CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Katherine B. Adelman

Project Number
J1501

Project Title
The Effects of Nutrients on the Microbial Biodegradation of Petroleum Hydrocarbons

Abstract

Objectives/Goals
The objective was to test the effects of varying levels of added nutrients on the growth of Pseudomonas bacteria, an oil-eating microbe, and the corresponding rates of microbial biodegradation of petroleum hydrocarbons.

Methods/Materials
Freeze dried Pseudomonas microbes were rehydrated, incubated and placed in 30 of 42 beakers containing 100 ml distilled water and 6 ml refined motor oil. The beakers were organized into six sets of seven beakers. Each of the six sets of seven beakers included five trial beakers (inoculated with Pseudomonas microbes) and two controls (without Pseudomonas microbes). The six sets differed by the amount of added nutrients (0g, 0.5g, 1.0g, 2.0g, 4.0g, 8.0g); within a set, each beaker, including the controls, contained the same amount of nutrient mix. The nutrients were a mixture of sodium chloride, ammonium phosphate, potassium phosphate and magnesium sulfate. Changes in microbial growth were observed daily for 14 days and were interpreted using a visual scale of 11 categories with 10 stages each. Oil degradation was assessed daily by measuring the amount of remaining oil using a millimeter ruler.

Results
Over the 14-day period, the beakers with higher nutrient levels were characterized by greater evidence of microbial growth and oil biodegradation. However, the set of beakers that contained the highest level of nutrients experienced a period of noticeably slower microbial growth through day 8 followed by a resumption in microbial growth and oil biodegradation.

Conclusions/Discussion
Oil-eating microbes are known to be an effective means of bioremediating oil spills. This project suggests that the addition of nutrients to a site of oil contamination is a means of improving the rate of biodegradation and bioremediation. However, the results also suggest that an excess amount of nutrients could have a detrimental effect on microbial growth and corresponding biodegradation.

Summary Statement
This project is an investigation of the effects of increased nutrient levels on the growth of oil-eating microbes and the corresponding changes in the rate of oil biodegradation.

Help Received
Project mentor, Dr. Jennifer Ross Viola, answered questions

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Rohan Bhushan; Paul Kunz

Project Number

J1502

Project Title

Nitrate: A Threat to Plankton

Abstract

Objectives/Goals

The main objective of this project is to investigate the effects of nitrate on aquatic microorganisms, such as plankton.

Methods/Materials

We built plankton net to collect plankton samples from the ocean. Other materials include a compound microscope, a nitrate solution, a nitrate testing kit, and a water sample collected from a river close to farmland. Our research methodology includes the nitrate experiment and the plankton experiment. We took a sample from a water source near a farmland and then tested for nitrate concentration to see whether farms contribute to the amount of nitrate in water sources. In the plankton experiment, we prepared four samples; two with nitrate added (n1, n2) and two without nitrate(x1, x2). To get accurate results, we divided each sample into two parts and observed the plankton movement through a compound microscope at an interval of 5 minutes.

Results

The nitrate experiment on a local water source showed that there is a high level of nitrate presence, about 6mg/l. In the plankton experiment, in sample x1, part 1, there was an average of 45 moving. In the second part of x1 there was an average of 110 plankton moving. In both first and the second part of x2, the average was about 60. This shows that sample x1 and x2 were very active. In the sample n1, part 1, there was an average of about 20 moving, and 5.5 moving in the second part. In the sample n2, part1, there was an average of about 4 moving, and in the second part, the average plankton movement was about 4.5. Most of the plankton was dead, save a few zooplankton drifting around in both cases with nitrate added.

Conclusions/Discussion

The problem this research focused on was the effects of nitrate on plankton. We did background research on the effects of nitrate on animals and humans and we tested water sample close to farmland to test whether fertilizers really are affecting the water. Then we conducted our plankton experiment by adding nitrate solution to the samples. We observed that the plankton samples without nitrate had more activity than the samples with nitrate. Our findings yielded the answer to our problem. We found out that nitrate killed most of the plankton in the sample. In the samples with nitrate, on average we saw about 8.5 plankton moving, but very slowly. In the other two, we saw average 68.75 plankton moving. From this we conclude that nitrate does have a negative effect on plankton.

Summary Statement

In our research we examined how nitrate in water sources affect aquatic microorganisms, like plankton.

Help Received

We used the lab facility and tools in Monterey Bay Aquarium Research Institute (MBARI).

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Sophia Broudy; Alyson Flescher; Krista Wilson

Project Number

J1503

Project Title

Algae Counts: Algal Growth Rate Response to Light Frequency and Day Period

Abstract

Objectives/Goals

Here we explore the effects of both different wavelengths of light and shorter day-periods on algal growth. We selected three different day/night periods (3, 6 and 12 hours of light then dark for the same period) and three different colors of light (red 660nM, yellow 590nM and green 570nM using L.E.D. light sources of equal brightness). Our experiment used a locally collected wild algal sample. Our initial hypothesis is that red light and earth-standard day/night periods (twelve hours) will produce the most algae cells after a two-week period.

Methods/Materials

Each of our 3 day-period sets was composed of 3 containers illuminated by our different light frequencies. To conduct our experiment we designed, built and programmed an "Arduino Nano" microcontroller to turn on and off lighting for our sets of algae containers and also used three light intensity sensors to record changes in the light transmitted through each of the three 12-hour containers (to determine "growth" rates from "cloudiness" changes of the algae solutions). All 9 containers started with the same amount of algae (from a well mixed wild-collected sample)and after being exposed to their light and day/night period five samples from each experimental container and one control (naturally lit container) was counted under a microscope to determine differences in final algae densities. From this we determined which day-period and light frequency treatments produced the most algal growth. Prior to the experiment we tested the ability of our sensors and logging system to record differences in light transmission ("cloudiness") through our algal solutions. During the two-week experiment hourly relative algal-density ("cloudiness") was recorded for each color of light in our 12-hour day-period set.

Results

We determined that 12 hour day-night periods and yellow light frequencies showed the highest algal growth rates. Unfortunately our wild-caught sample did not experience high enough growth to show differences in our hourly transmission data.

Conclusions/Discussion

Results of this study suggest that if algal physiology (photosynthesis and respiration) may be tied directly to earth#s day-period but not the light frequency we expected. Alternate hypothesis for our result, use of additional light frequencies, and responses of extensively studied "lab" species of algae need to be further explored.

Summary Statement

Our experiment explores algal growth rate response to different light frequencies and day periods.

Help Received

Krista's dad in Honolulu helped with microcontroller programming and construction via skype and phone.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Christopher J. Caterinicchio

Project Number

J1504

Project Title

Turf Wars: A Microbial Battleground; The Study of Microbial Growth on a Synthetic Turf & a Natural Grass Football Field

Abstract

Objectives/Goals

My project was to determine if the composition of a football field's surface has an effect on the amount of microbial growth. I believe that a synthetic, artificial turf football field will have more microbial growth than a natural grass field.

Methods/Materials

Six football players volunteered to run a predetermined churn pattern on either a 100-yard artificial turf field or 100-yard natural grass field. Three athletes were randomly assigned to the grass field and three athletes were assigned to the artificial field. Each player's right cleat was identically cleaned and disinfected immediately prior to coming into contact with the field surface being studied. After running the churn pattern, each player's right cleat was removed by me prior to leaving the surface under investigation. Samples were collected from the soles of each cleat and streaked onto a Petri dish. A total of six Petri dishes were inoculated; three from the grass field and three from the artificial field. A third group of uncontaminated sterile Petri dishes served as the control. All dishes were stored and allowed to grow in an undisturbed, warm location away from direct heat or sunlight. The number of colony forming units (CFUs), color, size and appearance of CFUs on each Petri dish was measured and recorded at zero, 24, 48 and 72 hours.

Results

The amount of microbial growth in samples from the artificial turf football field was greater than the amount of microbial growth from the natural grass field samples.

Conclusions/Discussion

Based on the evidence collected, more CFUs were found on the Petri dishes from the artificial turf field. My data showed that based on averages, the natural grass agar plates had between 25%-48% less CFUs overall than the artificial turf plates which supports my original hypothesis.

There was significant germ growth over 72 hours on both natural grass and artificial turf Petri dishes. These findings may help local athletes reduce their chances of getting a skin infection or other illness by practicing good hygiene.

Summary Statement

An artificial turf field has more microbial growth than a natural grass field.

Help Received

Mother helped get Petri dishes and provided supervision for collecting samples and handling Petri dishesVarsity Coach E.Terry allowed access to football players, dad helped assemble display board.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Aspen Emler; Josephine Ryan

Project Number

J1505

Project Title

Reducing Bacteria in Lake Water

Abstract

Objectives/Goals

Will the amount of bacteria colonies change based off of lighting of the environment?

Methods/Materials

Gathered lake water and placed in different bottles. Let the bottles sit in dark or lit area for a total of 28 days. Measured bacteria colonies off of agar plates from each bottle every few days.

Results

On day 0 the lowest number of bacteria colonies was 165 in open light bottle 1. The highest number of bacteria colonies was 900 in cove dark bottle 5. On day 7 the lowest number of bacteria colonies was 208 in open light bottle 2. The highest number of bacteria colonies was 780 in cove dark bottle 2. On day 19 the lowest number of bacteria colonies was 238 in open dark bottle 3. The highest number of bacteria colonies was 870 in open dark bottle 4. On day 21 the lowest number of bacteria colonies was 264 in open dark bottle 1. The highest number of bacteria colonies was 932 in cove dark bottle 1. On day 28 the lowest number of bacteria colonies was 357 in open dark bottle 1. The highest number of bacteria colonies was 768 in cove dark bottle 3.

Conclusions/Discussion

Our hypothesis that the amount of bacteria colonies will increase in the light was supported. As seen in our graph, the average amount of bacteria colonies from day 0 to day 28 increased from 548.2 to 620 and 377.8 to 580.2 in the water kept in the light. Our hypothesis that the bacteria colonies will decrease in water kept in the dark was supported. Overall, the amount of bacteria colonies decreased in the water bottle kept in the dark. As seen in our graph, the number of bacteria colonies from day 0 to day 28 decreased. Our hypothesis that there will be more bacteria in cove water was supported. The cove water was sitting still and more bacteria could build up in it. On day 28, the number of bacteria colonies in cove dark was 660 and open dark was 457.2, and cove light was 620 and open light was 580.2. Therefore, it will most likely take longer to decrease the amount of bacteria if it is cove water.

Summary Statement

The difference of bacteria colonies in lake water kept in the dark and kept in fluorescent light showed that light had more bacteria.

Help Received

coach helped with agar plates

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Keoni K. Gandall

Project Number
J1506

Project Title
Engineering Pink Salt

Abstract

Objectives/Goals
Create an open Halobacteria plasmid with do-it-yourself (DIY) methods

Methods/Materials
Materials---
Strains-
E. coli K12 ER2267, Halobacteria NRC-1

Plasmids-
pGreen, pBeloBac11, pUC19, pUC57 + insert,

Chemicals / media
DMSO, LB agar, Agarose, ethidium bromide, Bromophenol Blue/Xylene Cyanol Gel Loading Buffer, Distilled water, Epsom Salt, PEG 3350 (miralax), LB broth, Halobacteria broth, Halobacteria agar, Ampicillin, chloramphenicol, CaCl,
Gycerol,

Tools
Electrophoresis box, Transilluminator, Power supply, loops, Bunsen burner, pipettes, water bath, centrifuge, PCR machine, Vortex, refrigerator, freezer,
glasses,

Expendables
Inoculating loops (plastic), petri dishes, PCR tubes, Centrifuge tubes, Culture tubes, gloves, masks,

Results
All polymerase reactions were verified by electrophoresis. The projects DNA could not be because of minimal amounts (gibson assembly). No E coli colonies observed. Halobacteria colonies were observed.

Conclusions/Discussion
All of the Polymerase chain reactions worked. The actual DNA could not be verified because of minimal amount of it.

However, a streak colony was observed on one of the transformed plates. Since it was small, and salt

Summary Statement
Creating a shuttle vector for genetically modifying the thrid domain of life, Archaea.

Help Received
Went to LA biohackers for help with ethidium bromide, verification of PCR. Used my own electrophoresis equipment, used their transilluminator. Needed to go there for my fair's regulations. Everything else I did

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Bronwyn S. Gilfillan

Project Number
J1507

Project Title
Sweet Cultures

Abstract

Objectives/Goals
my objective/goal is to see which sweetener the probiotics like the best

Methods/Materials
methods:make the yogurt,test the thickenss
materials:milk,1 cup measuring cup,candy thermometer,stove thermometer,1/2 teaspoon measuring spoon,large pot,12-8 oz.mason storing jars with lids,maple syrup,brown sugar, honey,venegar,tasting spoons.

Results
my results are that the probiotics didnt like the honey because they seperated at the bottom, didnt like the maple syrup because it was very liquidy and not thick, and the brown sugar was thick and didnt seperate.

Conclusions/Discussion
i conclude that the probiotics liked the brown sugar the best.

Summary Statement
my project is about trying to find out which sweetener the probiotics like the best.

Help Received
Father helped get supplys;Mother helped stir mil and type fastly;family members helped taste yogurt and give opinion.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Amanda G. Hayes

Project Number

J1508

Project Title

Denaturation: E. coli's Enemy

Abstract

Objectives/Goals

The objective is to identify which common household disinfectant is the most effective in killing E. Coli. The hypothesis for my project is that if I use bleach as a disinfectant, then it will kill the most E. Coli.

Methods/Materials

In my experiment, I am using the Kirby-Bauer disk diffusion method to determine effectiveness of each antimicrobial agent. The four solutions are: household bleach, mouthwash, garlic powder, and a liquid floor cleaner (containing pine oil). The purpose of mouthwash is to rinse out excess bacteria. Garlic powder has been used for centuries because it possesses natural antibiotic properties. Pine oil cleaner has essential oils that is known to kill germs effectively. Currently, all of these have some kind of anti-bacterial properties. Next, nine nutrient agar plates were plated with E. Coli (strain K-12), two per disinfectant and one control. The agar plates were placed in an incubator for 24 hours and then the zone of inhibition was measured to analyze the results.

Results

The agar plates, infused with bleach had the most E. Coli killed. These plates only had bacteria growing on the edges. Clearly, bleach was far more effective than the other solutions I tested. The average zone of inhibition for bleach was 62.3 millimeters. On the discs infused with pine oil, a good amount of E. Coli around the filter disks were noticeable. The clearing was less than bleach, but greater than garlic powder. The average zone of inhibition for pine oil floor cleaner was 34 millimeters. Following close behind was the solution of garlic powder which read an average zone of inhibition of 20.3 millimeters. Lastly, on the mouthwash agar plates, E. Coli growth was evident on the entire surface of the agar plate. There were no E. Coli killed around any of the filter disks. The zone of inhibition, 0 millimeters clearly proved it was the least effective.

Conclusions/Discussion

After gathering information on my project, I can conclude that my hypothesis was correct, and bleach killed the most E. Coli due to its active ingredient, hypochlorite. Although pine oil floor cleaner and garlic powder also killed E. Coli bacteria, of the three, bleach was the most effective, and the one I would use to clean areas that may have E. Coli.

Summary Statement

My project was to identify which disinfectant is most effective in killing E. Coli.

Help Received

Access to lab equipment at Westmont College with the supervision of Dr. Steve Julio.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Brian Q. Kendrick

Project Number
J1509

Project Title
Designed by Slime: "Intelligent" Transportation Systems

Abstract

Objectives/Goals
The objective of my experiment was to test whether the Physarum polycephalum, a slime mold, is capable of creating dendritic networks between food sources. . I hypothesized that the Physarum polycephalum could be used to help highway engineers design the most efficient transportation routes since the slime mold has the ability to create the shortest path between two points.

Methods/Materials
I prepared ten agar plates and placed twenty oats representing cities within the boundaries of Los Angeles County and Orange County using a printout of a map of the freeway system of the two counties. Once the agar plates were prepared, a piece of the slime mold was placed on the oat flake representing downtown Los Angeles. The movement of the Physarum polycephalum and the connections it made between the oats were observed and then compared to the map, which had been reduced to match the size of the petri dish.

Results
The Physarum polycephalum did create shorter paths between most of the cities. Overall the total distance of the Physarum polycephalum created network was 4.96 centimeters shorter than the total distance of the paths between the cities on the present freeway system.

Conclusions/Discussion
These results support my hypothesis that the Physarum polycephalum is not only capable of creating the shortest path between two food sources, but can also be used as a tool to help guide the design of freeway networks and other transportation systems. This will help civil engineers around the world to design more efficient transportation systems.

Summary Statement
My project was conducted to test the ability of the Physarum polycephalum to create efficient transportation systems.

Help Received
Science teacher allowed use of lab tools to conduct experiment.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Sean J. Panado

Project Number

J1510

Project Title

Chlorine Kills: The Cell Density of E. coli in which Tap Water's Chlorine Can No Longer Kill

Abstract

Objectives/Goals

Before water is released from the supply reservoirs as pure, potable, finished water, it must be filtered and disinfected. Chlorination, using the reactive element chlorine, is a common method of treatment. In sufficient doses, chlorine kills microorganisms, including E. coli, within thirty minutes. Contamination of some strains of E. coli can cause serious food poisoning and sometimes death. My objective in this project is to determine the cell density at which chlorine loses its ability to kill Escherichia coli at 100%.

Methods/Materials

Three different types of water were tested: sterile distilled water, my school#s tap water, and a college lab#s tap water. A total of six trials were performed. Per trial, each type of water contained their own series of eight dilutions. Proceeding with the serial dilutions, I allowed the chlorine time to react. Then, I used the spread plate technique to spread each diluent onto a nutrient agar plate. After finding the original cell density, I converted it into exponential form. From there, I multiplied that number by the sample volume in which E. coli stopped growing on the tap water#s nutrient agar plates. I conducted the same for the last plate in which the E. coli grew. I divided the number of colonies on the last nutrient agar plate with growth by the number of colonies that would have grown if there was no chlorine in the water. I converted the result into a percent. This percent is how much E. coli survived.

Results

I have successfully formulated a reliable procedure that shows the range in which chlorine loses its ability to kill E. coli. I also realized the importance of high chlorine content within your tap water. If your tap water#s chlorine content is low, its antimicrobial effect on E. coli could almost be equivalent to that of sterile distilled water.

Conclusions/Discussion

The results and procedure can be used by water authority agencies. My results suggest that the minimum amount of residual chlorine content should be raised. The low requirement may lead to illnesses from infection due to the inefficient killing effect.

Summary Statement

I determined the range in which my school#s tap water can no longer effectively kill E. coli, and also, that the Free Residual Chlorine minimum standard of 0.2 mg/L should be re-evaluated.

Help Received

Supervised by Dr. Michael Leboffe; use of San Diego City College laboratory and equipment

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Srikant Sagireddy; Elliott Stenzler

Project Number
J1511

Project Title
Should You Dispose Disposable Water Bottles?

Abstract

Objectives/Goals
The goal of our project was to determine if reusing and refilling disposable water bottles is potentially unsafe to the consumer due to increased levels of bacteria growth.

Methods/Materials
Four subjects, two male and two female, who consumed Nestle brand of water from disposable water bottles over specific time periods. Water bottle one was consumed the first day and swabbed. Water bottle two was consumed the first day, refilled with bottled water to avoid tap contamination, and consumed a second day and swabbed. Water bottle three was consumed the first, second and third days, refilled twice and swabbed after the third day. Bacteria counts were taken and plotted after three days.

Results
: A substantial growth of bacteria occurred as the time periods of drinking and refilling increased. Water bottle one did not show a significant growth of bacteria when compared to the control, however, bottle two had a 30% increase in bacteria while the bottle three had a 180% increase. Additional trials are currently being conducted. All further data and results will be reported.

Conclusions/Discussion
When disposable water bottles are reused and refilled, bacteria growth exists and increases the longer the water bottles was reused and refilled. This project confirms that consumers should be concerned when reusing and refilling these bottles. Manufacturers of these bottles should equally be concerned and can conduct further studies on this matter. The next step with this study would be to classify the type of bacteria growth and how much is needed to do actual harm. Different brands of disposable water bottles can also be evaluated.

Summary Statement
To determine if reusing and refilling disposable water bottles poses a potential risk to the consumer due to growth of bacteria.

Help Received
Mrs. Stenzler and Mrs. Sagireddy for overseeing the safety practices of growing bacteria. Ms. Pompeya for teaching Elliott and Srikant how to make their own swaps and nutrient agar. She also initially assisted them in safe and effective procedures for growing and disposing of bacteria.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Nicholas D. Schanzer

Project Number

J1512

Project Title

High CO(2) + Low O(2) = Burgers That Stay Fresher Longer

Abstract

Objectives/Goals

The objective of this project was to investigate how a high CO2/low O2 environment affects the degradation of raw hamburger patties. I hypothesized that the bag containing CO2,O2 absorbers,and the fuel cell would extend the freshness and slow the degradation of the hamburger patty to the greatest extent. The bag with CO2 and O2 absorbers would be the next freshest,and the bag with O2 absorbers only would be the third freshest. I expected that the control would spoil first.

Methods/Materials

I put 4 raw hamburger patties in different packaged environments in a refrigerator for 14 days: one with nothing in it except ambient air; one with O2 absorbers; one with a CO2 flush and O2 absorbers; and one with a CO2 flush, O2 absorbers, and a fuel cell to see which hamburger would appear and smell the freshest after 2 weeks. After every 4 days, I took O2 and CO2 readings with an oxygen analyzer. On day 14, I took out the hamburgers and rated them on a scale of 1-5 in terms of smell and appearance.

Results

The percentage of O2 dropped drastically in Bags 1 and 2 over the course of the experiment. Bags 1 and 2 started out with 19.7% and 19.9% O2 respectively. Over time, the O2 dropped all the way down to zero. Since Bag 3 was flushed with CO2, almost all the O2 inside it was removed. Shortly after day 1, the level of O2 dropped and remained at 0%. Bag 4 was also flushed with CO2 and nearly all the O2 was removed. The O2 in Bag 4 slowly rose until days 12-14 when a major spike occurred. A leak was suspected. The percentage of CO2 increased in Bags 1 and 2 over the course of the experiment. Bag 3 remained constant with a 100% CO2 environment throughout the experiment. In Bag 4, CO2 started at 100%. It steadily dropped until days 12-14 when a major decrease occurred. Again, a leak was likely. The hamburger in Bag 3 had the best appearance and the freshest smell at the end of the experiment while Bag 4 had the worst appearance, and Bag 1 had the worst smell.

Conclusions/Discussion

Most of my results supported my hypothesis. A high CO2/low O2 environment extends the freshness of and arrests microbial growth on raw hamburger patties. Bag 3 appeared and smelled the freshest because bacteria couldn#t survive in the 100% CO2 environment. Bags 1 and 2 had the most spoilage. Bag 4 was the second freshest, which did not follow my hypothesis, because there was a leak in the bag.

Summary Statement

A high CO2/low O2 modified atmosphere environment can keep raw hamburger patties fresher over 14 days.

Help Received

My dad helped get the supplies and taught me how to use the equipment. Mr. Larry Bell and Mr. Dave Nemiroff were my advisors and offered technical support.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Yinghao Wang

Project Number
J1513

Project Title
Contaminated Milk

Abstract

Objectives/Goals
Find out which milk (Vitamin D (whole), 2%, or Fat-Free) will contain the most amounts of bacteria colonies.

Methods/Materials
Need agar powder, liter of water, Incubator, Vitamin D (whole) milk, 2% milk, fat-free milk, Petri dishes, Pipette, Q tips, Bacteria colony counter

Leave the Vitamin D milk in the incubator. Make the agar solution. Put agar solution on the petri dishes. Bring Vitamin D milk out of the incubator. Use pipette to measure 0.25 ml of milk. Squeeze 0.25 ml of milk on all of the petri dishes. Put lids on the petri dishes and put the petri dishes in the incubator. Bring out the petri dishes after 2 days and count the number of bacteria colonies. Repeat the process with the other 2 types of milk.

Results
The Vitamin D (whole) milk had an average of 5.5 bacteria colonies in it, the 2% milk had an average of 2.5 colonies in it, the Fat-Free milk only contained about 0.6 colonies. There was no high point or low points for the Fat-Free milk. There were no high points or low points for the 2% milk. The high point for the Vitamin D (whole) milk was 13 colonies. There was no low point for the Vitamin D (whole) milk.

Conclusions/Discussion
My hypothesis was supported. My hypothesis that if Vitamin D (whole), 2%, and fat-free milk are left in an incubator at 37°C for 2 days, then Vitamin D will have the most bacteria colonies on it because Vitamin D milk contains the most amount of fat. My graphs and table show that the Vitamin D milk had an average of 5.5 colonies in it. The 2% milk had 2.5 colonies in it. The Fat-free milk had 0.6 colonies in it.

The reason to this might be that the amount of fat are different in the three milks. From the nutrition facts, the Vitamin D contains 8 grams of fat per cup. The 2% milk has 5 grams of fat and per cup. The Fat-free milk has 0 grams of fat per cup. The reason why this happened might also be due to that the amount of pasteurization in the milks are different. The less the amount of pasteurization, the more bacteria will be in the milk. Vitamin D milk is the least pasteurized milk, so it contains the most bacteria.

Summary Statement
Count the amount of bacteria colonies on Vitamin D (whole) milk, 2% milk, and Fat-Free milk.

Help Received
Got materials from Ms. Herrington and did my experiment in her room.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Ward H. Watts

Project Number
J1514

Project Title
Keep Off the Turf?

Abstract

Objectives/Goals
My objective was to determine whether bacteria is growing on the three artificial turf fields in my home town. If so, which artificial turf field has the most bacteria? Further test the colonies to determine if any are Staph.

Methods/Materials
With sterile swabs, I obtained samples from three different locations on each of the three artificial turf fields for a total of nine samples. I grew each sample at room temperature on prepared petri dishes with agar for 5 days. I observed, logged and analyzed my data. I counted how many colonies there were on each petri dish. I averaged the bacteria colonies for each location an compared them to each other.

Results
The results found bacteria on all three artificial turf fields. The most bacteria was found on the football field, the oldest field of the three. The baseball field, the second oldest, had slightly less bacteria than the football field. The soccer field, installed this year, had the least.

Conclusions/Discussion
Bacteria grew on all of the fields despite the fact that the turf fibers are inert and that there is nothing to feed it. I believe bacteria is brought on to the turf by people spitting, rubbing their bodies on the turf, and by what people bring on the bottom of their shoes. Heat from the sun should kill bacteria but our coastal climate doesn#t have the hottest weather. I predicted that the oldest field would have the most bacteria but was surprised by the amount found on the baseball field since the field is not being used as often and is not as old.

I did additional testing to see if any of the colonies could be staph. I did gram staining and found 4 colonies #two from the baseball field and two from the football field. I tested these colonies to see if they would grow on a MS (mannitol salt agar) plate that only grows staph. 3 colonies grew on the MS plate. One of the three changed the plate yellow, indicating S. aureus - a strain that people can be sensitive to and can be dangerous if it is antibiotic resistant.

I can imply, based on my results that the soccer field will eventually have bacteria like the football field and that people should be aware of the potential dangers.

Summary Statement
Determine if bacteria grows on artificial turf fields.

Help Received
My mom helped me design my experiment and type my report. To do gram staining, I used the lab equipment at SF State under the supervision of a neighbor, a SF Biology teacher- Amber Johnson.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Alyssa (Aly) R. Neistadt

Project Number

J1598

Project Title

Prokaryotes and a Prandial: Identification of Bacteria Colonies in Restaurants

Abstract

Objectives/Goals

My objective was to identify the quantity of bacteria, types, and potential health risks associated with the bacteria found in fast food establishments. I compared the overall health risks of each restaurant according to the amount of harmful bacteria found. My hypothesis is that In-n-out will be the most sanitary and that McDonald's will be the least sanitary.

Methods/Materials

I cultured bacteria from five specific objects in four different fast food restaurants using sterile materials. I recorded the bacteria growth daily for six days. Next, I identified the bacteria using gram staining techniques, a microscope, and extensive research.

Results

After totaling up the bacteria colonies found in each restaurant and identifying whether or not the bacteria was harmful, I determined that In-n-out was the most sanitary. The In-n-out samples grew fewer colonies of bacteria overall, and 90% of bacteria that did grow were not harmful. Carl's Jr. was the most unsanitary, it grew more colonies than the other restaurants, and harmful bacteria was found in three of the five objects tested.

Conclusions/Discussion

The results of my project showed which local fast food restaurants were the most sanitary. This project also revealed certain areas in the restaurants that were prone to bacteria colonies. Using this information, fast food restaurants could be more aware of which areas demand special attention, and how to prevent bacteria proliferation.

Summary Statement

My project is about cultivating and identifying bacteria found in various fast food restaurants.

Help Received

Mr. Williams helped me format my board; my father drove me to the restaurants I swabbed; my mother helped me take pictures.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Lauren M. Harris

Project Number
J1599

Project Title
Bacilli Backtrack

Abstract

Objectives/Goals
The objective of this experiment was to find out how different types of metals affect the zone of inhibition of exposed bacteria. I hypothesized that copper and brass metals would inhibit the bacteria most since they come from a family of metals that have anti agents used to kill most bacteria compared to zinc, magnesium, and aluminum metals which have minerals within them allowing the growth of bacteria in all areas. Copper is in a family that includes anti agents known to kill most bacteria which would inhibit bacterial activity in several ways within the petri dish. Oppose to zinc, which is from a family of metals that have minerals and enzymes within them that bacteria feed on.

Methods/Materials
To begin, I started with 50 agar filled petri dishes and 5 different types of metals. First, the petri dishes were inoculated using a triangle-shaped template with E.coli. Then,I cut the metals into pieces that would form a triangle in the center of each petri dish and sterilized the metals. During the previous step I made sure the triangles of metals were the same size. Soon after, the triangles were placed in the center of each petri dish the dishes were closed, taped, and left in an incubator upside down for 3 days. Every 3 days the zone of inhibition was measured with a caliper for a total of nine days.

Results
The results of this experiment support my hypothesis. I hypothesized that copper metals would inhibit the bacteria most since it includes anti agents that kill bacteria compared to zinc which has minerals that allow the growth of bacteria. The hypothesis was supported since all copper metals inhibited the bacteria best, and left some trials with an average zone of inhibition of 9.858 mm away from the substance. The zinc allowed the bacteria to grow until it was completely overtaken. By day nine, most trials were overtaken while some remained with an average zone of inhibition of 1.922 mm.

Conclusions/Discussion
These results supported my hypothesis since the copper did inhibit the bacteria most and stopped most activity when the zinc trials were all overtaken by the bacteria in the end of the study. This experiment connects to the real world since metals could be used to inhibit bacteria instead of medicines. These studies could help professionals incorporate the use of anti agents in metals to promote sanitation oppose to medicines, to help save money and create new products for future generations.

Summary Statement
This project is about how several metals can affect the growth of bacteria around us and on many of our surfaces.

Help Received
Ms. Fisher (Teacher): For helping me gain all supplies needed for my project, helping me make the agar needed for my project, and guiding me throughout my entire project with plenty of detail.