CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Jasmine Antonio; Desiree Torres

Project Number

J2001

Project Title

Discovering Different Glucose Levels in Commercial and Homemade Smoothies

Abstract

Objectives/Goals

Have you ever thought of having a nice smoothie from Starbucks? Or just a Strawberry Banana Smoothie? This project will be covering the different hidden sugars in homemade and store-bought smoothies. The project illustrates the glucose content in all of the additives in your favorite smoothies. The hypothesis for this project was that store bought smoothies contain more hidden sugars than a homemade smoothie because most stores bought smoothies contain frozen fruit.

Methods/Materials

Graduated Cylinder, Glucose Powder, Urinalysis test strips that measure glucose, Graduated transfer pipettes, Disposable cups, Permanent marker, Food coloring, Spoons for stirring, Distilled water, Measuring spoons, Timer or clock with a second hand, Scale, Blender, Lab notebook, Strawberries, Pineapple, Bananas, Soy Milk, Cocoa Powder, Concentrated Orange Juice, Heavy Whipping Cream, Milk, Honey, Starbucks Strawberry Banana Smoothie, Frozen Strawberry Banana Smoothie, Naked Strawberry Banana Smoothie, Homemade Strawberry Banana Smoothie.

Results

The additives tested in this project included things such as bananas, pineapple and strawberries. liquids such as soy milk, orange juice and more. the smoothies that were tested were a homemade smoothie, a Starbucks smoothie, a Naked juice smoothie and a frozen smoothie. Each one was then compared and some additive had more of a glucose content than others but the additive with the most was the concentrated orange juice. The smoothies with the most sugars were the Frozen smoothie and the Starbucks smoothie.

Conclusions/Discussion

This proves our hypothesis right because the two smoothies with the most glucose content were store bought.

Summary Statement

In this project will be covering the glucose level in commercial and homemade smoothies, which will be compared to which smoothie has a higher glucose content.

Help Received

Gloria and Victor Torres, Kim Shirley, Ms.Sally Burns, Mrs. Heather Vickers, Mr. Alex Hofsteen, and Flor Lopez and Jaime Antonio

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Michael Baghdassarian

Project Number
J2002

Project Title
Can You Prevent Unrefrigerated and Unpasteurized Milk from Spoiling by Adding a Commonly Available Substance?

Abstract

Objectives/Goals
The objective of this project is to see if the manuka honey can help preserve raw (unpasteurized) and unrefrigerated milk for a longer period than just the milk itself. The secondary objective is to see if someone who does not have refrigeration available can use a natural substance such as manuka honey to help preserve the milk for several days.

Methods/Materials
10 beakers, digital pH meter, manuka honey, agave nectar, honey (regular)

Tested manuka honey, agave nectar, and honey to see if either substance can be added to raw unpasterized milk to prevent it from spoiling while the milk is unrefrigerated and left at room temperature. Measured the pH of the milk to check if the milk had spoiled over given time.

Results
The substances I used did preserve the raw milk as measured by the the digital pH meter. Out of the three substances manuka honey preserved the milk better than the regular honey and agave nectar. I repeated the test with a higher concentration of manuka and found that the manuka could preserve the raw unrefrigerated for over ten days compared to the plain milk which spoiled in three days. The likely explanation is that manuka honey contains anti-bacterial properties such as methylglyoxal, hydrogen peroxide, and dihydroxyacetone.

Conclusions/Discussion
The amount of manuka honey used did make a difference in how long the raw unpasteurized unrefrigerated milk lasted. The real wold benefits of this project is that manuka honey may be used in underdeveloped countries where pasteurization and refrigeration are not available. The second benefit which I would like to study in the future is the use of manuka honey to treat cuts or illness instead of an antibacterial cream or in lieu of an oral medication.

Summary Statement
I showed that manuka can preserve raw, unpasteurized, and unrefrigerated milk for over ten days.

Help Received
Dr. Sevada Chamras at Glendale Community College loaned the digital pH meter and beakers to me and showed me how to properly use and clean the instruments.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Harrison J. Cameron

Project Number
J2003

Project Title
Out of Control: Blood Glucose Meter Accuracy

Abstract

Objectives/Goals
After noticing differences in my glucose meter readings I was worried about their accuracy, so I chose to test blood glucose meter accuracy. My hypothesis was that blood glucose meters from different manufacturers will produce similar results when testing the same sample of blood. I was also testing to see if blood glucose meters met the FDA standards set in 2014.

Methods/Materials
I prick my finger and apply the blood to test strips for the Nova Max Plus, Contour Next EZ, One Touch Verio IQ, Accu Chek Aviva Connect, and Precision Xtra blood glucose meters. I record the measured values and then plot each one relative to the meter and trial number in Excel. The order blood is applied is randomized for each trial.

Results
The blood glucose measurements showed significant variability between the meters especially at high blood glucose levels. In some cases meter readings were different by more than 50%. Each of the meters had at least one measurement at or above 20% variability. This means that according to the FDA guidelines none of these meters would pass.

Conclusions/Discussion
The variability between meter results could lead to huge differences in how a diabetic manages their diabetes. In my results it was possible that for one meter a diabetic would administer 2 units of insulin, while for the same blood sample another meter would indicate a need of nearly 4 units. The first could lead to a hyperglycemia and the other hypoglycemia.Hyperglycemia and hypoglycemia create unhealthy and sometimes very unsafe situations. This study shows that meter accuracy needs greater scrutiny and likely follow-up testing.

Summary Statement
I compared five blood glucose meters with each other and to see if they are accurate relative to FDA guidelines.

Help Received
My dad helped me with some of the graphs.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Caleb J. Caminiti

Project Number
J2004

Project Title
The Effect of Different Types of Toothpaste on Oral Bacterial Growth

Abstract

Objectives/Goals
The object of this study was to find out which type of toothpaste removes the most bacteria from my teeth.

Methods/Materials
To conduct this experiment I needed petri dishes with agar, swabs, a mouth with teeth, sterile toothbrushes, and four types of toothpaste. Each morning and night, at least 8 hours apart, I brushed my teeth with one type of toothpaste for two minutes, swabbed my mouth, and rubbed the swab on the petri dish. I tested each type of toothpaste four times. For my control I used no toothpaste when I brushed my teeth.

Results
I tested each type of toothpaste four times. For my control I used no toothpaste when I brushed my teeth. To find my results, I counted the colonies on the petri dishes after fifteen days and averaged the results for each toothpaste. The toothpaste with the smallest number of colonies showed that there was less bacteria on my teeth. I found that the Crest Pro-Health Advanced Deep Clean Mint Toothpaste removed the most bacteria from my teeth, which confirmed my hypothesis. In addition, I found that the Colgate toothpaste removed the least amount of bacteria from my teeth.

Conclusions/Discussion
The Crest toothpaste removed the most bacteria from my teeth because it contained stannous fluoride and a strong abrasive. Stannous fluoride is an antibacterial agent not found in the other three brands of toothpaste. In addition, while researching the ingredients of the Colgate toothpaste, I found that one of its ingredients is triclosan, an endocrine disruptor which can be very harmful to your body. The information gained from my project can be used by every consumer who needs to know what type of toothpaste is the best to purchase and use.

Summary Statement
I found that Crest Pro-Health Advanced Deep Clean Mint Toothpaste grew the least amount of bacteria on the petri dishes, showing that it is the most effective bacteria-removing toothpaste tested.

Help Received
I designed and conducted the experiment by myself. My mom, who is my science teacher, showed me how to research the ingredients it the toothpastes. I plan to meet with my dentist to discuss my results for review and future investigations.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
John P. Connell

Project Number
J2005

Project Title
Brushing with Bacteria

Abstract

Objectives/Goals
Contaminated toothbrushes have been shown to grow microorganisms. The scientist conducted a study to see the effectiveness of different methods of toothbrush cleaning on toothbrushes.

Methods/Materials
Sixteen toothbrushes, used by four healthy subjects, were evaluated for the presence of bacteria. Bacteria was sampled from the brushes by swabbing the top half of the bristle and an average of 89 CFU were counted on Luria Broth Agar after forty-eight hours incubation (in a homemade incubator) at ninety degrees. Four hours of Listerine, Air dry, Steripod, and UV light treatment were tested for their effects on the bottom half of the bristle.

Results
Listerine killed nearly all of the bacteria on the toothbrush bristles (95%, 100%, 100%, 94% reduction in four trials). Air drying killed over sixty percent of the bacteria(70%, 94%, 33%, 81% reduction in four trials). In contrast, UV Light therapy results were more mixed (43%, 14%, and 44% increase, 27% reduction in one of four trials). On average, UV light therapy increased the bacteria count by twenty percent. Steripod treatment increased bacteria counts by seventy percent (130%, 56%, 36%, 29% increase in four trials).

Conclusions/Discussion
Listerine was shown to be most potent as a toothbrush sanitizer and Steripod consistently increased microorganism counts at forty-eight hours. This study suggested that soaking the toothbrush head in Listerine might offer benefits for patients who are more susceptible to infections or have existing infectious disease. Dental care companies could use this data to better their products to be more effective.

Summary Statement
I showed that Listerine was the most effective as a toothbrush sanitizer and Steripod consistently increased microorganism counts.

Help Received
None. I designed, built, and performed the experiments myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Jordan M. Darrell

Project Number
J2006

Project Title
How Effective Are These Medications against the Common Acne?

Abstract

Objectives/Goals
The objective of this experiment is to determine the effectiveness of popular over the counter acne medications and one natural product which can be used to treat acne.

Methods/Materials
Made an incubator using Styrofoam, a 25watt bulb, and a digital thermometer/humidity gauge. Staphylococcus epidermidis bacteria,petri dishes with Tryptic Soy Agar(TSA), acne medications[Neutrogena{2.5% salicylic acid},Pro-Activ{5% benzoyl peroxide},Tea Tree Oil(TTO)], and sterile disks. Adjusted the temperature in the incubator until it reached a steady temperature around 37 degrees Celcius and a humidity greater than 75%. Divided a petri dish in 4 equal sections and inoculated with Staph. epi. Placed a sterile disk with a control, Neutrogena, Pro-Activ, and TTO separately in each labeled section. All hazardous material was soaked in 10% bleach overnight, sealed, and bagged. I ran a second trial with 4 petri dishes with three previous products and pharmaceutical grade TTO.

Results
The pharmaceutical grade TTO had an average zone of inhibition of 15.75mm, the regular TTO had an average of 12.73mm in the first trial and 13.87mm in the second trial, Neutrogena had an average of 9.53mm in the first trial and 12.87mm in the second. Finally, Pro-Activ had 8.53mm in the first and 11.37mm in the second trial.

Conclusions/Discussion
Acne is the most common skin condition. In the U.S. there are 60 million people with acne. In all 9 petri dishes, the TTO be it pharmaceutical grade or not was most effective against Staphylococcus epidermidis as compared to Pro-Activ,and Neutrogena. Although the zones of inhibition were slightly larger in the second trial, I think a possible explanation is the fact that I used bacteria that had been reactivated 4 days earlier. The order of effectiveness was not changed in either the first or second set of trials. It appears that TTO is more effective and less expensive than the other two products. Further research of the effectiveness of TTO as compared to prescription acne medication would be a next step.

Summary Statement
The natural product Tea Tree Oil is most effective in treating acne.

Help Received
I designed, built my incubator, and ran both trials. Consulted my aunt, Dr. Stephanie Fennelly, as to the best choice of agars and troubleshooting achieving a steady temperature and humidity in the incubator.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Noorah Dhamim

Project Number
J2007

Project Title
The Eco Cleanser

Abstract

Objectives/Goals
The purpose of this experiment is to create an all-purpose hair and body cleansing powder that can be made from natural ingredients. The aim is to create a powder that will be able to absorb body and hair oil, absorb sweat, and kill bacteria using materials that are inexpensive and commonly found. This project will replace harmful chemicals used in dry shampoos with antioxidants, leaving behind a good long lasting smell using the powders of citrus and natural herbs and lastly to donate to the homeless people.

Methods/Materials
To test my prediction, I gathered 18 Petri dishes and 6 different types of powders that are commonly used to test how many bacteria colonies each powder produced. I tested each powder 3 times to get accurate results. To do this, I contaminated the counter with raw chicken grease because chicken is known to produce the most bacteria. After that, I found the percent of water and oil each powder absorbed during intervals of 10, 20, and 30 minutes. I did this by first soaking the powder for the specific amount of time, then filtered the mixture using a coffee filter. I tested each interval for every single powder 5 times to get accurate results that we could rely on.

Results
According to my results, baking soda has the least growing bacteria colonies out of all the other powders I tested. Sedr lost the least amount of water and oil in 10, 20, and 30 minute intervals, which means it would be best body cleansing powder. Lemon and pomegranate also followed in order of absorbing the second and third most water and oil.

Conclusions/Discussion
After conducting the experiment, my hypothesis was proven right. My results proved that Sedr absorbed the most percent of water and oil, and that Baking Soda had the least amount of bacteria colonies.The combination of the four winning powders that killed the most bacteria and absorbed the most water and oil, which are: Baking soda, Sedr, Lemon, and Pomegranate, created the ultimate cost-efficient cleansing powder that will help many homeless people that do not have hygienic products.

Summary Statement
My project is to test 6 different powders to find out which powder absorbs the most water and oil, and kills the most bateria.

Help Received
My teacher always encouraged me to keep moving forward with my project. My science teacher kindly let me use her incubator, and my parents gave me great moral support.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Lucas M. Dyal

Project Number
J2008

Project Title
Inhibiting Escherichia coli

Abstract

Objectives/Goals
The objective of my study was to determine the efficacy of 5 antimicrobial substances at inhibiting the growth of Escherichia coli. I also wanted to examine whether combination products were more effective due to synergy.

Methods/Materials
I inoculated 5 agar plates, using sterile procedures, with Escherichia coli K-12 strain and then placed a sterile control disc with no substance and a sterile disc with one of 5 substances on opposite sides of the plate. I also had a separate control plate for every trial. The substances used were 6% bleach, 10% povidone-iodine, 20% vinegar, 2% chlorhexadine gluconate with 70% isopropyl alcohol, and 3.15% chlorhexadine gluconate with 70% isopropyl alcohol. I inverted and incubated the 6 plates at 37 degrees Celsius for 48 hours. I then measured the size of the zone of inhibition around each disc in millimeters and calculated the standard deviation. Based on the measurements of the zones I classified the Escherichia coli response as susceptible, intermediate, or resistant to the substance. These classifications are determined/accepted by the Clinical and Laboratory Standards Institute.

Results
The results demonstrated that 6% bleach was the most effective against E.coli with an average zone of 43.5 mm. Povidone-iodine was the second most effective with an average zone of 16.3 mm. E.coli only showed an intermediate response to the CHG/Alcohol combination substances and the synergy of these substances was not completely effective. 20% vinegar was not able to inhibit the growth of E.coli as it demonstrated resistance in every trial.

Conclusions/Discussion
Escherichia coli is a significant contributor to food borne illness and hospital acquired infections so knowing the most effective antimicrobial can be life-saving. My findings indicate that 6% bleach and other Halogens should be used to prevent E. coli growth on potentially contaminated surfaces. Both bleach and povidone-iodine are Halogen-releasing compounds and appear to have mechanisms of action that inhibit E.coli with the greatest efficacy. Despite vinegar being advocated for as a "non-toxic" disinfectant I determined it was 100% ineffective as an E. coli inhibitor, therefore unreliable in protecting people. A synergistic effect of combination products may not be as advantageous as choosing a class of chemicals with specific mechanisms that target E.coli structure and function.

Summary Statement
I determined, that of 5 substances commonly used in healthcare as antimicrobials, bleach and then povidone-iodine were superior at inhibiting the growth of Escherichia coli.

Help Received
My mom who works in healthcare taught me the principles of sterile technique and the processes to follow. My science teacher Mrs. Van Nice gave me guidance while I determined my procedure and provided feedback for improvement.

Name(s)
Marissa A. Goswami

Project Number
J2009

Project Title
Using Next-Gen Sequencing to Compare Levels of Bacteria in Bagged Salads

Abstract

Objectives/Goals
The purpose of this project was to analyze types of bacteria present in bagged salads and determine if any bacteria were pathogenic and whether bacterial composition and quantities changed over time. I believed that older packages of lettuce would show more evidence of cell deterioration, which would mean that they might contain a higher concentration of bacteria.

Methods/Materials
I tested "Herb Salad Mix" and "Butter Lettuce." I tested samples with five different expiration dates to simulate how long the lettuce might be stored in the refrigerator. I poured 30 mL of DPBS into each bag to suspend the bacteria, then poured the bacterial suspension into a 50 mL tube. I genetically sequenced each sample to find the bacterial composition, and also grew bacteria from each sample group for a total of 20 different agar plates to get a sense of the quantity of bacteria. The final five plates were inoculated with 50 microliters of bacterial suspension diluted at 1:500.

Results
In the agar plates, I saw no significant difference in the number of bacteria in each sample. When I sequenced the samples, I found many different types of bacteria. In the Herb Salad Mix, the majority of the bacteria encountered were from the genuses Shewanella, Pseudomonas, and Flavobacterium, in addition to small quantities of many other types of bacteria. In the Butter Lettuce, the bacteria were even more diverse and once again represented in small percentages, except for the Pseudomonas, Nostocales, and Bacillales. In both types of bagged salads it was consistently observed that the Pseudomonas bacteria essentially took over, and showed significant increases over time.

Conclusions/Discussion
Although there did not appear to be any significant difference in the overall numbers of bacteria in these salads over time, the composition of the bacteria showed a significant change over time. The Pseudomonas seemed to dominate over the other bacteria. Very few other bacteria showed increases in population. In future experiments it might be interesting to introduce a pathogen, such as E. coli, to see how it affects the bacterial composition and bacterial growth patterns. Because some strains of bacteria observed, such as Pseudomonas, may be pathogenic to humans, I would recommend that packages of bagged salads be consumed as soon as possible. I would also recommend the lettuce be washed before consumption to reduce risk of infection.

Summary Statement
I analyzed samples from bagged salads with different expiration dates to compare how the composition and quantities of bacteria present in the bagged salads changed over time.

Help Received
I would like to thank my parents for driving me to the lab and to the store to obtain my materials. I would also like to thank Tanya Biorac, Loni Pickle, Yutao Fu, Mark Andersen, and Joydeep Goswami for supervising me while I performed the sequencing process at Thermo Fisher Scientific.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Alec Hayashi; Jorja Helms; Tiffany Talamantes

Project Number

J2010

Project Title

Which Anti-Bacterial Substance Kills the Most Bacteria?

Abstract

Objectives/Goals

We tested 2 different antibacterial substances, Clorox wipes and Lysol spray, to see which one eliminated more bacteria. We also added a factor of water and a paper towel because that is what many people use to clean their devices. We hypothesized that the Lysol spray would eliminate more bacteria because it claims to kill bacteria and fungi, whereas the clorox wipes claim to kill more flu and cold viruses.

Methods/Materials

The materials used for this project were Clorox wipes, Lysol spray, water, paper towel, IPad, and petri dishes. First, we wiped down a section of the screen with water and a paper towel. We then waited 30 seconds for it to dry. We swabbed the screen where we wiped, and placed that into a petri dish. We did the same for the Clorox wipes, Lysol spray, and with nothing on the screen. We labeled the petri dishes accordingly. The petri dishes were placed in a room with a temp. of 29 degrees celsius. According to research, 70-95 degrees, or 21-35 degrees celsius, is the ideal temperature for growing bacteria in a petri dish. We also found out that when growing bacteria in a petri dish, certain bacteria can grow faster than others, leading us to decide that we should not do a graph based on bacteria colony size.When we were using the Clorox wipes, instead of following the directions on the back that states that you should use enough wipes to leave the surface wet for 4 minutes, we just used 1 wipe and wiped the surface across 3 times, imitating what people would normally do. We followed the directions on the back of the Lysol spray, though, because that is what people commonly do anyways. The instructions stated to hold the spray can above the surface about 6-8 inches and spray the surface for 2-4 seconds.

Results

The results were very close, with the lowest amount of bacteria remaining after 7 days with the use of the Clorox wipe, followed by water and the paper towel. Lysol spray had the most amount of bacteria remaining.

Conclusions/Discussion

Our results do not support the hypothesis because Lysol actually eliminated the least amount of bacteria. There were very few bacterial colonies seen on the Clorox wipes petri dish, and same for the water and paper towel. In the Clorox wipe trials, 1 of the petri dishes did not grow any bacteria, and 2 grew very little, showing that the Clorox wipes eliminated almost all of the bacteria. The Lysol spray was the least effective of the three substances.

Summary Statement

In our science fair project, we tested 3 different antibacterial substances and compared them to see which one eliminated the most bacteria off of an IPad screen.

Help Received

None: This project was designed, researched, and performed by each member as a group.

Name(s)
Emily A. Hsi

Project Number
J2011

Project Title
A Scientific Method for Choosing Sweet Grapes: An Evaluation of 12 Characteristics

Abstract

Objectives/Goals
Evaluate 12 grape characteristics to identify useful attributes for choosing the sweetest grapes in the store without tasting them.

Methods/Materials
663 grapes from 100 bunches, ruler, beaker, refractometer, and Color Name App. Power calculations were done on the bunch and individual grape level. A sample size of 50 bunches per dichotomous characteristic (red/green, organic/non-organic) would detect a 2% difference in Brix Score (1%=1g sugar/100g solution) with 92% power, and a sample size of 600 grapes would detect a 1% Brix difference with 98% power based on two-tailed, t-tests at a significance level of P<=0.05. Univariate analyses were conducted using proportions (categorical variables) and mean and standard deviations (continuous variables). Bivariate analyses were conducted by 1) creating scatter plots for visual associations between grape characteristics and sweetness, and 2) entering variables one-by-one into a generalized linear mixed model predicting sweetness, accounting for clustering at the bunch level. Lastly, multivariable analyses were conducted by entering multiple variables into the same model to evaluate the independent association of each variable with the outcome while simultaneously controlling for other variables and accounting for clustering at the bunch level.

Results
Bivariate models found that red, non-organic, low-volume, shorter, and bigger-bunch grapes were sweeter. Using exact hues, less red, less green and less blue, but more yellow predicted sweeter grapes. In multivariable models, red grapes were sweeter by 3.3 Brix %, non-organic grapes were sweeter by 1.2 Brix %, and shorter grapes were sweeter by 0.95 Brix % per cm. A similarly fitting model replaced the visually red grape variable with the exact red and green hue colors, and found a 0.01 Brix % increase per unit red hue (decimal code), and a 0.02 Brix % decrease per unit green hue (decimal code). Clustering at the bunch level had a small effect.

Conclusions/Discussion
There is a pragmatic way to choose sweet grapes in the store without tasting them. Small, non-organic, red grapes are significantly sweeter. For highly discriminating consumers or colorblind individuals, a color app can identify the exact color of the grape, with redder and less green hues predicting sweeter grapes. Thus, easily distinguishable characteristics can lead to the selection of sweeter grapes for millions of people who consume grapes each year.

Summary Statement
Choosing bunches of small, red, non-organic grapes is the most pragmatic way to select sweet grapes in the store without tasting them.

Help Received
I conceived of the project, conducted all experiments, collected the data, and ran my own analyses in SAS. I received training on sample size calculations and SAS programming from my mother (Dr. Susan Huang, Professor of Infectious Diseases at UC Irvine).

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Daniel H. Hudak

Project Number
J2012

Project Title
Is a UV Wand More Effective than Household Sprays at Germ Killing?

Abstract

Objectives/Goals
The objective of this experiment is to determine if a $50 ultra violet wand is more effective at disinfecting surfaces than 409 and Lysol.

Methods/Materials
Cleanwave UV Wand by Verilux, 409 spray, Lysol spray, school tables, agar petri dishes, and sterile swabs.

Results
The UV Wand did not perform as well as expected. Lysol spray did the best at disinfecting an area than either the 409 or UV Wand. The UV Wand had 3 out of 7 plates with bacteria on them, Lysol had 1 out of 7 plates with bacteria on them and 409 had 5 out of 6 plates with bacteria on them.

Conclusions/Discussion
Although the UV Wand did not perform the best against Lysol, it is more effective than 409. Also, this UV Wand is not as high-powered as UV Wands used in hospitals and medical centers. As we move forward in technology, the UV Wand has the potential to be the next best thing for disinfecting large areas instead of using messy sprays that can only clean a small area at a time.

Summary Statement
The conclusion of the experiment shows that the most effective cleaning agent is Lysol out of: a UV Wand, Lysol spray, and 409 spray.

Help Received
I designed and performed the experiment myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

Christopher Kwok; Nicholas Kwok

Project Number

J2013

Project Title

R.I.P. Double Reeds: How to Delay the Decaying Rate of a Double Reed?

Abstract

Objectives/Goals

Our project is to discover how to delay the decaying rate of a double reed? Double reeds, belonging to the bassoon and oboe, are delicate, short term lasting mouth pieces that are essential for the sound and tone for its instrument. We preserved the reeds using cooling/freezing, heating, curing/pickling, and hydrogen peroxide. Our hypothesis is that hydrogen peroxide will increase the reed's lifespan most effectively. We discovered that enzymes in your spit is the cause for a double reed to decay as enzymatic reaction takes place on the canes of the reeds.

Methods/Materials

We started with 10 bassoon reeds and 10 oboe reeds, each with decibel of 80. Then we tried to make the reeds as identical as possible. We followed the experiment by first taking the initial reed's decibel by blowing a constant stream of air and using a decibel meter. After, we soaked the reeds in spit for 2 hours to mimic a practice session. Next, we proceeded with each preservation method for the next 22 hours. We continued the 24 hour cycle of spit, preserving, and taking the decibel until the reed reached a decibel of 0 or unresponsive.

Results

In result, heating was the best preservation method. With heating, the reeds lasted for 54 days for the bassoon reeds and 48 days for the oboe reeds. Compared to the control, it lasted for 28 days for the bassoon reeds and 23 days for the oboe reeds. This was almost a double in lifespan. Followed by heating, hydrogen peroxide worked the second best, then curing/ pickling, and lastly cooling/freezing that actually reduced the reeds average lifespan. Heating has the ability to increase a reed's lifespan and is capable in extending the longevity of a double reed.

Conclusions/Discussion

Our data indicated that our hypothesis was wrong, and instead of hydrogen peroxide working the best, heating did. Heating was the best to increase a double reed's lifespan as the 100 celsius environment allowed the enzymes contaminating the reeds to denature itself successfully and actively. This delayed the enzymatic reaction. Next time, we would like to test if the full 22 hours under the heat lamp was necessary. This data could be used by double reeds musicians to help lengthen there most precious, fragile reeds.

Summary Statement

Our project wants to discover how to delay the decaying rate of a double reed using different preservation methods such as cooling/freezing, heating, curing/pickling, and hydrogen peroxide.

Help Received

We received help from several sources including our music teachers, Wendall Hannah and Adrian Malley. They helped supplied and make the identical reeds that was conducted in the experiment. They helped make the mass quantity of reeds with specicial dimensions. Lastly, our support from our parents!

Name(s)
Angela Y. Ling

Project Number
J2014

Project Title
The Effects of Sulfates on Hair Tensile Strength

Abstract

Objectives/Goals
The objective of this study is to determine if the use of sulfate containing or sulfate-free shampoo better affects hair strength. Sulfates can sometimes have a harsh treatment on hair by dehydrating it, leading people to use sulfate-free shampoo; the experiment's goal was to determine if which actually affects hair strength better.

Methods/Materials
Several strands of human hair, 2 sulfate containing shampoos, 2 sulfate-free shampoos, kitchen scale, uncooked rice, duct tape, plastic bag. The hair strand was secured to the plastic bag with tape. The bag was slowly filled with uncooked rice grains until the hair broke. Then, the weight of the bag was measured on the kitchen scale.

Results
The sulfate-free shampoo had a worse effect on hair than sulfate containing shampoo. The control group held an average of 78.3 grams. The two sulfate-free groups together held an average of 82.3 grams. The sulfate containing groups together held an average of 93.1 grams, both holding more than the control group and the sulfate-free group. One of the sulfate-free shampoos held less than the control group.

Conclusions/Discussion
Hair tensile strength is better affected by sulfate containing shampoo than sulfate-free shampoo. Both of the sulfate containing shampoos held a higher average than the control group, while one of the sulfate-free shampoos held less than the control. However, some uncontrolled variables could have affected the results, such as the source of the hair, previous hair treatments, or the hair's thickness.

Summary Statement
I found that sulfate containing shampoo, rather than sulfate-free shampoo, has better effects on hair tensile strength.

Help Received
None. I conducted the experiment myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Charlotte E. Newman

Project Number
J2015

Project Title
Discovering Effective Ways to Reduce Bacteria in the Mouth

Abstract

Objectives/Goals
My project focused on the effectiveness of different mouth cleaning products that claim to destroy damaging bacteria from the mouth. Because my dentist recommended that I use the Philips Sonicare Kids electric toothbrush, I hypothesized that the electric toothbrush with toothpaste would be the most effective at removing bacteria. My hypothesis was proven wrong after I assessed my data and found that Cool Mint Listerine Antiseptic removed the most bacteria. Looking back on my data, I can see that this result makes sense. Whereas the electric toothbrush removes food particles and plaque, it only moves the bacteria around. The Listerine, on the other hand, is an anti-bacterial and bacteria killing mouthwash. Further studies could study what product cleans teeth the best of plaque or food particles. This study proved that Listerine mouthwash is superior to other products when it comes to removing bacteria.

Methods/Materials
Swabbed subjects' mouths before and after use of different products to determine which product was the best at reducing bacteria. The following materials were used:
One bottle of Listerine Cool Mint Antiseptic
One bottle of Listerine Kids Smart Rinse
Two tubes of Colgate Maximum Strength toothpaste Six Up & Up brand Contour soft bristle toothbrushes
Six Philips Sonicare replacement toothbrush heads One Philips Sonicare Toothbrush base
36 Sterile cotton swabs
70 squares of Parafilm
35 Petri dishes with nutrient agar 2 Petri Stickers

Results
I found that Listerine Cool Mint Antiseptic was better at reducing bacteria than the other methods tested. The Phillips Sonicare electric toothbrush with Colgate toothpaste was worse than the other methods.

Conclusions/Discussion
This project shows that to reduce bacteria, an antiseptic or antibacterial should be used.

Summary Statement
My experiment is about finding the best way to clean bacteria from your mouth without going to the dentist.

Help Received
My science teachers Dr. Jay Fisch and Mrs. Arpa Ghazarian

Name(s)
Nikita Senthil

Project Number
J2016

Project Title
Eliminating Escherichia coli: The Effect of Nanosilver Particles on Escherichia coli Growth

Abstract

Objectives/Goals
The objective of this experiment was to discover the effect of different concentrations of nanosilver solution (500,000 µg/L; 50,000 µg/L; 5,000 µg/L; 500 µg/L; and 0 µg/L) on Escherichia coli growth (or lack thereof, measured as the zone of inhibition in millimeters).

Methods/Materials
During the experiment, which consisted of three trials, the concentrations were first prepared using serial dilution; then, paper disks were soaked in the concentrations and lowered into the inoculated petri dishes. The petri dishes were then transferred to the incubator set at 37°C. For four days, the zones of inhibition for each petri dish were observed, and the results were recorded. Seven days after setup was completed, 10% bleach was sprayed in the petri dishes, which were then sealed and left to soak for eight hours before disposal in the dump.

Results
On average, when the disk was soaked in the highest concentration of nanosilver solution (500,000 µg/L), the zone of inhibition in the petri dish was widest, followed by each lower concentration, with the control group displaying no zones of inhibition.

Conclusions/Discussion
The nanosilver solution's potency increased with its concentration, so the hypothesis was fully supported. This was because nanosilver particles destroy the sulphur and phosphorus bonds in E. coli, harming functions leading to the death of the bacterium. Nanosilver particles are small enough to be completely absorbed by the bacteria, causing the bacteria to burst. The highest concentration of nanosilver solution gave way to the widest zone of inhibition because a higher concentration means more nanosilver particles in the same amount of liquid; the greater the number of nanosilver particles, the more quickly the ambient bacteria will die. Nanosilver thus is a viable solution to E. coli outbreaks. Even the lowest concentration tested yielded a zone of inhibition, demonstrating that such a seemingly low level of nanosilver solution is, though effective, still potent. The EPA has not regulated a safe level of nanosilver, which is harmful to not only the environment but also to our cells when ingested. The project calls for the EPA to take action in setting a standard for nanosilver levels in the environment.

Summary Statement
As measured by the zone of inhibition's width, it was found that higher concentrations of the antimicrobial nanosilver prevented the growth of Escherichia coli most effectively.

Help Received
I executed the project's methods myself, with my science teacher offering guidance, especially in proper disposal techniques. She provided me with a work space and an incubator with which the experiment was conducted.

Name(s)
Diana Shidaeva

Project Number
J2017

Project Title
Comparing Nitrate levels on Different Apples and Studying the Effectiveness of Different Solutions in Removing Pesticide

Abstract

Objectives/Goals
This experiment was conducted to compare the nitrate levels of both organic and conventional gala, granny smith, and red delicious apples before and after they are washed in a baking soda solution, a white vinegar solution, and Trader Joe's Fruit Wash. The hypothesis was that baking soda solution would work the best at removing pesticide residue.

Another experiment was also done with twenty of the apples that were used. The hypothesis for this experiment was that wiping down the apples would be the most effective at removing pesticide rather than air-drying which was proved correct.

Methods/Materials
The materials used were different varieties of apples, solutions, and a Greentest Nitrate Tester.

Five conventional and five organic apples were wiped down completely after being washed, and the other five organic and five conventional were left to air-dry.

Results
The results showed that white vinegar was the least effective at removing residue. It indicated that both before and after the wash there was no change in residue levels. (<30 milligrams.) Trader Joe's Fruit Wash had removed 20 milligrams off of a 60-milligram conventional gala apple. Baking soda solution had turned <30 milligrams into 0 milligrams on two apples

Two conventional apples washed with baking soda and wiped down and were found with 0 milligrams of nitrate after being tested.

Conclusions/Discussion
This experiment is useful because it clarifies the fact that both organic and conventional apples had safe levels of pesticide residue. In this study, organic apples did not prove to be better than cheaper conventional apples.

Summary Statement
This project is about comparing nitrate levels on different varieties of apples and finding the most effective solution in removing pesticide.

Help Received

Name(s)
Priyanka K. Soe

Project Number
J2018

Project Title
Comparing Levels of Coliform Bacteria in Raw, Pasteurized, and UHT Milk Products

Abstract

Objectives/Goals
According to statistics from 2009 - 2014, the average person who drinks raw milk is 840 times more likely to contract a foodborne illness than one who drinks pasteurized milk. In my project I tested coliform levels in raw milk, pasteurized milk (heating milk to 63°C for 30 minutes), and Ultra Heat Treatment (UHT) milk (heating milk to 135°C for 1-2 seconds). I believed that the UHT milk and the pasteurized milk would contain safe levels of coliforms while the raw milk results might vary, and the raw milk might not contain safe levels of coliforms.

Methods/Materials
I performed two trials to test 10 of milk products and used a total of 33 plates. I inoculated each plate with 2 mL of milk into the Coliscan Easygel. I used Coliscan Easygel media, sterile serological pipets, an incubator at 37°C, safety goggles, a metric (mm) ruler, a colony counter, Parafilm, a magnifying glass, disposable gloves, and a lab coat.

Results
I tested one brand of raw milk twice, two types of raw kefir (whole and skim), four brands of pasteurized milk, and three brands of UHT milk. In my first trial, I found an average of 16 coliform colonies in the raw milk, but in my second trial, the test plates for raw milk contained coliform colonies too numerous to count. I also found E. coli colonies in the raw milk during my second trial. For the raw kefir, I was unable to count the exact number of colonies because the plate contained lawns of coliforms. I also documented E. coli in the raw kefir plates, and in the skim raw kefir plates. All the plates inoculated with either pasteurized milk or UHT milk were completely sterile.

Conclusions/Discussion
I thought I might encounter bacteria in the pasteurized and UHT milk products, but these milk products were completely sterile. The raw kefir contained many colonies, which was expected, since it contains beneficial bacteria, but some E. coli was also found, which surprised me. My hypothesis, stating that the raw milk results would vary most, was supported. I found several coliform colonies during my first test of raw milk, but the number still met California state regulations. However, during my second test of raw milk, I found numerous coliform colonies in the raw milk products as well as some E. coli colonies. This supports my hypothesis that the raw milk would not meet the California state standards for raw milk. 2321 characters

Summary Statement
I compared numbers of coliform colonies in various milk products while checking to see if the raw milk passed California state standards.

Help Received
I would like to thank my mother for driving me to various grocery stores to purchase the milk products for my project. Thanks to my science teacher for her guidance, supervision, safety, and providing materials and equipment. I preformed all my procedures and analyzed the results by myself.

Name(s)
Evan K. Taw

Project Number
J2019

Project Title
Which Type of Drinking Water Is Fresher and Better Hydrates Your Body?

Abstract

Objectives/Goals
There is a popular assumption that all water, especially bottled water, available to the public is essentially equal in their chemical and electrical property. However, there are differing types of water, which come from different sources. The objective of this project is to find out which type of drinking water is fresher and would better hydrate our body.

Methods/Materials
I tested 8 different types of drinking water, which had the same temperature, from different sources: Aquafina (pure water purified by Reverse Osmosis), Core Hydration (perfect pH water with electrolytes and minerals), Evian (spring water), Essentia (pH 9.5 ionized hydration, pure water electrolytes), Kangen Water (pH 9.5 ionized alkaline water through electrolysis), Smart Water (vapor distilled water and electrolytes), tap water, and Voss (artesian water). I used a pH drop solution to test water pH levels - acidic or alkaline, an ORP meter to test for oxidation or reduction chemical reactions in each type of drinking water, and apples to find out which type of water oxidizes the apple slices faster by submerging them into the waters and removing them to oxidize. I used an apple corer to cut each apple into slices to maintain the same oxidation time.

Results
Kangen water showed negative OPR and 9.5 pH values while other types of waters all had positive ORP and different pH values. A positive ORP value means the substance is an oxidizing agent. A negative ORP value means the substance is a reducing agent, which has the ability to donate electrons. An acidic water has more hydrogen ions than hydroxide ions as the acid donates hydrogen ions. In contrast, a base accepts hydrogen ions, and as the base water soaks up hydrogen ions, it results to more hydroxide ions than hydrogen ions. Oxidation rates in water with a lower ORP and a higher pH values are slower because oxygen does not rapidly penetrate a surface in order to reach the free radicals. Consequently, drinking water with lower OPR and higher pH better hydrates our body.

Conclusions/Discussion
The results of my experiments confirmed that drinking water with a lower ORP and a higher pH value is not only fresher but also better hydrates our body. My findings would be helpful for chemists, material scientists, and water quality scientists in doing further research on how different sources of water benefit different people based on an individual's pH level, how hydrated they are, and diet.

Summary Statement
This experiment proved that drinking water with a lower Oxidation-Reduction Potential value and a higher potential of Hydrogen scale is fresher and better hydrates our body.

Help Received
My mother helped me take pictures and printed them. During apple oxidation tests, my parents helped me put the apple slices in the waters and took them out at a consistent time so that the apples would all oxidize at the same time.

Name(s)
Elizabeth A. Thacker

Project Number
J2020

Project Title
Effectiveness of Hand Drying Products Utilizing Silver Ion Antimicrobial Fabric Technology in Reducing Bacteria

Abstract

Objectives/Goals
Not drying hands thoroughly after washing may reduce the benefits of handwashing. According to researchers at the CDC and Mayo Clinic, drying hands is equally as important as washing hands and is often overlooked in disease prevention. When I noticed students at school wiping their hands on their pants when paper towel dispensers were empty, I was inspired to invent the reusable HandyDRYGlove using fabric with antimicrobial silver ion technology. The objective of my project was to test the effectiveness of using this glove for removing more bacteria and moisture from hands compared to commercial hand drying products.

Methods/Materials
I inoculated and analyzed 73 agar plates to evaluate the effectiveness of hand drying products on bacterial reduction. I washed my hands over 300 times and dried them using three different products: HandyDryGlove, paper towels, electric hand dryer and not drying (the control). After each test, I measured degree of hand wetness with a moisture meter and visually assessed hand condition on a scale from 1 to 5. I inoculated MacConkey and LB agar plates with three fingers and incubated them at 37 degrees C for 72 hours. I photographed and analyzed results. I also sent 10 plates to a lab for DNA gel electrophoresis bacterial strain identification.

Results
The results showed that bacteria remained on hands after drying for all products. Bacterial colony numbers increased progressively with hand wetness level after drying. The glove reduced the average CFU plate coverage to 5% compared to 22% for paper towels, 29% for hand dryers, and over 50% plate coverage with no drying. Hand moisture meter readings were DRY for the glove compared to MOIST for all other hand drying products. Bacteria was also found on unused paper towels and not on gloves.

Conclusions/Discussion
The glove was significantly more effective at reducing bacteria, moisture and providing a cleaner drying surface compared to other products. Using the right drying product after washing is an important factor in limiting the spread of disease. I recommend that people finish the job of washing hands by drying hands with a silver ion antimicrobial fabric glove, but any drying method is better than leaving hands wet. Future testing could include towels made from cotton, bamboo, and polyester blends. The practical application of an antimicrobial fabric hand drying product used everyday by consumers may improve public health.

Summary Statement
I created a reusable hand drying glove using silver ion antimicrobial fabric and showed that it was more effective at reducing bacteria and moisture on hands when compared to commercial hand drying products: paper towels and air hand dryers

Help Received
I researched fabric, designed glove, wrote procedures, performed experiments and analyzed results myself. I thank Dr. S. Culler for talking with me about science, providing agar plates, incubator space, and DNA gel electrophoresis results for 10 of the 73 plates. I also thank my science teacher for her guidance

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Kayla T. Venger

Project Number
J2021

Project Title
Going Bananas over Fruit Ripening?

Abstract

Objectives/Goals
The objective of this project is to determine if banana ripening is prolonged using larger than necessary food preservation bags.

Methods/Materials
Bananas, large and small food preservation bags, cups of zeolite (food preservation agent), avocado mesh. Banana ripeness was measured under different conditions of zeolite exposure.

Results
Ripening was prolonged using either a small or large food preservation bag. However, there is no statistically significant difference in the speed of ripening between large vs. small preservation bags for the same amount of produce.

Conclusions/Discussion
Ripeness measurements over a large set of bananas does not show a statistically significant difference in banana ripening between large and small food preservation bags. Surrounding bananas with zeolite is more effective at prolonging ripening than exposure to zeolite in a nearby container.

Summary Statement
The purpose of this project is to determine if banana ripening is prolonged by using larger than necessary food preservation bags.

Help Received
I set up this experiment and performed all the measurements myself. My cousin in the biotech industry helped me understand the science of produce ripening. My father helped with statistical analysis of the data.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Lindsey E. Williams

Project Number
J2022

Project Title
The Effect of Antibacterial Soap Brand on Bacterial Life Decrease

Abstract

Objectives/Goals
The goal of this experiment was to find what brand of antibacterial soap is most effective to kill bacteria.

Methods/Materials
Bacteria samples, Petri dishes, incubator inoculator, three brands of antibacterial soap. Grew bacteria colonies and treated them with various kinds of soap.

Results
It was found that Softsoap kills 55% of bacteria, Dial kills 50% of bacteria, Trader Joe's kills 6% of bacteria, and no treatment kills 0.75% of bacteria.

Conclusions/Discussion
Bacteria colonies were tested to find what brand of antibacterial soap is most effective to kill bacteria. It was found that more natural soaps are less effective at killing bacteria than chemical soaps.

Summary Statement
After testing different brands of antibacterial soap on bacteria, it was found that Softsoap is the most effective at killing bacteria.

Help Received
In addition to the help I received from my school and family, I was assisted by Dr. Kaitlyn Hanley. She helped me form my procedure so that it was safe and effective, answer my many questions, and encourage me to persevere in my project.