces.

Conclusions/Discussion
Copper piping is a superior material for water submerged applications, where algae growth can be a problem.

Summary Statement
Determine algae growth on three common pipe materials.

Help Received
My mother printed the pictures and my dad helped me layout the display board.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Anjini Karthik

Project Number
J1511

Project Title
Green Gold: Maximizing Algal Biomass Production of Chlorella and Scenedesmus for Use in Biofuel

Abstract

Objectives/Goals
The world's intensive use of costly and nonrenewable fossil fuels and the dangerous greenhouse gas emissions that result from burning it has created need for an economically viable and environmentally-friendly alternative fuel. Algae biofuel is a promising future solution to our energy problems but faces engineering challenges. My goal was to investigate maximizing algal biomass production for cost-efficiency and for cleaning up the environment by varying growth conditions. I hypothesized that biomass production of Chlorella and Scenedesmus algal strains would be maximized by providing them with additional CO2, phosphate, and iron, and a secondary goal was to determine the relative importance of each of the nutrients to growth.

Methods/Materials
My constants: light intensity, temperature, and pH of solution. Independent variable: nutrient added; dependent variable: algal biomass production; control: culture with no additional nutrient. Stock cultures were prepared in Erlenmeyer flasks, two for each strain. Cultures were aerated and agitated continuously. Cell density was measured using a hemacytometer every day. After seven days of good stock growth, I subcultured and started tests in triplicates with additional CO2, phosphate, and iron. I then tested different concentrations (1% and 2%) of phosphate and iron.

Results
For Chlorella, all three test agents maximized biomass production. CO2 induced the most growth (192%), followed by phosphate(18-33%), and lastly by iron(11-23%). For Scenedesmus, all three test agents also maximized biomass production. CO2 induced the most growth(53%), followed by phosphate(9-17%), and iron(6-16%).

Conclusions/Discussion
CO2 induced the most biomass production because it is essential for photosynthesis; CO2 addition resulted in faster cell division and hydrocarbon production. Phosphate was next because it is a macronutrient for algal growth, as opposed to iron, a micronutrient. All three test agents increased biomass production compared to the control. My hypotheses were thus supported. Algae sequestrate atmospheric CO2 while increasing biomass production as well. My experiment suggests that better matching of algal nutrient requirements with their supply could play an important role in increasing cost-effective algal biomass production.

Summary Statement
I investigated maximizing algal biomass production by varying growth conditions; my project could combat engineering challenges for cleaning the environment and increasing cost-effective algal biomass production to get our "green gold."

Help Received
I thank my science teacher for her guidance; Schmahl for their lab use; and Dr. Quinn from Berkeley National Laboratory for answering my numerous questions.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Sarina R. Katznelson

Project Number
J1512

Project Title
Tackling the Bottleneck of Algae Biofuel Production: The Dewatering Process

Abstract

Objectives/Goals
Producing biofuels from algae is an expensive and energy intensive process. The major bottleneck is the dewatering process. The separation step with centrifuges provides the best results, but consumes much energy. The amount of time and energy required depend on the settling rate of algae in the centrifuge, which in turn depends on density and size of algae cells. I characterized these factors for various algae types in order to predict algae types that require the least amount of energy for dewatering. I indirectly tested centrifugation settling velocities for three algae types: Chlamydomonas reinhardtii, Thalassiosina pseudonana, and Phormidium tenue, which I called algae A, B and C respectively.

Methods/Materials
I performed more than 40 tests, ten preliminary tests and 33 final tests. The algae solutions were run over varying periods of centrifugation, increasing in time from 30 seconds to 30 minutes in duration. I extracted samples each time from the top layer in the centrifuge vial and measured the concentration of the algae by the samples' optical absorbance using a spectrophotometer.

Results
According to my data, the concentration depletion of algae A was significantly more rapid than that of algae B, at a rate that was consistent with its larger cell diameter. The depletion rate for Algae C was the most rapid of the three, consistent with its larger size due to its longer filamentous shape.

Conclusions/Discussion
I learned that the settling velocity increases with the size of the cell. Because dewatering energy consumption increases with separation time, I concluded that dewatering Algae A will consume less energy than dewatering Algae B. Stoke's law for spherical objects does not apply to long filamentous objects such as Algae C and as such, it could not be used directly in this instance. However, the general result that larger particles having larger mass settle faster is consistent with my observation that Algae C separated at the fastest rate.

Because all algae types are denser than water, I conclude that algae strains that are richer in oil (lighter) would necessarily have density closer to that of water, making separation harder and more energy intensive. My project highlights the importance of measuring algae candidates' settling velocity to ensure that the extra energy that oil-rich algae produce is greater than the extra energy required for its dewatering.

Summary Statement
I indirectly tested the settling velocity for various algae types by measuring the optical density of the vial sample at the surface after centrifugation using a spectrophotometer.

Help Received
Thanks to Dr. Greg Mitchell for teaching me basic lab skills and Dr. Robert Pomeroy for allowing me to use his lab and equipment. Thanks also to my science teacher and my father for their guidance and support.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Nelson F. Liu

Project Number
J1513

Project Title
The Effect of UV-A Light on the Amount of Bacteria in Lake Water

Abstract

Objectives/Goals
Is UV-A light powerful enough to kill bacteria in normal lake water? If so, is the UV-A killing the bacteria, or is some other source?

Methods/Materials
I used agar to measure the growth of the bacteria.
I used a UV-A emitting light to give off UV-A.
I used droppers to assist in growing bacteria.
I used water bottles to hold the water I was purifying.

Results
Test 1: I tested bottled lake water under UV light from 0-10 in 2 hour intervals and boiled water. Test results seemed to be not significantly affected by hours the under UV light. How effective is the UV light from the 100 watt Daylight Blue Bulb compared to the Sun?
Test 2: I tested bottled lake water under UV light from 0-14 in intervals of 2, and under the Sun. Again, test results were not significantly affected by hours under UV light among the dishes. The bottle under the sun was exposed to a UV index of 3; it was nearly completely clean of bacteria, meaning that my bulbs are VERY weak in comparison to the Sun. Should I extend my test hours to find the comparable hours under UV light to under the Sun?
Test 3: I tested from 0-48 hours, in 6 hour intervals and also included an water under the sun test. The water stayed in the sun for 7 hours, and the weather was partly cloudy, with a UV index of 2. After growing them, I was surprised at the results. The 48 hour was about as sterile as the water under the sun. Both had very little bacteria, which supports my case that UV-A does have some sterilization power. However, the thermometer in the box read 39 degrees Celsius, which is about 102 degrees Fahrenheit. Was the UV-A, or the heat, killing the pathogens?
Test 4: In this test, I wanted to determine what was killing the bacteria: the heat, or the light. I tested from 0-48 with intervals of 12. For each interval, we set in a normal bottle, and a bottle encased with aluminum foil. The foil will repel the UV-A waves, but will allow heat to pass through. After my testing, I found that the agars with UV-A exposure had less bacteria colonies.

Conclusions/Discussion
In my testing, I deduced several things about the ability of UV-A to kill bacteria. First, UV-A does clean water by killing pathogens, although the amount of time necessary depends on the environment. Also, there was a correlation between the number of hours under the UV-A light and the amount of bacteria

Summary Statement
Determining whether UV-A can kill bacteria in water.

Help Received
Mother helped to get water.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Malinali X. Martinez

Project Number
J1515

Project Title
Bacteria Invades Fast Food Restaurants

Abstract

Objectives/Goals
Many people eat out in fast food restaurants, but have you ever wondered what you got in that tray or after you washed your hands? The purpose of this project was to determine the cleanliness of fast food restaurant trays and their bathroom faucet handles.

Methods/Materials
Four fast food restaurants that had trays were picked and each location (trays and bathroom faucet handles) was swabbed on three different dates. Then the specimens were transferred to Petri dishes that were put into an incubator. After one week in the incubator, bacteria colonies were counted to see the percentage of bacteria that covered the Petri dishes.

Results
Results show that overall bathroom faucet handles were more contaminated than restaurant trays. Overall, samples swabbed from restaurant faucet handles had a mean of 18.6% of the Petri dish covered by bacteria colonies compared with a mean of 16% of the plate covered when samples were taken from restaurant trays.

Conclusions/Discussion
After reviewing my results, I noticed no consistent pattern in the data#some restaurants had higher amounts in bacteria on the faucet handles and others had more bacteria on the trays. In the future it would be interesting to repeat this same experiment at different branches at the same restaurants to see if the results are consistent with my findings.

Summary Statement
My project is to determine how much bacteria were found on trays and bathroom faucet handles in selected grade A restauarants.

Help Received
Teacher helped me chart my findings and showed me the procedure on how to collect my data.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Morgan M. Mendicino

Project Number

J1516

Project Title

Don't Neglect. Protect

Abstract

Objectives/Goals

This science project is trying to find out if sunscreen and polarized sunglasses protect bacteria from UV light. It is hypothesized that sunscreen and polarized sunglasses do protect from UV light because it states that sunscreen absorbs, scatters, and reflects the UV rays. The polarized sunglasses black lenses help with blocking out the UV rays.

Before testing, the following topics were researched; UV light, UV rays, UV light on bacteria/humans, bacteria, sunscreen, polarized sunglasses and good/bad bacteria, to better understand the project thoroughly. Some interesting information from this research, I would have to say would be that some bacteria are used for making healthy foods such as yogurt and cheese. Another interesting thing is that UV light/rays can help the human body, if only in a small dose, by killing harmful bacteria. To test the project, I took skin flora bacteria and in three different groups, polarized sunglasses group, sunscreen, and controlled, put them under the UV light for certain amount of times and compared the results.

The data from this experiment shows that sunscreen and polarized sunglasses protect bacteria from UV light. For example, at the 15 minute mark for each group, the sunscreen group had an average of 337 bacteria alive and the polarized sunglasses had an average of 74.5 live bacteria, where the controlled group had an average of 3.5 bacteria alive.

Methods/Materials

Project Materials: 1. Cotton tip applicators (sterilized). 2. 24 TSA Agar plates. 3. 15 wattage UV light bulb. 4. Cardboard box: Height-22.4cm, Width-29.4cm, Length-44.9cm,
Lid of box: Height-8.85cm, Width- 29cm, Length-45.8cm. 5. 30 spf CVS brand sunscreen. 6. Lab coat, 7. Safety goggles. 8. Gloves. 9. Skin flora (bacteria from skin, most likely hand skin). 10. UVA/UVB protection polarized sunglasses. 11. Liquid enrichment media (chicken broth). 12. Foil (any type will work). 13. Ruler (cm). 14. Syringe 10cc(mL), 21 gage. 15. Loops. 16. Vial tubes. 17. Bleach. 18. Incubator unit. 19. Magnifying glass.

General Materials: 1. Board for science fair. 2. Binder (3in.). 3. 50 plastic sheets. 4. #2 pencil. 5. Computer paper (8 ½ x 11). 6. Computer. 7. Scissors. 8. Tape/glue (duct and clear scotch). 9. College Ruled notebook to write in. 10. Colored pencils. 11. Markers. 12. Pen. 13. Stapler/Staples. 14. Colored paper.

Summary Statement

My project is to learn if sunscreen and polarized sunglasses would protect bacteria from the UV light.

Help Received

Doctor helped with watching and teaching of microbiology procedures; mother and father helped with making of board; used teacher's microbiology lab.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Emily Nevens

Project Number
J1517

Project Title
To Which Antibiotic Does E. coli Show the Most Resistance? Amoxicillin or Tetracycline?

Abstract

Objectives/Goals
The goal/objective of my experimentation was to determine which of two commonly prescribed antibiotics, Amoxicillin or Tetracycline, would yield the greatest antibiotic resistance levels in E. Coli.

Methods/Materials
Three samples of E. Coli bacteria, cultured on a nutrient agar Petri dish, were dosed with either Tetracycline, Amoxicillin, or distilled water, with antibiotic solutions consisting of 1mg of antibiotic to 10mL of distilled water. The antibiotic dosages were applied to filter disks and were centered in the E. Coli cultured dishes. Each sample was then incubated for 24 consecutive hours at 37 degrees centigrade. At the end of the incubation period, the diameter of each inhibition zone was measured and recorded in millimeters. This process was then repeated for another three generations, and the entire experiment was conducted in three trials.

Results
The control samples (distilled water) showed no signs of an inhibition zone, and subsequently, no decrease in inhibition zone size. E. Coli samples treated with Amoxicillin, showed a decrease in inhibition zone size from; Generation 1-2, 15%, Generation 3, 25%, and Generation 4, 24%. E. Coli samples treated with Tetracycline, showed the greatest decrese in inhibition zone size from; Generation 1-2, 17%, Generation 3, 27%, and Generation 4, 28%.

Conclusions/Discussion
The result of the experiment showed that the E. Coli bacteria displayed the greatest resistance to Tetracycline. This outcome contradicts the hypothesis that E. Coli would show the greatest resistance to Amoxicillin. This hypothesis was formed based on the assumption that Amoxicillin, being a weaker and more limited spectrum antibiotic in comparison to Tetracycline would yield the greatest resistance. Through multiple observations and the resulted outcome of the experiment, two conclusions can be made. In the first generation of the cultures, the E. Coli bacteria exposed to Tetracycline yielded the greatest inhibition zone sizes. Thus it can be concluded that the stronger the antibiotic the stronger the resistance levels. Furthermore it can be concluded that different classes of antibiotics have unique properties in the way they destroy bacteria. That said; E. Coli may be more tolerant to one method of destruction (antibiotic) than others.

Summary Statement
This study examined the resistance strength of E. Coli bacteria against two commonly prescribed antibiotics, Amoxicillin and Tetracycline.

Help Received
Pierce College provided me with the E. Coli in LB medium.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Vanessa Prado

Project Number
J1518

Project Title
The Exposure of Bacteria on Shopping Carts

Abstract

Objectives/Goals
My objective is to determine what type of shopping carts carry more bacteria; grocery stores or children toys stores.

Methods/Materials
Fifteen shopping carts where tested to determine growth of bacteria on shopping carts. Each one was tested using sterile swabs to collect bacteria colonies which then were swabbed gently onto a petri-dish. Rubber gloves where used to protect any bacteria from spreading any contamination onto the hands. Then the petri-dish was placed into a incubator for two days to see the growth of bacteria from each shopping cart. After you remove the petri-dish from incubator and count the bacteria coloneies then i disinfect each petri dish using clorox.

Results
The results of my experiment showed that grocery stores tend to carry more bateria onthere shopping carts than retail and children toy stores.

Conclusions/Discussion
From my experiment showed that grocery stores tend to carry more bacteria than retail and children toy stores. I also learned that shopping carts carry three different bacterias that can cause us to get very ill which could be harmful to our health.

Summary Statement
The growth of bacteria on shopping carts

Help Received
My mother help with the typing and a teacher help me by donating petri-dishes for my experiment

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Alec Rupp; Ariana Rupp

Project Number
J1519

Project Title
Do Sunglasses Sold at Retail Stores Harbor Microorganisms That Are Resistant to Commonly Prescribed Ocular Antibiotics?

Abstract

Objectives/Goals
To determine if sunglasses sold at retail stores harbor microorganisms.To evaluate the effectiveness of 5 commonly prescribed ocular antibiotics against 8 of the bacterial isolates cultured from the sunglasses.

Methods/Materials
The nose bridges of 9 pairs of sunglasses from Macy's and 6 pairs of sunglasses from Guess were swabbed with a sterile swab moistened with sterile phosphate buffered saline. The swabs were then used to inoculate the surfaces of sterile tryptic soy agar plates. Plates were incubated at ambient room temperature for 7 days. At the end of incubation the numbers of microorganisms were counted. Antimicrobial susceptibility testing was performed using representative bacterial isolates. Antibiotic disks were prepared using ophthalmic solutions containing gatifloxacin, gentamicin, tobramycin, moxifloxacin and trimethoprim/polymyxin B. Disks were placed onto the surfaces of tryptic soy agar plates previously inoculated with bacteria. Plates were incubated at ambient room temperature for 7 days to produce bacterial lawns. Clearing around the disks indicated that antibiotics prevented growth. The clearing produced circular zones which could then be measured and recorded.

Results
Bacteria and mold were isolated from approximately 93% (14/15) of the sunglasses. Different degrees of susceptibility were displayed by the different bacteria. Three of the eight bacterial isolates (37.5%) tested were not susceptible to one or more antibiotic.

Conclusions/Discussion
Customers should take precaution when trying on sunglasses since they could have been handled by customers who have infections. Antibiotic resistant bacteria recovered from sunglasses could pose a risk to some patients requiring sunglasses after surgery.

Summary Statement
We evaluated the effectiveness of commonly prescribed ocular antibiotics against bacteria isolated from sunglasses sold at retail stores.

Help Received
Received support and guidance from our teacher, Mrs. Donna Harbison, and from our parents.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Katherine Y. Sham

Project Number
J1520

Project Title
SODIS: Solar Water Disinfection

Abstract

Objectives/Goals
The objective is to test whether or not the opacity of PET bottles affects the solar disinfection of pathogenic-infested water.

Methods/Materials
Fourteen PET bottles, fourteen petri dishes, nutrient agar, and an Escherichia coli slant culture are prepared in order to begin the experiment. Six of the bottles are scratched to varying opacities of 25%, 50%, and 75%. Four of the bottles are scratched to 100% opacity, and the other four are left unscratched. Approximately 0.25 milliliters of Escherichia coli are pipetted into each bottle. Seven bottles are placed in the sunlight for six hours, and the rest are placed in a box covered with a UV light bar for six hours. A sample of each bottle is spread on separate petri dishes, and then after twenty four hours of incubation, the colonies are counted and observed.

Results
In the sun trials, there was no growth of bacteria in any of the agar plates. The shade agar plates had varying amounts of bacterial growth that seemed to be slightly affected by opacity. However, in the trial with the UV bar, all agar plates had some degree of growth, and the opacity affected the amount of bacterial growth to a slight degree. Shade was simulated by covering two of the bottles (0% scratched and 100% scratched) with a cloth, thereby creating indirect UV light exposure. Interestingly enough, the bottles with indirect exposure had agar plates where the bacteria appeared in approximately 12 hours, while the bottles with direct UV exposure had agar plates where the bacteria appeared 24 hours later.

Conclusions/Discussion
The opacity of the bottle did not appear to affect the amount of bacteria neutralized by the sun's rays. The shade agar plates had varying amounts of bacterial growth that seemed to be slightly affected by opacity. However, in the UV bar trial, all agar plates had some degree of growth, and the opacity affected the amount of bacterial growth to a slight degree. The results were not as expected, because the sun was strong enough to deactivate all bacteria, regardless of opacity.

Summary Statement
The purpose of this project is to determine if the degree of opacity of PET bottles affects the solar disinfection of pathogenic-infested water.

Help Received
Parents helped to acquire materials and supervise the inoculation, observation, and disposal of the Escherichia coli

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Charulata Sinha

Project Number
J1521

Project Title
Repeated Use of Antimicrobial Mouth Rinses: Risk of Resistance Development

Abstract

Objectives/Goals
My hypothesis is that oral bacteria will develop resistance to mouthrinses with repeated use, with maximum resistance buildup in mouthrinses containing chlorohexidine. This hypothesis was based on previous research on the growth of super-bugs after repeated exposure to the chemical triclosan in antimicrobial handsantizers.

Methods/Materials
Streptococcus Gordonii, a oral bacteria was used in this in-vitro study. The #Minimum Inhibitory Concentration# (MIC: the weakest concentration at which the mouthwash can inhibit growth) was determined for four mouthwashes (active ingredient in brackets); Listerine (Essential Oils), Natural Dentist (Aloe Vera), Rite Aid (Ceptylpyridinium Chloride), and Periogard (Chlorhexidine). Bacteria were inoculated into dilutions of each mouthwash and an optical plate reader was used to monitor growth. The bacterium was then grown in mouthwash at a concentration one less than the MIC value and the process was repeated 20 times. After 20 passages, the MIC was determined in the corresponding mouthwash.

Results
The MIC showed that chlorhexidine mouthwash was the most effective. The postpassage MICs were changed to higher concentrations. The Periogard and the Rite Aid were changed by a factor of 16, while the Listerine and Natural Dentist did not inhibit even at undiluted strengths.

Conclusions/Discussion
My results support my hypothesis that oral bacteria develop resistance to mouthrinse with repeated passage and the effect is strongest in the mouthwash that contains chlorhexidine.

Summary Statement
It explores if bacterial resistance builds up in oral bacteria with repeated use of mouthwash.

Help Received
Ms. Alyssa Jminez, senior in Dr. Doran's lab taught me the procedures used in this project. My sister helped me with the formatting and layout for the poster.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Walker E. Spence

Project Number
J1522

Project Title
How Gross Are Your Greenbacks? A Study Examining the Bacterial and Fungal Contamination on US Paper Currency

Abstract

Objectives/Goals
In this study, I investigated which denomination of US paper currency contains more bacteria, and whether, within a given denomination, the year of minting affected the number of bacteria. My hypotheses were that lower denominations of paper currency would have more bacteria because they are handled by more people, and that older bills would have more bacteria because they have been in circulation longer.

Methods/Materials
I obtained eight bills for each of five denominations ($1, $5, $10, $20, and $100) from a local credit union and sorted them into two groups based on year of minting (except for $100 bills, which were split into four year groups). Using sterile gloves, I stamped each bill on tryptic soy agar (TSA) plates, incubated the plates for three days at 23-25 degrees C, and then counted and categorized the colonies that appeared. Sterile gloves alone were stamped on plates to serve as controls.

Results
I found that, generally, lower denominations of US paper currency produced the most bacterial colonies. Furthermore, within a denomination, older bills generally had more bacteria than newer bills. Surprisingly, I found that fungus (i.e., mold) was more common on $100 bills than on lower denominations such as $1 bills and $5 bills. The control plates stamped with sterile gloves did not produce any bacterial or fungal colonies.

Conclusions/Discussion
My studies showed a general trend that the higher the denomination of US paper currency, the fewer bacteria that it contained. This trend could be due in part to the lack of use of the higher denominations and the more frequent use of lower denominations. In addition, this study suggested that, generally, the earlier the bills went into circulation, the more bacteria they had. This trend is probably due to the older bills being handled for a longer time than the fresher bills. I also found that $100 bills had large fungal counts compared to other denominations, possibly due to storage in a cabinet or vault, which are both places that might accumulate moisture. My data had large standard deviations, indicating high variation in the counts on individual bills. A larger sample size would help to validate the trends I observed.

Summary Statement
My project examines the bacterial and fungal contamination on US paper currency and how it varies with respect to denomination and year of minting.

Help Received
I received many helpful suggestions from Susan M. Williams, Ph.D. about how to grow bacteria. From Lonna Larsh, M.D., I received a supply of sterile gloves, which were critical to my experiment. Also, my Father, Brian, helped me with the Excel plots, and my Mother, Michelle, proofread my report.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Lianne R. Sturgeon

Project Number
J1523

Project Title
Plaque's Preference: How Do Sucrose, Honey, and Splenda Affect the Growth Rate of Streptococcus mutans?

Abstract

Objectives/Goals
The purpose of my experiment was to determine which commonly available food sweetener, table sugar (sucrose), Splenda (Sucralose), or honey, was least likely to promote the growth of streptococcus mutans.

Methods/Materials
Streptococcus mutans was inoculated onto plates of Trypticase Soy Agar (TSA) media with either 2% honey, 2% sucrose, or 2% sucralose. Plain plates of TSA were inoculated as a control. Plates were incubated at body temperature for 152 hours. The diameter of each of the colonies was measure to determine the amount of growth in each environment.

Results
Sucrose grew the biggest colonies of the sweeteners and honey the smallest colonies. The control grew the biggest colonies.

Conclusions/Discussion
Honey was been shown to have antibacterial properties which may have been the reason for the smaller colonies. Sucrose is a highly refined sugar which bacteria can use efficiently. Sucralose, when packaged as Splenda, has maltodextrin and dextrose added to it. The bacteria may not have used the sucralose, but grew off the added sugars instead. it is not clear why the control grew the biggest colonies unless adding sugar to the medium threw off the balance of nutrients to water.

Summary Statement
I wanted to see which commonly available foor sweetener least promoted the growth of plaque.

Help Received
Used lab equipment at UCSB under the supervision of Dr, Low's technician Bruce Braaten.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Heidi K. Van Beek

Project Number
J1524

Project Title
Plastic vs. Metal: Where Do Germs Prefer to Ride?

Abstract

Objectives/Goals
The objective is to determine which type of shopping cart, plastic or metal, will be a better place for growing bacteria.

Methods/Materials
I took samples from carts and allowed bacteria to grow in petri dishes. I measured the bacteria in two different ways to get the best results. One way that I measured was by the amount of bacteria colonies. I also measured the largest bacteria colony in millimeters.

Results
The results were that the plastic carts had an average amount of 47.2 millimeters of bacteria and the metal carts had an average amount of 36.6 millimeters of bacteria.

Conclusions/Discussion
My hypothesis was that plastic carts will grow more bacteria and be dirtier because they have a bigger surface area compared to the tiny metal rods. If I was to repeat this project I would start earlier because at the beginning of my project I made a mistake and had to restart. I would also try to be more careful when I swabbed the carts so that I wouldn't mess up the agar. I may even try the project on soap bottles, restaurants, and other places.

Summary Statement
In my project, I tried to find out which type of shopping cart, plastic or metal, was the best place for bacteria growth.

Help Received
My mom helped me glue parts on my board.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Natalie J. Wu-Woods

Project Number

J1525

Project Title

Separating Plant Essential Oils Components Using Thin Layer Chromatography and Testing Their Effect on Bacterial Growth

Abstract

Objectives/Goals

Based on my experiments from the last two years testing the effects of plant essential oils on the growth of E. coli, I decided to expand on my previous research and separate individual components of the complex mixture. My thought was that there could be specific compounds within the essential oil causing the antibacterial effects.

Methods/Materials

TLC Silica gel 60 F254,Petri dish, Top Agar,E. Coli bacteria (Red), Lab glassware, LB broth, Hydrodistilation apparatus, Incubator, Toluene, Ethyl acetate, Plant Essential oils, Paper disc (Sterile), Bunsen burner, Chemical Hood.

Results

Oregano and Thyme had the same major component based on TLC analysis. Cinnamon, Sagebrush and White Sage had different components. The major spot on Oregano and Thyme was the antibacterial sub-component. The other three plant essential oils had different antibacterial sub-components.

Conclusions/Discussion

I have developed a new method for rapidly finding the sub-compounds of plant essential oils that act as antibacterial substances. Using this method I have found that different plants contain different sub-components and some of these components have antibiotic properties. The compounds in Oregano, Thyme, and Cinnamon all move similarly in the toluene and ethyl acetate solvent. The major sub-components we found in these oils all have antibacterial properties. Using this new method, we have discovered a potentially new compound in California Sagebrush. This compound migrates much slower in the solvent and is therefore probably different from the compounds found in Thyme, Oregano and Cinnamon. The California Sagebrush compound has potent antibacterial properties. White sage also has a sub-component that has not been described. It migrates at almost the top of the TLC plate and can only be seen at extremely high concentrations of oil. Sagebrush and White Sage essential oil didn#t work well in the original disc diffusion assays, but one of their sub-components has antibiotic properties. Oregano#s had the greatest amount of antibacterial properties probably due to a large amount of carvacrol and thymol, these compounds have already been found, but never by this method before.

Summary Statement

Isolated compounds from plants that inhibited growth of E. coli.

Help Received

Used lab equipment at Inscent, Inc. under the supervision of Dr. Woods.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Kile Young

Project Number
J1526

Project Title
The Unique Properties of Coccolithophorid Algae and Its Effects on the Biofixation of Carbon Dioxide

Abstract

Objectives/Goals
The purpose of this experiment is to show a way in which CO2 may be reduced by using Coccolithophorid Algae. These algae have the unique property of being able to lock up CO2 within their coccolith shells thereby producing carbon sinks. Because of this, CO2 does not get released back into the atmosphere where it would have the potential of contributing to global warming.

Methods/Materials
Prepare algae culture for the aeration process by combining algae with a solution of boiled salt water and soil nutrient water. Bottle the culture solution and hook up to aeration and light apparatus for 10 days. Remove and separately bottle into 12 (591ml capacity) bottles with 250ml of algae solution in each. Add ferric nitrate in specified quantities into each bottle leaving, 2 control bottles with no added ferric nitrate. Measure CO2 in bottle and record. Cover opening tightly with plastic wrap and then twist lid on securely. Place on continuous rotisserie motion apparatus. Remove 1 set of bottles after 4 days and carefully measure the CO2 level and repeat procedure with 2nd set of bottles after 7 days. Repeat all above for 2nd trial. Record and compare results.

Results
The results turned out to be consistent with my hypothesis. The algae had the greatest growth with the highest concentration of ferric nitrate at 16ml. Correspondingly, the increased amount of algae consumed the most CO2 at this level by decreasing the CO2 by 11.6%. Trial 1 and 3 were on the continuous rotisserie motion apparatus for 4 days and trial 2 and 4 were on the motion apparatus for 7 days. The additional 3 days of continuous light and motion proved to increase the amount of CO2 removed from the air by 1.5%. I surmised that over the 3 additional days, more algae grew therefore used up more of the CO2 within the bottle.

Conclusions/Discussion
The Unique Properties of Coccolithophorid Algae and Its Effects on the Biofixation of Carbon Dioxide confirms the usefulness of algae and its viability as a method to remove carbon dioxide from the air. Although it is not a final answer to our problem of global warming, it can help, while new technology is being developed and researched for more permanent solutions.

Summary Statement
My project shows the unique ability of Coccolithophorid Algae to reduce CO2 in our environment.

Help Received
Mr. Briner (my science teacher) was a great support answering my questions and directing me with his advice, my cousins helped me with their knowledge in the field of environmental studies, and my mom helped me with the board design.