CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Bailee D. Ankrom

Project Number
J1601

Project Title
The Antioxidant Effects of Beta Carotene and Vitamin C on Agrobacterium tumefaciens Tumors as seen on Mammoth Sunflowers

Abstract

Objectives/Goals
The purpose of the experiment is to determine whether the antioxidants Beta Carotene and Vitamin C are effective in preventing tumor (gall) formation in Mammoth Sunflowers. The effect of the antioxidants on plant height is also examined. I expect the antioxidants to have a positive effect on gall prevention and plant height.

Methods/Materials
Six groups of sunflowers (A,B,C D E & F) with five plants in each group were planted using the same type of soil and same size pot. The plants were rotated regularly to ensure equal exposure to sunlight. They were given equal amounts of watering solution every second day. Groups A & D were given water supplemented with Beta Carotene, Groups B & E were given water supplemented with Vitamin C and Groups C & F were given water without antioxidants. On day 21 Groups A, B, & C (one group from each watering category) were inoculated with A. tumefaciens. Plant growth and gall formation were measured every second day over a period of 54 days.

Results
The plants inoculated and given Beta Carotene formed 9 galls, the plants inoculated and given Vitamin C formed 3 galls and the plants inoculated and given water formed 2 galls. The antioxidant solutions were not preventive in gall formation. There was no significant difference between the height of the Beta Carotene plants, the Vitamin C plants or the water plants. All p values were > 0.05 There was no significant difference between the height of the inoculated and non-inoculated plants with a p value = 0.1267

Conclusions/Discussion
Although the data was inconclusive and did not support the hypothesis this may have been due to the small sample size. I believe that further research in this area is important as it could lead to important finding concerning the use of antioxidants in tumor or cancer biology.

Summary Statement
This experiment examined whether the antioxidants Beta Carotene and Vitamin C have an effect on plant gall formation.

Help Received
My family helped me in designing my project, measuring the plants and analyzing the data.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Justin R. Aoyagi

Project Number
J1602

Project Title
Germophobia

Abstract

Objectives/Goals
The problem with germs is that we can't see them with our eyes so it is hard to avoid contact. We share many things at school including germs.My experiment was to find which object at Holy Name School that we come in contact with is the "GERMIEST". I chose 5 different objects; the computer keyboard, classroom desk, boys' bathroom toilet handle, basketball in the gym and the school office telephone. I also expanded on last year's science project findings and experimented on real germs to see which of the two hand-cleaning agents (Hand Sanitizer with alcohol or Anti-Bacterial Soap) will kill more germs by applying them to the samples I collected. The purpose of my project is to help my family and friends to stay healthy, be protected and be aware of Germs. Germs spread when we pick up a germ and touch something else and someone else touches something and keeps spreading. If we are aware that germs are everywhere around us, it's helpful especially during the flu season to learn where we share the most germs.

Methods/Materials
1. Label all 16 Petri Dishes w/masking tape to identify the content. 2. Wipe the Petri Dish labeledw/Anti-bacteria Soap and Hand Sanitizer w/ Alcohol using a clean swab with theeach of the solutions indicated. Close the lid immediately after the solutionsis applied. 3. Collect specimen from thefrequently touched surface chosen. (Computer key board, classroom desk,Toilet Handle in bathroom, Basketball in Gym, telephone in school office). 4. Roll and rub them onto the Agar of each labeled PetriDish. 5. DisposeSwab after each use. 6. Tape around the Petri Dishto secure the lid to the Petri Dish with Agar. 7. Place all 16 Petri Dishesin box to keep dark and near the heater thermometer where room temperatureis steady at 74F. 8. Observe daily for 5 days and keep a logrecord and chart any changes of the Petri Dish with Germ samples collected. Iam looking for number of colony spot growing, changes in color, shape and sizes.

Results
My hypothesis was partially correct. First half was wrong; the school office telephone had the most amounts of bacteria instead of the boy#s bathroom toilet handle after 5 days. The second half, my experiment on real germs proved last year#s findings were true. Anti-bacteria soap is more effective on germs. The results show the importance of washing hands with anti-bacterial soap and germs are all around us.

Conclusions/Discussion
The results show the importance of washing hands with anti-bacterial soap and germs are all around us.

Summary Statement
What is the most germiest place at school and which cleaning agent is most effective to kill germs

Help Received
Mother helped ordering the mateiral online; My science teacher, Mrs. Miller gave me advice when the first two trials of collecting germs did not work.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Hanna Erquiaga; Alicia Hoxie

Project Number

J1603

Project Title

The Battle of Chlorhexdine vs. Betadine

Abstract

Objectives/Goals

Our objective in this project was to see which chemical scrub worked better to defeat bacteria from the bottom of a horses foot better. The reason we did this is because horses are constantly getting injured in their feet, so it is important to kill most of the bacteria in and around a horses injury so that it doesn't cause infection.

Methods/Materials

MATERIALS

-three horses; -supervising veterinarian; -BD BBL stacker plates; -sterile swabs; -Betadine scrub (8% iodine concentrate); -Chlorhexdine scrub (2% Chlorhexdine concentrate); -hoof picks; -latex gloves; -towels; -timer.

METHOD

-spray down horses legs with water; -pick hoofs; -wipe all over hoof with clean towel; -scrub left front hoof with Betadine for one minute; -sterile swab around frog and place on petri dish in Z formation while held at 45 degree angle; -scrub right front hoof with Chlorhexdine for one minute; -swab and place on petri dish in same fashion; -swab left hind hoof (control) using no soap and apply to petri dish in same fashion.

Results

Joe's Betadine average total colonies between test one and two was 3,000. Chlorhexdine was 750. Control foot was 4,000. Pokie's Betadine total colonies between test one and two was 3,407. Chlorhexdine was 835. Control was 4,600. Otis' Betadine total colonies between test one and two was 2,200. Chlorhexdine was 910. Control foot was 3,700

Conclusions/Discussion

Our hypothesis was that Chlorhexdine would defeat more bacteria than Betadine, and our data supported this. We figured out which one would defeat the most bacteria scrubbing the bottom of the left and right front feet of the horse. We swabbed each foot after scrubbing and but the substances on the swab and then onto the petri dish, and observed the growth for five days. If there was something that we could do differently on this project, it would be to see if we got the same results with the petri dishes held at a different temperature. (Our mentor, Sheri Cronin, is switching from Betadine to Chlorhexdine because of what our results have shown!)

Summary Statement

Defeating bacteria from the bottom of horses feet with different chemical scrubs.

Help Received

Used lab equipment, under supervision, at office of veterinarian Sheri Cronin

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Amith T. Galivanche

Project Number
J1604

Project Title
Antimicrobial Activity of Clove Oil and Cinnamon Oil against Escherichia coli

Abstract

Objectives/Goals
In this project, the antimicrobial effectiveness of cinnamon oil and the antimicrobial effectiveness of clove oil were tested against the Gram-negative Escherichia coli.

The hypothesis of this study was "If the antibacterial properties of clove oil and cinnamon oil are tested against the Gram-negative bacteria, E. coli, then they will show effective results in terms of Zone of Inhibition, Minimum Inhibitory Concentration (MIC), and Minimum Bactericidal Concentration (MBC)."

Methods/Materials
Procedures included the Kirby-Bauer Disk Diffusion Method for testing the Zone of Inhibition, the Broth Dilution Method for MIC and nutrient agar plate method of testing MBC. In the disk diffusion method, a filter paper disk is impregnated with a certain antimicrobial agent and is placed on an agar plate that has already been swabbed with bacteria, and incubated at 37° C for 24 hours. The Zone of Inhibition is the area around the impregnated filter paper disk with no bacterial growth after overnight incubation. In the Broth Dilution Method, a serial dilution is performed with essential oils fighting E. coli and LB Broth. After overnight incubation at 37°C, the MIC end point is determined as the lowest concentration of essential oil, at which there is no visible growth of bacteria. To determine the MBC, the liquid in each test tube is swabbed onto an agar plate. After overnight incubation at 37°C, the last plated test tube with no bacterial growth on the agar plate will be determined as MBC.

Results
The results showed that cinnamon oil performed significantly better than clove oil. Zone of Inhibition of Amoxicillin was 26.33 mm, and that of cinnamon oil was 22.0 mm. The clove oil had a lower Zone of Inhibition at 14.0 mm. The MIC of clove oil is 0.0078 mL and MBC is 0.0156 mL. The MIC/MBC value of clove oil is 0.5. The MIC of cinnamon oil is 0.0039 mL and MBC was 0.0156 mL. The MIC/MBC of cinnamon oil is 0.25.

Conclusions/Discussion
The results of the study consistently proved that cinnamon oil is a more effective antibacterial agent against E. coli compared to clove oil. However, clove oil showed good antibacterial properties against E. coli. The results of the study suggest that the essential oils of clove and cinnamon have a good potential to be used as natural, low cost and easily available antibiotic agents against E. coli, a Gram-negative bacteria.

Summary Statement
The purpose of this science fair project was to determine and compare the results of the antibacterial activity of clove oil and cinnamon oil against Escherichia coli.

Help Received
Mrs. Schmahl mentored my project and Dr. Khalaf and Mr. Carroll guided me through laboratory procedures.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Saachi Jhandi

Project Number
J1605

Project Title
Garlic Keeps Bacteria Away

Abstract

Objectives/Goals
The objective is to determine if raw garlic or boiled garlic is more effective in inhibiting the growth of E. coli.

Methods/Materials
Four test tubes containing 10 ml of milk each were used. One of the test tubes was left with only 10 ml of milk in it as a control. 0.5 ml of E. coli in broth was added to the three other test tubes. One of the test tubes with 10 ml of milk and 0.5ml of E.coli in broth was kept as a second control. In one of the remaining two test tubes raw garlic extract was added, and in the second test tube boiled garlic extract was added. The test tubes were allowed to incubate for 12 hours. After incubation, the contents of the test tubes were transferred to four petri dishes prepared with blood agar. The growth of the E. coli was observed and measured using a ruler everyday for a span of 5 days.

Results
The raw garlic was more effective than the boiled garlic in inhibiting the growth of E. coli. The petri dish that was inoculated with the E. coli and raw garlic mixture showed no bacterial growth throughout the duration of the experiment. The petri dish that was inoculated with the E. coli and boiled garlic mixture grew 8 centimeters over the course of 5 days. The petri dish that was inoculated with mixture of milk and E. coli grew 10 cm; petri dish that was inoculated with milk alone did not show any bacterial growth.

Conclusions/Discussion
My conclusion is that both boiled garlic and raw garlic inhibit the growth of E. coli, although raw garlic is more effective. The way in which a home remedy is prepared does affect the way it performs. In the case of garlic and E. coli, the way in which the remedy was prepared played a key roll in suppressing bacterial growth.

Summary Statement
The bacteriostatic effect of raw garlic extract was compared to boiled garlic extract, I found that raw garlic extract suppresses the growth of E. coli better than boiled garlic extract.

Help Received
Parents helped proof read and took pictures. Uncle helped in getting E. coli specimen.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Janie Kim

Project Number

J1606

Project Title

Solution Sensation: A Study of the Antimicrobial Effectiveness of Contact Lens Solutions Against MRSA

Abstract

Objectives/Goals

The objective of this experiment was to find which out of five RGP contact lens solutions: Boston Advance Conditioning Solution; Lobob Soaking Solution; Boston Simplus Multi-Action Solution; Menicare Multipurpose Solution; and Opti-Free GP Multi-Purpose Solution, prohibited the growth of MRSA strain TCH 1516 the most effectively.

Methods/Materials

MRSA TCH 1516 was grown onto a Todd Hewitt Agar plate. A colony was put into 5 ml of Todd Hewitt Broth and was grown for 7 hours, was spun in a centrifuge for 6 minutes, then diluted to an optical density of 0.40 using a spectrophotometer. It was then diluted to 1:20 in phosphate buffered saline. 200 µl of each solution, 2 wells each, were pipetted into an assay plate, Row A. 100 µl of CA-MHB broth was added to all other wells. 100 µl from Row A was moved to Row B, then from B to C, etc until the last row. 90 µl of every well was moved to a new assay plate and a positive/negative control was added. 10 µl of the bacteria solution was added to every well except the negative control. The plates were parafilmed then placed in a shaker incubator for 15 hours. After incubation, 10 µl of rezasurin was added, and the plates were incubated for 24 hours.

Results

The saline averaged 45% in the percentage of solution in which bacteria began to grow, and the bacterial growth was extremely high. Advance averaged 1.58203125%, placing 2nd in terms of effectiveness after Simplus' 0.52734375%. There was a defined "dot" in the bottom center of the well, with a cloud of growth around it smaller than in saline. Lobob averaged 5.625%, Menicare averaged 2.8125%, and lastly, Opti-Free performed the "worst", averaging 14.0625%.

Conclusions/Discussion

Boston Simplus, was most effective in discouraging growth of MRSA, and average of the percentage in which bacteria began to grow was 1.58203125%, rather than the hypothesized 2.8125%. Solution 2, Boston Advance, was second most effective and was most effective out of the two-step solutions, averaging 1.58203125%, rather than the hypothesized 2.8125%. The three other solutions did not perform as well (due to less thorough preservative combinations?). The sterile saline control averaged 45%, which proved that the preservatives did make a difference in antimicrobial strength. The two preservatives that seemed to be most effective in combination were Chlorhexidine Gluconate and Polyaminopropyl Biguanide, both contained in the top two solutions.

Summary Statement

This project tested the antimicrobial effectiveness of 5 RGP lens solutions and a saline control against MRSA TCH1516.

Help Received

Used lab equipment at UCSD under supervision of Dr. Victor Nizet, Mr. Leo Lin and Wdee Thienphrapa. Mother and father drove me and bought lens solutions.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Priyanka J. Koliwad

Project Number
J1607

Project Title
Soccer Players Beware! Identifying and Preventing Bacterial Growth on Sports Equipment

Abstract

Objectives/Goals
To identify bacteria growing on soccer shin guards in order to figure out how to prevent this growth.

Methods/Materials
Materials: Cotton swabs, Blood agar plates, sweaty shin guards sampled right after use, Crystal violet, Gram's iodine, acetone/ethanol, 0.1% basic fuchsin soln., glass slides, bunsen burner, light microscope , oxidase reagent, 3% hydrogen peroxide, MacConkey agar
Methods: Isolating Bacteria: Swab shin guards. Streak on blood agar. Culture upside down in a cool place for 2 w. Gram Stain: Streak samples on new slides. Dry samples over flame. Spray samples with crystal violet, allow to sit for 10-20 s, then rinse. Add Gram's iodine solution. Let stand for 1 min then rinse. Add decolorizer then rinse for 10 s. Counter stain with basic fuchsin. Hemolysis Test: Re-streak cultures onto blood agar. Wait 3 d. Look at the clearing of the agar (hemolysis).
Catalase Test: Place a small amount of culture onto slide. Add H202. A positive reaction is seen as bubbling. No bubbles mean a negative reaction.
Oxidase Test: Re-streak a culture onto paper. Place a drop of oxidase reagent onto the paper. A positive reaction turns blue within 10-30 s.
MacConkey Test: Streak a MacConkey plate with the selected bacteria. Culture for 2 d. Yellow cultures ferment lactose. No color change indicates non-fermenters.
Identifying the Bacteria: Use an algorithm to identify bacteria based on test results.

Results
Sample A: Grew Gram+ cocci (round) in clusters. They were catalase+ and hemolytic. This makes it S. aureus or S. epidermis. We tested whether it was a methicillin resistant. It was not. Sample B: Gram-, catalase+ and non-hemolytic. Therefore, it was most likely S. hycius, a normal skin flora. Sample C: Gram, oxidase+, and did not grow on MacConkey agar. Given that it was a non-motile bacillus (rod), it was most likely a Gram- normal skin flora. Sample D: Gram-, oxidase+, and grew on MacConkey agar (lactose fermenter). It was non-motile. Therefore, it was either Acinetobacter or a non-motile Aeromonas.

Conclusions/Discussion
Bacteria grew from the shin guards we studied. Though ours were normal flora, some bacteria do cause disease. Because skin infections are reported from sports equipment, it makes sense to prevent all bacterial growth on shin guards. Some ways include chemicals (70% alcohol, chlorhexidine), antibiotics, or barriers. My next goal is to compare these approaches.

Summary Statement
This project is designed to identify bacterial species growing on soccer shin guards in order to better understand what sorts of approaches might be used to prevent odors and skin infections.

Help Received
Worked in UCSF Microbiology Lab to perform specific tests under the supervision of Dr. Miller. See letter from Dr. Miller for details. My parents helped me join two display boards together to make a larger board.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Zoey N. Lykins

Project Number
J1608

Project Title
Bacteria Killers

Abstract

Objectives/Goals
The purpose of my project was to determine whether antibiotics or probiotics work better at killing bacteria.

Methods/Materials
1. Petri dishes
2. Pro/Anti Biotics
3. Tissue paper
4. Ecoli
5. Cotton Swabs

I gathered my antibiotics, probiotics, petri dishes, and ecoli bacteria. First, i got my bacteria and made a S motion on each petri dish. Next, i got my antibiotics and probiotics and tissue paper and dipped each tissue paper in the liquid antibiotics and probiotics and placed them on the petri dishes. Then, i waited 5 days to check my results.

Results
The results of my project was that antibiotics wored better than probiotics at killing bacteria.

Conclusions/Discussion
I believe that the antibiotics work better than the probiotics because doctors prescribe them to patients with any bacteria caused disease.

Summary Statement
My project was about discovering whether probiotics or antibiotics work better to prevent the growth of bacteria.

Help Received
Mr.Scott helped to correct; Mother bought supplies; Grandmother gave information on subject

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Luca V. Mendoza

Project Number
J1609

Project Title
Can Electricity Kill Bacteria?

Abstract

Objectives/Goals
Bacteria is one of the main causes of sickness and disease. Antibiotics are harmful poisons. An effective, quick, and practical solution to the cause of some of the most foreboding of sicknesses is yet to be found. The purpose of this lab is to illustrate how bacteria can be eradicated with the use of an electric current. This simulates the method of the most common type of leukocyte, the neutrophil. The neutrophil, comprising the majority of leukocytes, uses an electromagnetic flux around 60mA to kill invading microbes.

Methods/Materials
In this experiment, two types of bacteria, the gram-negative Serratia Marcescens and the gram-positive Micrococcus Roseus, were smeared onto 12 different plates. The plates contained "Nutrient Agar 1.5," which has an added amount of sodium for conductivity. The ends of two copper wires carrying nine volts for half the trials and six for the other were then inserted into the dishes for varying times of 1 minute and 30 seconds. This results in 12 plates, three of each of the bacteria, one for each time length and one control.

Results
Each of the dishes showed a distinct difference from the control, the 1 minute plate more so than the 30 second plate. This took approximately two days to show, but upon that, there was no visible sign of bacteria between the slits created from inserting the wires into the agar.

Conclusions/Discussion
The experiment accurately represented the hypothesis, as both bacteria showed no growth in the area affected by the electrical current, indicating the bacteria had been exterminated.

Summary Statement
Low voltage electricity was successfully used to eradicate two types of bacteria, Serratia Marcescens and Micrococcus Roseus.

Help Received
Parents ordered supplies.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Titus M. Patton

Project Number

J1610

Project Title

Antimicrobial Activity in Stingray Mucus: A New Source for Treatment of Infections

Abstract

Objectives/Goals

The objective is to determine if a Cownose rays epidermal mucus will inhibit three types of bacteria: Micrococcus luteus, Staphylococci epidermidis, and Escherichia coli. If the lack of infection in rays is related to antimicrobial activity in their epidermal mucus; then, the Cownose rays epidermal mucus will inhibit cultures of bacteria.

Methods/Materials

Two forms of fresh epidermal mucus were collected from 12 Cownose stingrays. One drop of mucus from direct scraping was used to plate 5 Petri dishes of each type of bacteria culture; while the diluted mucus was centrifuged and two drops were put in each dish to plate 10 Petri dishes of each type of bacteria culture. Prior to plating the mucus, each Petri dish were inoculated with stock bacterial cultures of one of three bacteria: Escherichia coli, Micrococcus luteus, and Staphylococcus epidermidis. After 72 hours, my readings consisted of measuring the area of inhibition created by the epidermal mucus.

Results

The results of my investigation of the protective mucus from Cownose rays indicate that there was an antibacterial inhibitory component in the mucus. All Petri dishes for each of the three bacteria showed inhibition, except one in each bacterium. The average inhibition for non-centrifuged mucus on Escherichia coli was 4.75mm, and averaged 16.95mm for centrifuged mucus. The average inhibition for non-centrifuged mucus on Micrococcus luteus was 2.5mm, and averaged 13.35mm for centrifuged mucus. The average inhibition for non-centrifuged mucus on Staphylococcus epidermidis was 3mm, and averaged 13.75mm for centrifuged.

Conclusions/Discussion

This project has shown that there is an antimicrobial inhibitory component in the epidermal mucus secreted by the Cownose rays and that this inhibition is effective against both gram-positive and gram-negative bacteria. This is important to determine because one of the major concerns in medicine over the past ten years has been the increasing bacterial resistance to common antibiotics. A follow-up on the results of this project might, in the future, provide useful mucus-based medicines that would benefit humankind.

Summary Statement

Due to the inhibitory effects on bacteria growth, stingray mucus may be a possible new source of antibiotic medicine.

Help Received

Adrian Castro, Director of Education, Fresno Chaffee Zoo, coordinated meetings; Sandy Pitts, CIG Education Specialist, Fresno Chaffee Zoo, coordinated meetings; Lewis Wright, Dr. of Veterinarian Medicine, Fresno Chaffee Zoo, mucus collection; Renee Tindall, Aquarist, Fresno Chaffee Zoo, mucus

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Aspen S. Reed

Project Number
J1611

Project Title
Investigating Effects of Cajun Spices

Abstract

Objectives/Goals
I like Cajun style fish and chicken. I read an article that said there could be antibacterial effects from Cajun spices, but the findings were still controversial. I decided to investigate and try to find an answer. Based on my research, I believed that the Cajun Spices would have antibacterial effects because of the many different spices in the ingredients., I believed that Red Cayenne Pepper, Black Pepper, and Oregano would have antibacterial effects because they contain carvacrol. In some recent studies, carvacrol was the strongest antibacterial agent found in spices. I believed thyme would be antibacterial because it contains both thymol and carvacrol.

Methods/Materials
I repeated my procedures in three separate trials. I used a total of 74 plates of Coliscan Easygel. This media could identify coliform bacteria and E. coli. I tested eight spices multiple times with replicates. The spices I tested were Cajun Spice, Garlic, Onion, Salt, Oregano, Thyme, Black Pepper/Peppercorns, and Red Cayenne Pepper. I also plated positive controls and negative controls. I plated serial dilutions of 1/10 and 1/100 for the creek water, which was my source of bacterial contamination. In each plate, I placed 0.10 gram of each test spice, which I measured to the nearest 0.01 of a gram on a digital scale. I analyzed each plate individually and photographed the plates.

Results
Surprisingly, many of the spices I tested appeared to have no inhibitory effects on microbial growth. Bacteria and molds often grew directly on the spices in the plates. However, I found that garlic and onion both appeared to moderately inhibit the growth of coliforms. No large coliform colonies grew in any of the garlic or onion test plates. In the garlic plates no E.coli or molds were observed. Few noncoliform colonies grew in the garlic plates. Garlic was the most effective spice in inhibiting microbial growth. No E. coli was observed in the onion plates, but numerous molds grew in the onion test plates. No E. coli was seen in the black pepper plates, Cajun spice seemed to moderately inhibit non-coliforms and molds.

Conclusions/Discussion
It may be that the antimicrobial compounds in the spices which are fat soluble are extracted and become more active in foods, but in this water challenge, no zones of inhibition were observed in the growth media.

Summary Statement
The purpose of this project was to investigate the antibacterial properties of Cajun Spices

Help Received
I would like to thank my mother for driving me to the creek to obtain water samples. I would also like to thank my science teacher for supplying me with some of the materials needed for the experiment, teaching me sterile procedures, and providing a lab in which to perform my procedures.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Layla G. Stefanacci

Project Number
J1612

Project Title
The Antibacterial Effectiveness of Essential Oils

Abstract

Objectives/Goals
The objective is to determine how effective four different essential oils (thyme, lavender, geranium, tea tree) are in killing Escherichia Coli K-12.

Methods/Materials
Nutrient broth was made and incubated for 24 hours. After this period, the choice oil was added. The mixture was then diluted six times over, from 1:1 to 1:100000 and each one of these was plated. After the plates being incubated for 24 hours, the one with colonies between 30-200 would be used for future testing.

Results
Thyme oil proved to be the most effective, leaving about 349,000 bacteria after treatment. Lavender oil was the least effective and left an average of 3,500,000 bacteria.

Conclusions/Discussion
Essential oils are more than home remedies and should be considered further in the scientific community.

Summary Statement
My project focuses on how effective essential oils are in killing Escherichia Coli K-12.

Help Received
Mother/Father proofread paper and bought materials

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Michelle Q. Xu

Project Number
J1613

Project Title
Exploring the Use of Natural Herbs as a Novel and Safe Fruit and Vegetable Wash

Abstract

Objectives/Goals
Fruits and vegetables are an important part of a healthy diet. However, harmful bacteria may contaminate them. Nearly one-third of the major foodborne illness outbreaks were caused by contaminated fruits and vegetables. Currently there is no solution that effectively removes the contaminants from fresh products and is also free of harmful chemicals. My project is to explore the use of natural herbs as a novel and safer fresh fruit and vegetable wash.

Methods/Materials
The herbs used in this experiment are Coptis Root (CR), Isatis Root (IR), Flos Lonicerae (FL), and Fructus Forsythiae (FF). After extracting herbs with the water boiling method, the diffusion test was performed to determine herb samples inhibitory activity. The test was repeated 3 times. Next, I chose the herb with large zone of inhibition to continue with the dilution test to determine herb minimum inhibitory (MIC) and minimum bactericidal concentration (MBC). At last, I soaked fresh fruit in the herb solution to see if the bacterial contamination can be removed from fruit surface. Grape tomatoes were used as the fresh fruit samples. Agar plates and broths were prepared as a medium for growing E-coli bacteria. Beakers, test tubes, forceps, a weight scale, mortar/pestle and cotton swabs were used in this experiment.

Results
CR and FL showed larger diameters of growth inhibition zones (16mm, 14mm) and are more effective than FF (9mm). IR had no zones of inhibition. FL is chosen to continue with the dilution test and fruit wash test for its favorable taste. Its MIC value is 0.0625g/ml and MBC value is 0.25g/ml. The fruit wash results showed that the agar dishes with swabs from tomato surfaces soaked in 50% and 100% FL solutions had no sign of bacteria, while those soaked in water did have bacteria.

Conclusions/Discussion
The tests showed that CR and FL effectively inhibited the growth of tested E-coli. MIC/MBC values and the results from the fruit wash test indicated that the experiment supports my hypothesis that natural herbs such as Flos Lonicerae can indeed remove contamination effectively to make a novel fresh fruit and vegetable wash. The solution is not only for cleaning fresh fruit and vegetables, but may also make a great cleaner for countertops, knives and cutting boards. This may lead to a safer and natural approach of minimizing the risk of foodborne illnesses associated with fresh products.

Summary Statement
Exploring the use of natural herbs as a novel and safe fruit and vegetable wash to prevent foodborne illnesses

Help Received
The experiments were preformed at A Schmahl Science Workshop under the supervision of Mr. Sean Carroll who also helped me prepare agar dishes. Dr. Stephanie Yaung/MIT reviewed my project test plans and the results with mentoring via email. Mom helped to buy the herbs. Dad helped me on the display

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Christian Castillo; Martha Villarreal

Project Number

J1698

Project Title

Antibiotic Harvester Ants

Abstract

Objectives/Goals

Our project is about the antibiotic properties of a bacterium carried by the Black Desert Harvester Ant (Messor pergandei). In a previous test, we determined that this species of seed harvesting ant carries the bacteria Streptomyces noursei. Native Americans were known to infuse cloth or leather at ant nest sites and bind wounds with the cloth. We believe that antibodies produced by Streptomyces noursei carried by this ant symbiotically to protect its own food sources may have many health benefits for humans.

Methods/Materials

In this project we conducted a screening test with representative species of fungi and yeasts (Penicillium candidum, Penicillium expansum, Penicillium glaucum, Aspergillus niger, Saccharomyces cerevisiae, Saccharomyces boulardii, Candida galbrata, and Candida albicans) to determine if the bacteria, known to produce the antibiotic nystatin, would be inhibited by the presence of the bacteria.

Results

We determined that of the eight (8) fungal and yeast species tried, one species Candida albican, a common human pathogen, appeared to be very inhibited at the site of the test discs employed.

Conclusions/Discussion

This being the case, we also would have expected a related species, Candida galbrata, a human skin pathogen to have also been inhibited. We are encouraged by our preliminary screening and plan on a wider and more extensive experiment with other social insects, such as wasps, that may exhibit similar symbiotic antibiotic protection mechanisms.

Summary Statement

This project examines the antibiotic properties of a bacterium carried by the Black Harvester Ant (Messor pergandei), and that the Streptomyces noursei carried by this ant symbiotically may have health benefits for humans.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Dabney Margaret S. Doepner

Project Number

J1699

Project Title

Cancer, Children, and Chemotherapy: A Continued Study on Preventing Oral Infections

Abstract

Objectives/Goals

The purpose of this project is to expand upon my previous study concerning children with cancer who suffer from mouth sores from chemotherapy by testing a broader variety of mouthwashes & creating my own formulation (after searching for drug interactions) in order to find which mouthwash is most effective in killing bacteria while continuing to be effective for an extended period of time & also providing other oral benefits. Using mouthwash fewer times a day my improve their quality of life.

Methods/Materials

Home: Create two mouthwashes. UCR Lab: Prepare all 5 mouthwashes, negative & positive controls, for serial dilutions with a 1:10 dilution in H(2)O. Dilute stock E.coli & add to each mouthwash. Complete dilutions to 10^-8. Begin membrane filtration process starting with negative control & becoming more concentrated. Plate filters & put in incubator for 24 hours. Place all left over solutions & dilutions in incubator for reactivation process. Day 2-Count colony forming units of bacteria on plates from Day 1. Repeat membrane filtration procedure. Day 3-Count plates from Day 2. Complete reactivation calculations for results.

Results

During Year 2, I discovered that Chlorhexdine(CHL) & Over the Counter (OTC) are the 2 most effective mouthwashes in killing bacteria and for the longest. These two mouthwashes were 100,000 times more effective than the next most effective of the mouthwashes, Stannous Fluoride (SF) at initially inactivating bacteria. SF was 10,000 times more effective than the fourth most effective, Miracle Magic Mouthwash (M3W). M3W was still effective in killing the bacteria but at a weaker concentration level. All four of the effective mouthwashes had 0% regrowth of bacteria after 24 hours. Magic Mouthwash (MMW) appeared to feed the bacteria.

Conclusions/Discussion

OTC & Chl initially inactivated the bacteria completely & continued to perform as well after 24 hours. SF may do as well as OTC & Chl at a slightly higher concentration. Due to the fluoride, SF strengthens teeth & prevents cavities & does not stain teeth as badly as Chl. In addition to killing germs M3W strengthens teeth, neutralizes acid & numbs the mouth which is useful for painful mouth sores. It is unclear why MMW did not do well in Year 2. Further testing on MMW with a larger number of samples is needed. Since Chl, OTC, SF & M3W were all effective, I would suggest choosing a mouthwash based on oral problems or concerns & cost.

Summary Statement

The purpose of this project was to find out which mouthwash is the most effective in killing bacteria and that continues to be effective for an exteded period of time while providing other oral benefits.

Help Received

I used lab equipment and resources of Marilynn Yates at UCR under the supervision of Dane Reano and Kaite Curnyn. J. Morana, DDS provided Stannous Fluoride & Chlorhexidine. Mother helpd type & took pictures.