CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Matthew J. Bates

Project Number

J1601

Project Title

The Development of Antibiotic Resistance in Escherichia coli

Abstract

Objectives/Goals

Antibiotic resistance is a major health issue. My goal in this project was to understand how common bacteria like Escherichia coli develop resistance to antibiotics. Question 1: Do bacteria become resistant to antibiotics as a result of exposure to inadequate drug concentrations? Question 2: If E. coli bacteria become resistant to one antibiotic like Neomycin, will they also become resistant to another antibiotic like Ampicillin?

Methods/Materials

Human stool was inoculated into 2 mLs of Luria Broth (LB) and grown overnight at 37C. After identifying the resulting bacterial growth as E. coli, the bacteria were inoculated into tubes containing different concentrations of Neomycin and growth was assessed. Using the bacteria that grew in the highest concentration of Neomycin, the process was repeated until growth was observed in all concentrations of Neomycin. E. coli that grew in the highest concentration of Neomycin (10ug/mL) was then exposed to either Neomycin or Ampicillin at 10ug/mL, along with appropriate controls.

Results

I observed that by exposing E. coli to sub-optimal concentrations of the antibiotic Neomycin, I could select for Neomycin-resistant bacteria that would be able to grow even in Neomycin at 10ug/mL. However, these bacteria could not grow in Ampicillin at 10ug/mL.

Conclusions/Discussion

These data suggest that exposure of E. coli to inadequate levels of antibiotics could lead to drug resistance by selecting for bacteria that have the ability to grow in the presence of the drug. However, using a different antibiotic can inhibit these resistant bacteria.

Summary Statement

I wanted to show that antibiotic resistance can be easily created and pose major medical problems in the world.

Help Received

Parents helped acquire supplies. Father got pipetmen and tips from his lab and clearence for a MicroScan machine.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Kennith A. Carpio

Project Number
J1602

Project Title
Can Acidic Water Be a Green Disinfectant?

Abstract

Objectives/Goals
My objective was to learn if plain Acidic Water can be used as a bacterial disinfectant. My hypothesis was that if I increase the level of acidity in the water used for household cleaning, then the number of bacterial colonies that can grow on household surfaces will be reduced or eliminated because common pathogenic bacteria will not be able to survive on an acidic medium.

Methods/Materials
Materials: Water ionizer, pH Meter, 25 Petri dishes with Super Broth nutrient agar, Two 100 ml bottles of sterile water, E. coli broth culture,four 5-ml plastic test tubes, five 1-ml sterile syringes, 25 sterile cell spreaders and a home made incubator.
Methods: Collect water at different pH. using the water ionizer and label them as follows: A- pH 2.5, B - pH 3.5, C - pH 5.5 and D - pH 7.0. Prepare serial dilutions of E. Coli bacteria to obtain a 1:10,000 dilution. Plate 0.2 ml of the bacterial solution into each of the Petri dishes labeled A to E. Then plate 0.2 ml of acidic water in the Petri dish according to how it is labeled. For each of the four pH levels, repeat this process. Petri Dish labeled E, is the control with no solution and just a dry paper disc. Cover the Petri dishes, and turn them upside down and place them in the incubator. At 12 hour intervals, observe each plate and perform measurements of the inhibition zone and the total number of Colony Forming Units (CFUs). Do five different runs of the experiment to confirm results.

Results
Bacteria grew at a fast pace on all the runs. At 5 days, all Petri Dish plates on all 5 runs had bacterial colonies at an average of 309.4 CFUs at ph 2.5, 309.6 CFUs at pH 3.5, 311.6 CFUs at pH 5.5, 312.6 CFUs at pH 7.0 and 314.6 CFUs in the control. There was a difference in the average number of bacterial colonies, with the control having a higher number of bacteria. However, the difference was not significant.

Conclusions/Discussion
The experiment failed to show a significant effect of acidic water in the growth of E. Coli bacteria. More research is needed with better measurement instruments and with a higher dose of acidic water to determine its impact.

Summary Statement
This project is about using acidic water to kill bacteria and disinfect

Help Received
Father helped supervise the dangerous parts with bacteria and taught me how to use Microsoft excel well.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Hannah O. Cevasco

Project Number

J1603

Project Title

Honey, I Found a Cure! Nature's Antibiotic

Abstract

Objectives/Goals

The purpose of this experiment is to determine if the antimicrobial properties of honey can combat bacteria to the same extent as a common antibiotic, Kanamycin. I studied the efficacy of three honeys, with a specific emphasis on Manuka honey, and determined their effectiveness against a non pathogenic strain of E. coli by measuring their zones of inhibition.

Methods/Materials

Fifteen petri dishes with pre-poured Mueller Hinton agar were labeled. A layer of liquid E. Coli was then spread on the surface of the agar using a cotton tip applicator. Five wells were cut in each petri dish and the bottom of each well was plugged with 100µl of liquid agar that was then allowed to cool. Three concentrations of honey were prepared using a w/v dilution. The concentrations for Manuka, Suebee, and CA Wildflower were 50%, 25%, and 12.5%. 100µl of each concentration were dispensed into individual wells with 5 replicate trials for each concentration for a total of 15 petri dishes. The antibiotic (Kanamycin) was diluted at concentrations of .005%, .0025%, and .00125% and dispensed into its appropriate wells. The plates were then incubated for 24 hours at 32 degrees Celsius. Photographs were taken after 24 hours and 7days and the width of the zones was measured digitally.

Results

As expected, Manuka honey produced significant results compared to Kanamycin but the CA Wildflower and Suebee honeys were surprisingly ineffective, producing fungi/bacteria in and around their individual wells. The results were statistically analyzed and the standard error was found for each treatment/concentration that produced a zone of inhibition. The Manuka honey at a 50% w/v concentration had an average zone width of 3.5mm while the .005% concentration of Kanamycin had an average of 3.9mm. This indicates that Manuka honey contains a key synergist responsible for its antibacterial properties that other honeys do not. With a 95% confidence interval, I can say that Manuka Honey and Kanamycin produced significant results.

Conclusions/Discussion

Based on the data collected from this experiment it can be concluded that Manuka honey is comparable to a standard antibiotic in terms of its effectiveness in killing a non pathogenic strain of E. coli. This significant discovery may lead the medical community to rethink their over usage of antibiotics when something as simple and powerful as Manuka honey may be the answer.

Summary Statement

I compared the antibacterial properties of Manuka honey to a general antibiotic, Kanamycin.

Help Received

Mother and teacher reviewed written work. Performed experiment at Stanford under the supervision of graduate student, Ken Hu.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Talie L. Cloud

Project Number

J1604

Project Title

Healing Honey: An Evaluation of the Antimicrobial Effects of California Monofloral Honeys

Abstract

Objectives/Goals

The purpose of this science fair project is to investigate the antimicrobial effects of California monofloral honeys in the inhibition of Bacillus subtilis, Escherichia coli K-12, and Rhizopus sporangia. The hypothesis was that after 72 hours, all four honey varietals would maintain a greater zone of inhibition than the control of double distilled deionized water.

Methods/Materials

Four monofloral honeys: Clover, Star Thistle, Blackberry, and Orange Blossom were diluted to a 10% concentration. Double distilled deionized water served as the control. The microbial cultures: Bacillus subtilis, Escherichia coli K-12, and Rhizopus sporangia were plated onto petri dishes using aseptic techniques. Four millimeter discs soaked in the test variable were placed in each sector of the petri dishes. The plates were incubated for 72 hours at maximum growth temperature and measured for zone of inhibition. This was repeated for 15 trials per variable for each microbial culture.

Results

When measuring the zone of inhibition for Rhizopus sporangia, all four honey varietals as well as the control exhibited less than one millimeter of inhibition. For Escherichia coli K-12 and Bacillus subtilis, all four honey varietals had less than one millimeter of inhibition. The control exhibited an average of 12 milllimeters of inhibition for Escherichia coli and 14.2 millimeters for Bacillus subtilis.

Conclusions/Discussion

All four honeys failed to inhibit the growth of the microbial cultures tested. Although many studies indicate that honey can inhibit microbial growth, the monofloral California honeys tested are not antimicrobial agents. The E.coli K-12 and Bacillus subtilis controls using double distilled deionized water inhibited their growth. This may be due to water leaching out from the paper discs and preventing bacterial growth.This data suggests that water is a better inhibitor of microbial growth than monofloral honeys.

Summary Statement

This project investigates the antimicrobial potential of California monofloral honeys.

Help Received

Used lab equipment at California State University, Fresno under the supervision of Dr. Paul Crosbie

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Elizabeth R. Cutler

Project Number
J1605

Project Title
How to Treat a Sweet Tooth: The Comparative Effects of Common Sweeteners on Tooth Decay

Abstract

Objectives/Goals
To compare the effects of common sweeteners on tooth decay, by evaluating their effect on oral bacterial growth.

Methods/Materials
Oral bacterial samples were obtained and combined with common sweeteners. The test groups involved raw and refined sugar, natural sweeteners including honey, agave and Stevia, artificial sweeteners including Splenda and Sweet N Low, and a positive and negative control group. The environment was maintained to allow the bacteria to thrive well. Over four days, spectrophotometric readings were taken to assess turbidity, a measure of bacterial growth. The turbidimetric results were then compared to determine the effect of sweeteners on bacterial growth. Bacteria were then disposed of as biohazard waste.

Results
The results showed increased turbidity in relation to the positive control for raw sugar, Splenda, Stevia and refined sugar, with relative growth over the four days of 102%, 83%, 52% and 37%, respectively. The Sweet N Low had growth comparable to the positive control. The turbidity of the honey and agave samples declined in comparison to the positive control, by -133% and -200%, respectively.

Conclusions/Discussion
Honey and agave are excellent choices as sweeteners to avoid bacterial growth and tooth decay, as these appear to have antiseptic properties. Splenda, raw sugar, refined sugar and Stevia are not good choices based upon the data collected. Sweet N Low is a good choice to avoid bacterial growth, and therefore tooth decay, although there are studies that indicate it may present health risks such as oral cancer.

Summary Statement
The main purpose of this project is to determine which sweeteners promote good dental health.

Help Received
Dr. Tai Wei Ly mentored, provided the lab equipment and supervised the experimenter's procedures. Dr. Joseph Gordon provided guidance on how to measure bacterial growth. Father coached throughout the project.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Anna D. de la Rosa

Project Number
J1606

Project Title
Bacterial-Busting Tea Bags? Effect of Caffeine Extracted from Used Tea Bags on Growth of Escherichia coli

Abstract

Objectives/Goals
The experiment aimed to determine the effect of caffeine extracted from used tea bags on the growth of E. coli. My hypothesis was that caffeine would inhibit E. coli growth with higher caffeine concentration resulting in greater inhibition. My objective was to see if caffeine from a waste product could be used as an antibacterial agent against E. coli.

Methods/Materials
Each of six agar plates was divided into quadrants and inoculated with E. coli. Each quadrant (Q) had a 7 mm filter paper disk soaked in a specific concentration of caffeine. Caffeine used was extracted from steeped tea bags using 10 g of sodium carbonate and 15 mL of methylene chloride. The highest caffeine concentration solution (D) in Q4 was based on caffeine's solubility of 0.0217 g/mL at 77°F. Solution A in Q1 was 0% (control), Solution B in Q2 was 50% and Solution C in Q3 was 75% of Solution D, respectively. After incubating the plates at around 37°C for 48 hours, the zone of inhibition in each quadrant was measured.

Results
After 48 hours, five out of six agar plates formed a bacterial colony. The control quadrant (Q1) displayed the most E. coli growth. A zone of inhibition formed around disks soaked in most of the solutions with caffeine. Zone of inhibition was smallest in the quadrant with the least concentrated solution (Q2) and largest in the quadrant with the most concentrated solution (Q4).

Conclusions/Discussion
My results support the hypothesis that caffeine extracted from used tea bags can inhibit E.coli growth and that higher concentrations of caffeine would be most effective. This experiment shows that used tea bags could possibly be recycled to develop an everyday caffeine-containing household, as an ingredient to fertilizers in produce, and as a safer alternative to artificial preservatives in foods.

Summary Statement
My project was to determine if caffeine extracted from used tea bags could inhibit the growth of Escherichia coli.

Help Received
Parents helped with purchase of materials; Science teacher and adviser provided guidance throughout the experiment.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Dina S. Dehaini

Project Number
J1607

Project Title
The Best Method to Fight Fungal Infections

Abstract

Objectives/Goals
The purpose of this project is to find the most effective method in fighting fungal infections while also maintaining a very minimal amount of side effects and using both natural and man-made medications.

Methods/Materials
1.Clear tube; 2.11 Liter bucket; 3.Yeast ; 4.Sugar; 5.Measuring cup; 6.Plastic water bottles; 7.Three antifungal agents; 8.Two natural methods; 9.Water proof sealant; 10. Thermometer; 11. PVC pipes; 12. Clear plastic box; 13. Bungee cords; 15. An accurate kitchen scale.

Procedure:
1. Drill a hole into a plastic water bottle cap the size of the tube. 2. Insert tube into the hole, apply sealant around the tube to trap produced CO2. 3. Start control process, which is amount of air produced by the yeast without any medications. 4. Fill the 11 liter bucket three fourths of water. 5. Fill a graduated cylinder with water fully with no bubbles and leave it upside down in the bucket without letting any water escape. 6. Measure 20 gm of yeast and then pour into an empty plastic water bottle. In measuring cup, add 13.45 grams of sugar and half a cup of water at 30C. 7. Pour the mixture of water and sugar in to the water bottle and immediately twist on the bottle cap with the tube. Stick the other end of the tube under the graduated cylinder under the bucket. 8. After 45 minutes, measure air produced by the yeast by measuring displaced water inside the graduated cylinder. 9. For testing with medications, repeat steps 1-8, however, add the medication with the sugar water at a dilution of one percent before pouring in to the water bottle with yeast.

Results
After 14 trials, the average amount of water that remained in the graduated cylinder for the control process was 10 milliliters of water.When honey was added, at a dilution of 1%, an average of 60.14 ml of water was left in the graduated cylinder. For tea tree oil, the average amount of water left in the graduated cylinder was 56.71 ml.The average amount of water left in the graduated cylinder while using Clotrimazole was 47.29 millimeters, 50 ml for Tolnaftate, and 51.29 ml for Undeclynic acid

Conclusions/Discussion
After testing 14 times with many diverse medications, I found that the best method to fight fungal infections is honey. Not only honey was effective, it also has one side effect; those who are allergic to it may receive burning or itching. However, other than that, honey is the best method to fight fungal infections

Summary Statement
The purpose of this project is to find the most effective method in fighting fungal infections while also maintaining a very minimal amount of side effects and using both natural and man-made medications.

Help Received
Teacher helped in reviewing research; Dad help with assembling

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Michelle K. Hibbs

Project Number
J1608

Project Title
Closing the Cap? Resisting Your Meds?

Abstract

Objectives/Goals
In this experiment the objective was to see if the bacteria Staphylococcus Aureus would become resistant to the antibiotic penicillin after being exposed to the antibiotic three times.

Methods/Materials
I started by taking a sterile swab and rubbing it onto the Staphylococcus culture tube. I rubbed the swab onto the agar in a triangle pattern. I boiled 200 ml of water and one penicillin pill which I stirred and formed a liquid. Using a hole punch and a coffee filter I created a disk filter. I dipped the disk filter into the solution for 30 seconds and placed the soaked disk filter in the middle of the triangle. I placed the Petri dish in an incubator for 72 hours. After used a caliper to measure the zone of inhibition on each side of the triangle by measuring the distance from the closest bacteria colony to the filter disk. I repeated these steps 19 times. Using a sterile swab I swabbed the closest bacteria colony of the bacteria that has been exposed to penicillin once. I took the swab with the bacteria exposed to penicillin and rubbed it onto the Petri dish. I repeated the steps starting with boiling 200 ml of water and one pill of penicillin. I repeated steps starting from swabbing the bacteria colony has been exposed to the penicillin once 19 times. I took a Petri dish and a sterile swab and swabbed the closest bacteria colony that has been exposed to penicillin twice. I repeated the steps starting with boiling 200 ml of water and one penicillin pill and stirring to make a solution and ending with using a caliper to measure the zone of inhibition on each side of the triangle and recording data. I repeated those steps 19 more times.

Results
For my experiment I collected 20 pieces of data for each time I exposed the Staphylococcus to the penicillin. The average zone of inhibition for the staphylococcus exposed to penicillin once was 7.97 mm. The average zone of inhibition for staphylococcus exposed to penicillin twice was 7.45 mm. The average zone of inhibition went down dramatically after the staphylococcus was exposed to penicillin three times with an average zone of inhibition of 2.28 mm. In most trials there was no zone of inhibition, the bacteria had taken over the filter disk of penicillin.

Conclusions/Discussion
The data supported my hypothesis. In the medical world many antibiotics are over prescribe or prescribed when not needed. When this occurs, a stronger or resistant bacteria might develop.

Summary Statement
My project is on antibiotic resistance, Staphylococcus Aureus vs. penicillin.

Help Received
Ms Fisher (Teacher) provided lab facilities, parents helped with money to make a presentation board.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Faatima Zahra Motala

Project Number

J1609

Project Title

Bacteria Slayer: Stop Antibiotic Resistance

Abstract

Objectives/Goals

My objective was to determine the susceptibility of gut bacteria to natural antimicrobial agents compared to antibiotics. I chose two types of gut bacteria Candida Albicans and Escherichia Coli and relevant antibiotics used to treat each. Fluconazole for Candida Albicans and Ampicillin for Escherichia Coli. My natural antimicrobial agents were, Oregano Oil, Garlic, Turmeric, Thyme, Black Walnut, and Propolis. My hypothesis was all natural antimicrobial agents would inhibit the growth of both Escherichia Coli and Candida Albicans.

Methods/Materials

To determine the susceptibility of bacteria I used the standard Microbiology test called the Kirby-Bauer Disc Diffusion Method. Using the aseptic technique, antibiotic sensitivity discs are inoculated with an antimicrobial agent and then placed onto an agar plate that has been swiped with bacteria and allowed to incubate for 24 hours at 30 degrees C. I then measure the zone of inhibition to determine susceptibility. I repeated this procedure 5 times.

Results

My results showed that some natural antimicrobial agents worked better than antibiotics. Oregano Oil worked better than Ampicillin on Escherichia Coli by preventing the bacteria from growing on the plate altogether. Black Walnut Oil was as effective as the antibiotic in Escherichia Coli. The results of my Fluconazole for Candida Albicans were inconclusive, however the Oregano Oil also prevented the Candida Albicans from growing on the agar plate. Candida Albicans is also susceptible to Black Walnut Oil.

Conclusions/Discussion

From my results I was able to conclude that gut bacteria can be effectively treated using natural antimicrobial agents instead of antibiotics. Based on my conclusion and research this is beneficial helping prevent antibiotic resistance. By treating mild diseases and infections with natural antimicrobial agents we can avoid the over use of antibiotics and prevent antibiotic resistance.

Summary Statement

Determining the susceptibility of gut bacteria to natural antimicrobial agents.

Help Received

Mum helped discussing project details, Dr.Hafizah Chenia (Microbiologist) discussed procedure to be used. Asma Mana helped get approval for project.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Christian E. Olsen; Matthew Stauber

Project Number

J1610

Project Title

Brush This Off! Dentifrice for Developing Countries

Abstract

Objectives/Goals

The objective was to determine if a charcoal based dentifrice that could be made in a rural area of a developing country would be effective in controlling bacterial growth. We believe that the charcoal based dentifrices would be ineffective.

Methods/Materials

Three different dentifrices containing charcoal were tested against a commercially available dentifrice containing sodium fluoride and triclosan and aganist a home made dentifrice containing sodium bicarbonate and sodium chloride. To simulate the acid that grows in a person's mouth, a mixture was prepared containing scrambled egg and syrup. Then, 500mg of the mixture was applied on a set of plastic dentures. Subsequently, 300mg of a dentifrice was twice brushed against the dentures. A Q-Tip swab was four times rubbed against the dentures. Then, the Q-Tip was rubbed on a petri dish in a defined Z-patern pattern. These steps were repeated using the other four types of dentifrices. One test was performed without a dentifrice. After preparing the six petri dishes, the dishes were placed in an incubator at 37º C (the temperature in a person's mouth). Then, the cultures in the dishes were photographed and documented. This procedure was repeated six times.

Results

On average, the sodium chloride and unexposed charcoal based dentifrice (7colonies ave.) was slightly less effective than the sodium flouride and triclosan based dentifrice (6 colonies ave.). Next, the sodium bicarbonate and soudium chloride dentifrice and unexposed charcoal (charcoal made in a clean environment) dentifrice were about 3x less efeective than the unexposed charcoal and sodium chloride dentrifrie at 20 colonies on average. Surprisingly, the control cultivated an average of 33 colonies per petri dish or 5x less effective than the unexposed charcoal and sodium chloride dentifrice. Lastly, the exposed charcoal (created in an unclean environment) was 16x times less effective than the sodium flouride and charcoal dentifrice.

Conclusions/Discussion

The unexposed charcoal with sodium chloride was almost as effective as the commercially prepared sodium fluoride and triclosan dentifrice. Secondly, the sodium bicarbonate and sodium chloride dentifrice was as effective in reducing bacterial growth as the unexposed charcoal. Finally, the test without a dentifrice only showed one third the number of colonies than the average exposed charcoal dentifrice test, 33 to 106 colonies.

Summary Statement

To determine if a charcoal based dentifrice that could be made in a rural area of a developing country would be effective in controlling bacterial growth.

Help Received

Mother helped typing the report and cutting and glueing sections of the board

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Riyaz S. Razi

Project Number
J1611

Project Title
Soybean Polyamines: A Possible Cure for Parkinson's Disease

Abstract

Objectives/Goals
The purpose of my experiment is to see whether or not soybean polyamines, found in soybean extract, play a role in stopping the breakdown of mitochondrial DNA, which could lead to a possible cure for Parkinson's disease.

Methods/Materials
Procedure: 1. Take 12 grams of yeast and add 11/2 cups of warm water. 2. Dip a cotton swab completely into the yeast mixture and gently swab onto the nutrient agar plates. 3. Repeat this process 5 times for each of the different percentages of soybean extract. 4. Add .1mL of MPP+, and .2mL of the different percentages of soybean extract. 5. Make the percentages of soybean extract 0%, 25%, 50%, 75%, and 100%. 6. Streak the mixture of soybean extract and MPP+ onto each designated agar plate. 7. In addition, create one agar plate that just has yeast without any MPP+ or soybean extract. 8. Let the yeast on each agar plate incubate for 48 hours in front of heat dish at 75o Fahrenheit. 9. Take 1 mL of yeast and dilute with water until there is a 10 mL solution, a 10 fold dilution. 10. Take .1 mL of the solution, add .05 mL of Methylene blue dye, and place under a hemacytometer counting slide in order to count the yeast. 11. Find the square etched onto the hemacytometer counting slide under 40x power, and then use the 100x power on the microscope to count the yeast. 12. Record the number of live yeast by counting 3 out of the nine smaller squares on the hemacytometer counting slide and then multiplying by 3 to get the amount of all the yeast on the larger square. 13. Repeat with the dead yeast cells. The dead yeast cells should be blue because of the Methylene blue dye. 14. Repeat the process for each of the five different yeast mixtures, and the one solution with nothing added. 15. Graph and compare the results.

Results
0% Concentration:138 live yeast 74 dead yeast
25% Concentration:149 live yeast 66 dead yeast
50% Concentration:161 live yeast 59 dead yeast
75% Concentration:175 yeast live yeast 51 dead
100% Concentration:188 live yeast 45 dead

Conclusions/Discussion
My results prove that my hypothesis was correct because at the beginning of my experiment I hypothesized that by adding soybean polyamines to yeast, the breakdown of mitochondrial DNA will be stopped significantly, and that the significance of the effects will have a direct correlation with the concentration of the soybean extract. My results prove this, so my experiment was a success.

Summary Statement
My project uses soybean polyamines to try and find a cure for Parkinson's disease by using yeast as a representation of mitochondrial DNA.

Help Received
My parents helped me order the supplies; Science teacher let me use a microscope and some tools and helped with supplies

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Vishnu Sreenivasamurtrhy

Project Number

J1612

Project Title

Examining the Effect of Acidity and Alkalinity on Bacteria Growth Inhibition

Abstract

Objectives/Goals

Will different chemicals affect the amount of acidity and alkalinity on the growth of E. coli bacteria in an inhibition zone?

Methods/Materials

The first step is to get all your materials organized and the refrigerated Petri dishes out of the refrigerator. Next, you cut out 45 paper discs and then place them separately from everything else. After that, you spread the E. coli across the dish. Next you immerse 5 discs into the ammonia and vinegar solutions and place them on the dish. Finally, you let the E. coli grow after 3 days and measure the inhibition zone.

Results

According to the average data of the size of the inhibition zones, it shows that the E. coli bacteria culture had a larger inhibition zone in the vinegar solution. The results showed: 5% - 5.4 mm, 10% - 2.5 mm, 15% - 4.6 mm, and 20% - 3.2 mm for vinegar. But, the results for Ammonia was as followed: 5% - 2.6 mm, 10% - 1.6 mm, 15% - 3 mm, and 20% - 3.2 mm. The Vinegar made the bacteria grow less (the bigger the zone, the less bacteria growth) because the acidity in the vinegar made the bacteria to die off and have less growth. But, since the ammonia is a base, there#s a lower chance of killing the bacteria and the results shows that.

Conclusions/Discussion

From this experiment, I learned how to grow bacteria and how different acids and bases can effect different growth. Also, I learned how to examine and measure inhibition zones and I learnt about new things such as inhibition zones, E. coli bacteria, and acids and bases. Some follow up experiments could be using different acids or bases (Milk, bleach, lemon juice, etc.). Also, you could use different types of bacteria and see if they grow differently with different temperatures and liquids.

Summary Statement

This project is about examining the effect of acidity and alkalinity on bacteria growth inhibition and to find out if ammonia or vinegar inhibits growth the most.

Help Received

Ms. Hollenbeck helped examine and setup the experiment in her classroom; Mom helped with tri fold; Dad helped with getting all the information.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Maggie Tang

Project Number
J1613

Project Title
Bacteria Fear, Medicine Is Here!

Abstract

Objectives/Goals
The objective of my experiment was to determine whether E.coli would be inhibited more by natural herbs (turmeric, coriander, ginger) or commonly prescribed antibiotics (Amoxicillin, Cefoxitin, Cephalosporin).

Methods/Materials
To start, I combined 500 mL of bottled water in .4 g of turmeric in a pot over a stovetop, then mixed the solution for 10 min. After opening a petri dish, I dipped a sterile swab into an E.coli culture tube and rubbed the swab on the agar in a triangular pattern. Then, I placed a filter disc in the turmeric solution for 30 sec. Next, I placed it in the center of the bacteria triangle and sealed the petri dish. Afterward, I placed the petri dish upside down in an incubator for 3 days. I repeated the procedure for ginger, coriander and 1 tablet of each antibiotic (Amoxicillin, Cefoxitin, Cephalosporin). After three days, without opening the petri dish, I measured and recorded the zone of inhibition for each of the three sides of the bacteria triangle with a caliper. 15 petri dishes for each of the 6 solutions were used.

Results
Antibiotics were more effective than herbs. The most effective solution was Amoxicillin with a zone of inhibition of 17.1 mm on avg. The second most effective was Cephalosporin; the zone of inhibition was on avg. 16.06 mm. The third most effective, Cefoxitin, had a zone of inhibition 16.03 mm on avg. Turmeric was the fourth most effective; the zone of inhibition was on avg. 16 mm. The fifth most effective solution was ginger with an avg. zone of inhibition of 14.73 mm. The coriander solution proved to be the least effective with a zone of inhibition of 13.18 mm, on avg.

Conclusions/Discussion
The results rejected my hypothesis that E.coli would be inhibited more by herbs rather than antibiotics due to an enzyme called beta-lactamase produced by E.coli causing antibiotic resistance and that ginger would be more effective than turmeric or coriander because it has therapeutic properties and gingerols that are effective towards E.coli symptoms. The results showed that antibiotics were more effective than herbs. E.coli, a top reason for food poisoning in the world, comes from undercooked beef (hamburgers/steak) also touching animals and not washing your hands. E.coli strains can be deadly. People may not have access/afford antibiotics. Over the past 10 years, antibiotic resistance has been growing; therefore, like our ancestors, we can use herbs as an alternative.

Summary Statement
The purpose was to determine whether natural herbs (turmeric, ginger, coriander) or commonly prescribed antibiotics (Amoxicillin, Cefoxitin, Cephalosporin) were more effective in inhibiting E.coli bacteria.

Help Received
My science teacher (Ms.Fisher) provided me supplies, allowed me to do the experiment in her classroom, and provided me tips throughout the experiment; Mother helped me by obtaining supplies and supported me through the experiment; Classmates took photos throughout the experiment.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Jason X. Tuermer-Lee

Project Number
J1614

Project Title
Bacteria Killers: Alcohol vs. Non-Alcohol Sanitizers

Abstract

Objectives/Goals
The purpose of this project is to test which type of sanitizer kills bacteria most effectively.

Methods/Materials
Bacteria were swabbed from the bottom of a sink and streaked onto five petri dishes. The first swab was used to streak a petri dish. That was my control group. The next four swabs were first exposed to one of four sanitizers containing either ethyl alcohol (Sanitizers A and B) or benzalkonium chloride (Sanitizers C and D) and then used to streak their respective petri dish. All five petri dishes were then incubated at 37° Celsius for 24 hours. After the bacteria cultures were incubated, the number of colonies were counted and compared to the control group. Three trials were run.

Results
On average, Sanitizer C killed 90.05% of the bacteria, suggesting it to be the most effective sanitizer. Contrary to my hypothesis, Sanitizer C, a sanitizer with benzalkonium chloride, killed bacteria more effectively than sanitizers with ethyl alcohol. Sanitizer D, also containing benzalkonium chloride and killing 88.55% of the bacteria on average, was similarly more effective than both of the two alcohol based sanitizers.

Conclusions/Discussion
My experiment suggests that benzalkonium chloride as the active ingredient in hand sanitizers is more effective at killing bacteria than ethyl alcohol. Given that benzalkonium chloride also is less irritating to the skin, these preliminary findings suggest that next time you are at the store, be sure to check the drug facts on the back of the hand sanitizer bottle for benzalkonium chloride to keep yourself healthy.

Summary Statement
The purpose of my project was to see which kind of sanitizer kills bacteria most effectively: sanitizers with ethyl alcohol as the active ingredient or alcohol free sanitizers with benzalkonium chloride as the active ingredient.

Help Received
Science Fair Coordinator Diana Skiles discussed my project with me and provided some guidance; Teacher Nicholas Dedini discussed my project with me and provided some guidance as well as an incubator; Mother supervised experiment

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Medha S. Vallurupalli

Project Number
J1615

Project Title
Natural vs. Synthetic

Abstract

Objectives/Goals
Through this experiment, I was trying to find a new way to treat illnesses and diseases.

Methods/Materials
The materials used in this experiment include; 3 petri dishes, e coli. bacteria, Penicillin, Augmentin, Honey, garlic, tea tree oil, rosemary oil,oil of oregano,forceps, test tubes, an incubator,filter paper,and pens, In this experiment, I prepared the solutions for the natural products and the antibiotics. Then, I prepared the E coli. Bacteria culture. After all of the solutions were made, I spread a layer of the E coli. Bacteria culture onto a prepared petri dish. Next, I dipped the circular filter paper plates into the solutions and placed them around the petri dishes. After 24 hours, I measured the size of the inhibition zone around the filter paper. My independent variables are the types of antibiotics and natural products used and the dependent variable is the size of the inhibition zone.

Results
From this experiment I discovered that natural products work as well as, ad in some cases better than antibiotics. Not only did the natural products fight the bacteria, some fought better than the antibiotics. I was able to prove my hypothesis correct. Through this experiment I hoped to discover a new way to cure illnesses and I was successful.

Conclusions/Discussion
In the real world, a common man could use my project everyday. Natural products are much more cost-efficient in comparison to antibiotics and they also have less risks. Stronger antibiotics are created to take the place of antibiotics that bacteria has grown resistance to. One day there won#t be a stronger antibiotic to create and there won#t be a cure for many illnesses. If natural products can take the place of antibiotics, there would be a healthy way to cure and prevent disease.

Summary Statement
In this experiment, I found a more effective way to cure and prevent illness and disease.

Help Received
Mother helped me gather my materials. Mrs. Cohen provided me an incubator.