CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Cynthia Aguado

Project Number
J1301

Project Title
Determining the Effects of Temperature Variations and Cooking Times on the Continued Growth of Escherichia coli Bacteria

Abstract

Objectives/Goals
My objective is to determine which of the three meats I cooked would develop the most E.coli based on it's cooking thime and temerature.

Methods/Materials
Beef, Chicken, Pork, cutting board, gloves, insulin needle, pan, stop watch, knife, thermometer, stove top, 27 petri dishes, 1 cup of water.

Results
Chicken developed the most Escherichia Coli bacteria, out of the three meats I tested.

Conclusions/Discussion
My hypothesis turned out to be incorrect. My hypothesis stated that beef would develop the most E.coli, but chicken turned out to heve the highest averaged percentage of bacterial infection.

Summary Statement
The purpose of my investigation is to determin what type of meat devlops the most E.coli based on the temperature and time exposure.

Help Received
Mother bought and gathered all nessesary materials for project, brother helped taking procedural pictures and advisor revised work.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Maliha S. Ahmed

Project Number
J1302

Project Title
Bacterial Content of Milk

Abstract

Objectives/Goals
My objective is to determine the amount of bacteria in refrigerated and standing milk to see if it is unsafe or safe to drink by using the Methylene Blue Test. Growing bacteria needs dissolved oxygen that the blue dye presents in the milk, so the time it takes the blue dye to disappear indicates the amount of bacteria present.

Methods/Materials
My materials that I used for my procedure were 2 test tube stands, 2 test tubes withrubber stoppers, 2 medium glass jars, a saucepan, a hotplate, a thermometer, a calibrated(cc)medicine dropper,tongs, methylene blue solution, standing milk,and refrigerated milk.
My methods for this experiment were that I first sterilized the test tubes.Then I put 9cc of refrigerated milk into both tubes. Then I put 1cc of methylene blue solution in fist tube and shook it thoroughly. I put water in a saucepan and placed it on a hotplate and slowly heated it until it reached 98.6 degrees F. Then I filled 2 glass jars with 3/4 full with water and then placed it in the pan. Then I put both test tubes in each jar and allowed them to remain until the methylene blue disappeared. I checked the tubes every half hour for the first 2 hours then once an hour after that. I did this experiment again but I substituted the refrigerated milk with standing milk. I did this whole experiment theree times.

Results
My results were that the first time I did this experiment it took the blue solution 8hr. and 25min. to disappear in the refrigerated milk. The standing milk with the blue in it took 35min. to regain its white color. On the second experiment the refrigerated milk with the blue in it took 8hr. and 12min. for it to regain its white color. The standing milk with the blue solution in it took 32min. for it to regain its white color. On the third experiment the refrigerated milk with the blue solution in it took 8hr. and 30min. for it to regain its white color. The standing milk with the blue solution in it took 35minutes for it to regain its white color.

Conclusions/Discussion
My conclusion was that my hypothesis for the refrigerated milk was incorrect. I thought that the refrigerated milk would be of good quality but it turns out that it was of excellent quality. But my hypothesis for the standing milk was correct. The standing milk was of poor quality.
I bought raw milk to compare it with the other milks and it took the the raw milk 5hr. and 10min. The raw milk was of Fair quality.

Summary Statement
My project is about bacteria in milk.

Help Received
NONE.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Aubrey L. Baldwin

Project Number
J1303

Project Title
Germs, Infection, Bacteria! Oh My!

Abstract

Objectives/Goals
To determine if liquid Colloidal Silver would kill bacteria found on your hands.

Methods/Materials
Using 27 human subjects, I had each individual wipe their fingers on agar in 2 petri dishs. All were swabbed on the same day. After three days, I measured the amount of bacteria grown in each petri dish, and then began treating 1 sample from each individual with Colloidal Silver spray, while keeping 1 sample from each individual as a control(untreated).
Petri dishes
Agar
Colloidal Silver

Results
In the two trials run, Colloidal Silver was effective in inhibiting further growth of bacteria in the test dishes, and in some cases, stopping the growth altogether, while the bacteria continued to grow in the control dishes.

Conclusions/Discussion
I concluded that Colloidal Silver spray is an effective treatment in slowing, and in some cases, stopping, the growth of bacteria.
My experiment leads me to believe that there are many kinds of treatments for killing bacteria, besides soap and water, or even drugs.
If Colloidal Silver was used immediately, at the first sign of bacteria growth, it might possibly wipe out all growth of the bacteria.

Summary Statement
My project is about how Colloidal Silver spray affects the growth of bacteria from your hands.

Help Received
Guidance from my teacher Debbie Dolan

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Alexandra Brabson; Randi Hartzman

Project Number
J1304

Project Title
How Low Will Plankton Go?

Abstract

Objectives/Goals
Our objective was to find the abundance of plankton at different depths of the ocean and if the depths affected the amount of Zooplankton and Phytoplankton in each sampled depth and area.

Methods/Materials
We came up with a device that would be able to collect water from different depths of the ocean without collecting water from other depths as well.It is two check valves connected with a pipe.It works by when dropping the device into the ocean the upward push of water pushes the check valves up and when you stop at the depth you want your upward pull keeps the valves closed until you open the bottom valve above your container.We used a 55ft rope with 5 knots in it every 10ft.We would measure our depths by holding a knot at the surface and dropping the device straight down until we felt a tug.We used plastic containers labeled with areas, surface, and the depth in feet.These helped us stay organized.Our boat was provided by our parents who so took us out and watched us collect our data.Our laser was provided by a family friend who works at UCSB.He helped us count the density and the amount of particles in each sample.This was our fluid count.He provided materials needed in the lab.Our microscope and slides, for our static plankton count, were provided by our parents. This count showed each kind of plankton in each sample.

Results
We found that Phytoplankton does live towards the surface because they need the sunlight to do photosynthesis because they are like a plant.We found that the smaller Zooplankton live right below them because phytoplankton is their source of food but, we found that the even larger Zooplankton live right below the smaller Zooplankton eating them. Then the larger marine animals eat fish which feed on plankton.

Conclusions/Discussion
we concluded that Plankton, while being at the bottom of the food chain, is the main source of marine life.Our project expands our knowledge of microbiology because from this experiment we learned that even though our hypothes was right, we can never really be sure about where they live.This is because they are living organisms, they eat, breathe, and move due the the currents and being able to swim.You can never be sure if you are going to land in an area full of plankton or two inches away from it. We found that there was never a certain kind of plankton in one area, both kinds were in each sample.We recorded both, but used the most common.

Summary Statement
Our project was to see how mcuh Zooplankton and Phytoplankton there was at different depths of the ocean.

Help Received
Used Lab equipment at USCB under the supervision of Dr. Vojislav Serdanov; Head of the Research Department of physics.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Karen M. Brentano

Project Number
J1305

Project Title
Resistance of Lake Water Biofilms to Ultraviolet Radiation

Abstract

Objectives/Goals
The purpose of this experiment was to determine the amount of UV light that kills biofilm organisms and other bacteria. The hypothesis of the experiment was that higher levels of UV light would eliminate more bacteria and biofilm organisms than lower levels of UV light. It was also hypothesized that the biofilm organisms would be more resistant than normal bacteria, represented by milk bacteria and E.coli.

Methods/Materials
The two forms of biofilm organisms treated were either free floating in 15 ml of lake water, or already established as biofilms on microscope slides that had grown for 2-3 weeks. For the milk bacteria and the E. coli trials, 0.1 ml of either milk or diluted E. coli culture were plated on an LB agar plate. Petri dishes containing plated bacteria, 15 ml of lake water, or a biofilm slide were treated with up to 1,000,000 microjoules per square cm of UV light. The number of colonies or organisms remaining was compared to the control.

Results
Most milk bacteria and E. coli colonies were eliminated by about 10,000 microjoules per sq. cm, but the established and free floating biofilm organisms were still thriving at that point and even at the highest treatment, 1,000,000 microjoules per sq. cm. The numbers of the organisms in established biofilms were estimated for the control and the treated, and were about the same. After treatment, free floating organisms were allowed to form biofilms for 2-3 weeks, then the number of organisms in 10 microscope fields from two plates were counted and averaged. Statistical analysis showed no difference between the treated plates and the control.

Conclusions/Discussion
Although the point where biofilm organisms began to decrease was not found, they were resistant to at least 100 times more UV light than milk bacteria or E. coli. It was hypothesized that the biofilms would be more resistant to UV light than milk bacteria or E. coli, but the free floating organisms were not expected to be this resistant without a biofilm matrix. I think that biofilm organisms are so resistant to UV light because they live out in the sunlight, and have developed the ability to protect and repair their damaged DNA, because without that, they would not be able to survive or reproduce properly.

Summary Statement
My project is about determining the resistance of biofilm organisms to Ultra Violet light in comparison to normal bacteria.

Help Received
My dad helped me understand scientific concepts and statistical analyses, helped with the experimental part, and took pictures of biofilms through the microscope. My science teacher, Mrs. McKinney, helped direct me in the written part of my project. Gen-Probe donated equipment and supplies.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Kevin A. Brothers

Project Number
J1306

Project Title
Bacterial Levels Compared to Distance from Mission Bay Storm Drains

Abstract

Objectives/Goals
My hypothesis is that water near the information center will be more polluted with E. coli and coliform bacteria the closer one gets to the storm drain. I am testing the levels of and coliform bacteria and E. coli, both found in human and animal fecal waste. I will see if the bacteria is more concentrated the closer one gets to a Mission bay storm drain.

Methods/Materials
I collected water samples at the mouth, 150 feet, and 300 feet North and South of two Mission Bay storm drains (the Information Center and De Anza Cove) on ten different occasions. I brought the samples to the microbiology lab at San Diego Mesa College. There I labeled and plated 100 microliters of the collected water samples onto EMB agar petri dishes. They were incubated for 24 hours to allow for the growth of the E.coli and coliform bacteria.

Results
My results showed that there was more bacterial contamination at the Information Center storm drain compared to the storm drain at De Anza cove. The average coliform count at the Information Center was slightly higher then at De Anza Cove, but the E.coli levels averaged five to tens times higher at the Information Center.The results of E. coli supported my hypothesis in that there was a greater concentration of bacteria at the mouth of the storm drains compared to 150 and 300 feet away

Conclusions/Discussion
The levels of coliform bacteria were the highest 150 feet away from the mouth of the Information Center storm drain and 300 feet away from the mouth of the De Anza Cove storm drain.

Summary Statement
I tested water sample for bacteria to see if distance from storm drains affected their number.

Help Received
The microbiology lab at San Diego Mesa College. My father, William Brothers, was the supervisor.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Elizabeth S. Church

Project Number
J1307

Project Title
Growth of Water Bottle Bacteria

Abstract

Objectives/Goals
The goal of my project is to find out which environment (in a car, on a kitchen counter, on an outside surface, or in the refrigerator) makes a Crystal Geyser Natural alpine spring water bottle grow the most bacteria after being drunk out of.

Methods/Materials
In my project, the main materials I used were: Crystal Geyser water bottles, sterile cotton swabs, petri dishes, agar, magnifying glass, a lamp, and a human mouth. To do my project I drank from each water bottle, then took a sample from the inside rim of the bottle. Then I had the bottles sit in their environment. After 2 days, and again after 5 days, I sampled the rim and the water itself. Then I measured the amount of bacteria that grew in each petri dish.

Results
Of all the samples I took, after five days, the results were that the outside environment had the most bacteria. The car environment had the next most, then the kitchen counter, and last the refrigerator.

Conclusions/Discussion
In conclusion, my hypothesis was partially correct. I was wrong when I predicted the most bacteria would grow in the bottle in the car. Instead the most bacteria grew in the outside environment. However, I was correct about which environment would grow the least bacteria..... the refrigerator.

Summary Statement
My project is about the growth of bacteria in a water bottle that has been drunken from, and left sitting in a certain environment.

Help Received
My mother helped type my report while I told her what to write. She also bought my supplies. My whole family encouraged me.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Stephanie N. Espinoza

Project Number
J1308

Project Title
Saccharomyces exiguus: Does Our Local Life Cycle Differ from San Francisco?

Abstract

Objectives/Goals
I hypothesized that our local wild yeast behavior would differ from what I considered the "norm," the San Francisco yeast, due to climate.

Methods/Materials
I used bread flour, straws, and various baking utentils and equipment. I prepared over 60 trials of sourdough culture. Straws were used to gather data on rise. While utilizing a microscope, I observed the cellular activity level.

Results
I found out that we do have wild yeast in our environment. However, they do not behave the same as the wild yeast in areas famous for sourdough breads. Specifically, data from culture days 1, 2, and 3 indicate that our wild yeast perform similarly to that of San Francisco. Day 4 and 5 data demonstrated a drastic difference: Day 4 local rise showed 62%, while San Francisco rise is at least 100%. Day 5 locally showed a rise of 68%, San Francisco rise ranges from 150-200%.

Conclusions/Discussion
In conclusion, our wild yeast did behave differently from the San Francisco variety, but my hypothesis may be only partly correct. I believe now that the climate difference between San Francisco and the Mojave Desert may change the bacterial strains that feed on the yeast more than the climate affects the yeast directly. I did learn that our yeast follow a pattern of behavior that is predicatable throughout the trials, even though it did not match the San Francisco studies.

Summary Statement
This investigation examines our wild yeast behavior, specifically life cycle, in comparison to the wild yeast that is famous for sourdough bread.

Help Received
My science teacher helped me.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
David H. Franson

Project Number
J1309

Project Title
Antibiotic Properties in Herbal Tinctures

Abstract

Objectives/Goals
Selected herbal tinctures were tested to see if they could inhibit the growth of the E. coli.

Methods/Materials
The herbal tinctures were applied to petri dishes, which were then inoculated with E. coli. Gentamicin sulfate was used as a positive control and plates with only E. coli were used as a negative control.

Results
Two herbal tinctures, chaparral and thyme were as effective as the gentamicin sulfate in controlling e. coli growth. Chaparral, thyme and gentamicin sulfate allowed no colonies to form. Shepherds purse, spilanthes, echinacea, and pau d'arco appeared to aid the growth of the E. coli.

Conclusions/Discussion
Two herbal tinctures, chaparral and thyme were as effective as the gentamicin sulfate in controlling e. coli growth. Chaparral, thyme and gentamicin sulfate allowed no colonies to form.
Some of the tinctures, shepherds purse, spilanthes, echinacea, and pau d'arco appeared to aid the growth of the E. coli. These tinctures allowed more colonies to form than what appeared on the negative control plates.
The tinctures of thuja, elder, oat grass and goldenseal allowed some e. coli growth. This group of tinctures appears to have some antibiotic activity against e. coli.

Summary Statement
Effectiveness of ten herbal tinctures on DH5 E. coli

Help Received
Used UCSD Rosenfeld lab under the supervision of Charles Nelson

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Karthik Ganesan

Project Number
J1310

Project Title
Spicy Juices vs. Antibacterial Effect

Abstract

Objectives/Goals
The purpose of my experiment was to figure out the effects of different fruit/vegetable/spice juices on two types of bacteria: e.coli and staphylococcus epidermis. My hypothesis was that juices from various items tested may have antibacterial power but it may vary with the types of juices and bacteria. I predicted that garlic would have the most antibacterial effect.

Methods/Materials
I extracted juices from ten different items using a food processor and refrigerated them in sterilized bottles until I was ready for the experiment. The ten juices were: Garlic, Red Onion, Ginger, Turmeric, Serrano Pepper, Green Cabbage, Eggplant, Cranberry, Blueberry, and I subcultured bacteria in nutrient broth and pipeted it into equally divided petri dishes. Then I poured warm liquefied agar into the dishes and mixed it up with the bacteria. Then I used sterile forceps to place four disks into each petri dish and three of them were soaked in a type of juice. After 48 hours of incubation, I measured the inhibition zone around the soaked disks.

Results
My results showed that garlic had biggest inhibition zone but was not the clearest against both types of bacteria tested. Cranberry inhibition zone clearer but the zone was not as large as garlic. From this, we can conclude that my hypothesis was correct but the results could have occurred because of refrigeration times, shelf life of the crops, etc.

Conclusions/Discussion
Study of everyday foods help us to choose better diet and enhance the quality of life.We can then make educated choices and are more productive in the society. These daily foods may not be as effective as medicines available at stores but a daily intake of the foods in our diet may help us to resist the store medications less and less, thus building immunity against infections in a natural way without harmful side effects.

If I had to repeat the experiment again, I would choose my top 2-3 juices and check their effectiveness once more, but at the same time instead of different. In my experiment, there were two different batches of juices that were tested and refrigerated until I could start my experiment. My top two juices came from both batches. If I had an opportunity to continue the study, I would want to test different powders of dry spices like cumin, fenugreek, cinnamon etc.

Summary Statement
My project is about the antibacterial effects of fruits, vegetables, and spices.

Help Received
Mother helped with making the juices, Used lab equipment under supervision of Mr.Lee at Miller Middle School.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Tanya Gupta

Project Number
J1311

Project Title
The Wonders of Antibiotics

Abstract

Objectives/Goals
The objective of this experiment was to determine the effect of various antibiotics on three types of bacteria in vitro.

Methods/Materials
Seven types of antibiotic discs (Cephalothin, Chloramphenicol, Kanamycin, Neomycin, Novobiocin, Tetracycline, and Vancomycin) were tested on three bacteria cultures (Bacillus cereus, Escherichia coli, and Micrococcus luteus). Twenty-one petri dishes were used to cover all combinations of antibiotics and bacteria. Three milliliters of each bacteria subculture (prepared with nutrient broth) was pipette into 7 sterile petri dishes and mixed with warm, liquefied nutrient agar. Each petri dish was divided (with a marker) into four equal sections. In one section a blank disc was used as a control variable and 3 identical antibiotic discs were placed in the remaining sections. After 48 hours of incubation at 37 degrees Celsius, the inhibition zones around each disc were measured.

Results
The results show that Cephalothin was most effective against both E. coli and M. luteus, followed by Chloramphenicol, Tetracycline, Novobiocin, Vancomycin, Kanamycin, and Neomycin. On the other hand, Tetracycline appeared to be the most effective on B. cereus, followed by Novobiocin, Chloramphenicol, Cephalothin, Vancomycin, Kanamycin, and Neomycin.

Conclusions/Discussion
Antibiotics are selected for use against specific diseases and bacterial infections based on their mode of action, broad/narrow spectrum, bactericidal/bacteriostatic, etc. In fact, most of the results from my experiment can be explained due to these characteristics of the antibiotics that I used. The antibiotics in my experiment mainly fall into three categories in terms of their mode of action. Cephalothin and Vancomycin interfere with the bacterial cell wall; Kanamycin, Tetracycline, Chloramphenicol, and Neomycin interfere with protein synthesis; and Novobiocin interferes with DNA synthesis. Antibiotics can also be classified as bactericidal (antibiotics that destroy bacteria) or bacteriostatic (antibiotics that inhibit the growth of bacteria). Kanamycin, Neomycin, Cephalothin, and Vancomycin are bactericidal, while Tetracycline, Chloramphenicol, and Novobiocin are bacteriostatic.

Summary Statement
The comparison of the inhibition zones in this experiment demonstrated that various antibiotics respond differently to the same bacteria, and that the order of effectiveness of the antibiotics on E. coli and M. luteus is identical.

Help Received
My instructor, Mr. Francis Lee, suggested my usage of statistics as another way of looking at my data. He also taught me several techniques to use when I was carrying out this experiment, such as a method that was an improvement over the common streaking method of bacteria on petri dishes.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Joseph J. Henry, III

Project Number
J1312

Project Title
Bacterial Contamination in Fast Food Drink Ice

Abstract

Objectives/Goals
Problem: Does drive-thru ice have a higher level of bacterial contamination than self-serve machine ice in fast food restaurants?
Hypothesis: The drive-thru ice will exhibit a higher level of bacterial contamination than self-serve machine ice due, in part, to contamination and mishandling of the ice by restaurant employees.

Methods/Materials
Four samples per day were collected from three different Del Taco restaurants for a total of five consecutive days. A sample of ice was taken from the ice machine as well as from the drive thru ice bin. Spigot water and sterile water in a restaurant cup were used as controls. The samples were cultured on R2A agar plates, and incubated for 96 hours. Heterotrophic plate counts were performed at 48 and 96 hours. Colilert presence/absence tests for the presence of coliform bacteria including Escherichia coli(E.coli) were performed on each sample as well.

Results
Bacterial colonies grew on all of the ice sample agar plates. Bacterial colonies were noted on the majority of the control plates. After incubating 48 hours, the number of colonies found on the ice machine samples were approximately the same as on the drive thru ice samples. At 96 hours, however, the drive thru ice samples contained more colonies than the ice machine samples. The samples from one restaurants ice machine consistently tested positive for the presence of coliform bacteria, however, E. Coli was not present.

Conclusions/Discussion
The experimental results after incubating the samples for 96 hours supported the hypothesis. The data recorded at 48 hours was inconclusive. I believe the data recorded at 48 hours was inconclusive because the bacteria required additional time to grow on the agar plates. I believe that mishandling of the ice by employees was a major contributor to the higher levels of bacteria found in the drive thru ice. This information can increase the awareness of restaurant management and employees to reduce the potential spread of disease.

Summary Statement
My project compared the amount of bacteria present in fast food restaurant self-serve ice machines to ice found in drive thru ice bins.

Help Received
My mom & dad drove me around for 9 consecutive days to collect &/or analyze my data, helped proof read my paper, & helped assemble some of my board. The Orange County Sanitation District (OCSD) Lab staff provided supplies, guidance, & the use of their lab facilities.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Dustin J. Holtz

Project Number
J1313

Project Title
Antibacterial Soap: Is It More Effective at Preventing Bacterial Growth than Non-Antibacterial Soap?

Abstract

Objectives/Goals
The objective of my project was to determine if antibacterial hand soap is more effective at preventing bacterial growth than non-antibacterial (regular) hand soap.

Methods/Materials
Two drops each of 4 Antibacterial Hand Soaps (2 over the counter/2 hospital brands) and 1 Non-Antibacterial Hand Soap were applied to a wooden kitchen cutting board that was sectioned off with silk tape. Sections were numbered to correspond with numbered petri dishes. Each soap specimen was lathered for a specific time (20 seconds and 2 minute trials) and rinsed with clear running water by a kitchen sink sprayer. Cultures were taken with sterile cotton swabs and applied to petri dishes. A base culture of the cutting board was also taken. Petri dishes were kept in a warm room and observed for bacterial growth over seven days.

Results
The base culture produced the most bacterial growth. Surprisingly, the non-antibacterial soap produced the least bacterial growth when compared to the antibacterial soaps as a group. In both trials, the Dr. Bronners non-antibacterial soap and the Baxter Exidine-4 antibacterial soap produced similar amounts of bacterial growth with the Dr. Bronners having slightly less growth. The remaining antibacterial soaps were very equal in the amount of bacterial growth, showing the most bacterial growth of the studies.

Conclusions/Discussion
I started this experiment expecting that the antibacterial soaps would be most effective at preventing bacterial growth. My conclusion is that antibacterial soaps are not the most effective. While researching this project, I have learned that while we believe we are doing a good thing by using antibacterial products in our homes, the overuse of antibacterial products may be harmful. We may be causing bacteria to become resistant to antibiotics and that makes bacteria stronger.

Summary Statement
My project is to determine if antibacterial hand soap is more effective at preventing bacterial growth than non-antibacterial hand soap.

Help Received
My mom helped me do the timing during my project , helped me set up my petri dish growth observation page and was my photographer. My dad helped me by getting samples of hospital antibacterial soaps and petri dishes.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Scott L. Karney-Grobe

Project Number
J1314

Project Title
Yeasts 'n Sweets

Abstract

Objectives/Goals
My objective is to see if yeast will reproduce using various sugar subsitutes.

Methods/Materials
One thermos with 1/4" hole in top, dry yeast, pressure gauge, sugar, saccharin, sucralose, NutraSweet, Ace-K, white flour, water, salt, 5 oz. souffle cups and oven bowls. Three tests, using sugar and each artificial sweetener were performed to determine yeast reproduction: Measuring CO(2) release from dough, counting yeast cells in a dough slurry with a microscope, and measuring dough rise in yeast-risen bread.

Results
The control made with sugar outperformed all of the artificial sweeteners. It gave off the most gas, had the largest nunber of yeast cells and resulted in bread with a good rise. Three of the artificial sweeteners failed in all three tests. Only Sucralose showed some promise: limited gas release, slight increase in yeast cells, and a dense, chewy bread loaf.

Conclusions/Discussion
Yeast cannot reproduce usuing sugar substitutes as a substrate. The yeast require the exact structure of sucrose to enable fermentation. All the data
suggest that Sucralose did the best because it's structure is the most similar to sugar. Sucralose replaces two hydrogen molecules with two chlorine molecules. It seems that the closer an artificial sweetener chemically resembles sugar, the more it behaves like sugar.

Summary Statement
To see if yeast will reproduce using sugar substitutes as the substrate for yeast fermentation.

Help Received
Mom helped type and edit, Dad drilled the 1/4" hole in the thermos lid for the pressure gauge , and Mr. Kaleikau taught me to recognize yeast cells using a microscope. .

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jessica W. Kwa

Project Number
J1315

Project Title
Effectiveness of Antibacterial Hand Soaps on E. coli

Abstract

Objectives/Goals
My objective is to see which antibacterial hand soap has the most effect on E. coli bacteria.

Methods/Materials
I tested six different kinds of antibacterial hand soaps. I mixed in an antibacterial hand soap with E. coli solution, which was E. coli and distilled water. I streaked the substance on tryptic soy agar with an inoculating loop. I made 4 trials of each and my control group was just the E. coli solution, without the hand soap. I also had a purity plate to make sure that there was no other bacteria in the agar to affect the outcome. After 48 hours of incubation, I checked the dishes and counted the colonies.

Results
Most antibacterial hand soaps killed a very small amount of E. coli. Different hand soaps produce different results. The Target brand compared to Dial had the best results, having the least amount of E. coli bacteria colonies surviving, which was 39 colonies. The worst was the Dial Antibacterial Hand Soap County Orchard Enriched with Aloe, having 310 colonies, which was more than the control.

Conclusions/Discussion
All the antibacterial hand soaps I tested were unable to kill the E. coli bacteria completely. The prices did not affect the quality of the antibacterial hand soaps. In fact, the cheapest priced hand soap had the best effect in my experiment.

Summary Statement
Which antibacterial hand soap has the most effect on E. coli bacteria?

Help Received
Father helped set up incubator.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Erin L. Lowry

Project Number
J1316

Project Title
Does Garlic Inhibit the Growth of Oral Bacteria?

Abstract

Objectives/Goals
My objective is to determine if garlic inhibits the growth of oral bacteria.

Methods/Materials
Two procedures were performed. For the first procedure, saliva samples were collected from 3 people and mixed with nutrient agar. Two test disks dipped in garlic were placed on each of the test subjects' saliva inoculated agar and incubated for 72 hours at about 95 degrees. The areas of inhibition of bacterial growth were measured and compared to test disks dipped in distilled water. For the second procedure, sterile tongue depressors covered with the test subjects' saliva were placed on nutrient agar that had been mixed with garlic and on plain nutrient agar for comparison. The colonies of bacterial growth on the garlic agar were counted, measured, and compared to the colonies of bacteria on the plain nutrient agar. Three trials were done for each procedure.

Results
For the first procedure, 5 of 6 test disks dipped in garlic oil showed increased oral bacterial growth while only 1 showed an area of inhibition. Two of the six disks dipped in distilled water showed increased bacterial growth and none showed inhibition. For the second procedure, there was more bacterial colony growth in the petri dishes containing agar that had been mixed with garlic powder than in the petri dishes with the plain nutrient agar. The two procedures consistently showed that garlic did not inhibit the growth of oral bacteria, and instead increased the growth of oral bacteria.

Conclusions/Discussion
My hypothesis, based on the fact that garlic is thought to be antibacterial, is incorrect. The data suggest that garlic does not inhibit the growth of oral bacteria, instead it increases the growth of oral bacteria in some cases. Garlic is used to treat some diseases, but my conclusion suggests that people who eat a lot of garlic are not less likely to have gum disase or cavities than people who don't eat a lot of garlic.

Summary Statement
My project is a study of the effects of garlic on oral bacteria.

Help Received
My mother and father were two of my tests subjects; My mother helped type my report; My father helped build the incubator; My mother and father took pictures of me doing the procedure.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Sarah D. MacEachron

Project Number
J1317

Project Title
Does Fat Content Affect Spoilage Rate of Milk?

Abstract

Objectives/Goals
My objective was to determine if the fat content of milk affects the rate at which it spoils. I was specifically interested in harmful bacteria multiplying in milk because my idea originated after I got food poisoning from milk left out at a hotel buffet. My hypothesis was that the higher the fat content of milk the more nutrients there would be for the bacteria so they would reproduce in greater numbers.

Methods/Materials
I used the chemical Methylene Blue as an indicator of how many bacteria were in milk. Upon adding Methylene Blue to samples of milk with 5 different fat contents, the milk turned dark blue. As bacteria multiplied and metabolized, using up oxygen, the milk gradually turned back to its normal color. I invented a color rating system to record color changes every four hours.

Results
My hypothesis proved generally correct. Comparative growth of the different milk fat content samples indicated that milk with a higher fat content allowed for bacteria to multiply in greater numbers. My data showed an abnormal result for 2% milk, which I believe was due to other factors such as possible pre-contamination of that particular milk sample.

Conclusions/Discussion
In conclusion my results indicated that milk with higher fat content allows bacteria to produce in greater numbers. I have learned that there are many factors that influence bacterial growth in milk, including ph level, oxygen availability, temperature, and the initial concentration of pasteurization-surviving bacteria. My experiment has contributed the factor of bacterial food supply in the form of the fat content in milk. If these results can be replicated in other experiments, the conclusion that milk fat is associated with higher bacterial growth may be useful for preventing illness and milk preservation.

Summary Statement
This experiment tested whether milk fat affected the bacterial concentration in pasteurized milk, finding that the higher the fat content the more nutrients bacteria can use to grow.

Help Received
Mother supervised work with chemicals and helped glue pages on board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Lorin M. Maki

Project Number
J1318

Project Title
The Growth of Microscopic Protozoa

Abstract

Objectives/Goals
The objective of this project is to see how different types of food affect protozoa.

Methods/Materials
Six water samples that had Protozoa in them with a food sample from each category on the food pyramid were put into each jar and observed. The categories on the food pyramid are sugar, meat, dairy, fruit, vegetables, and wheat bread. Two drops of water from each jar were put onto an eyepiece one at a time to be observed. The microscope was set at 40x normal vision. These samples were looked at four times throughout the whole project. Any kind of life was noted.

Results
The results prove that 90% of the time sugar had the most protozoa. At no time did I find any protozoa in the water sample with cheese in it.These water samples were compared to a plain water sample and none of the other water samples had more protozoa then the plain water.

Conclusions/Discussion
Out of all the discoveries I made I think the most important one I learned was that if you put any types of food in the water your killing off protozoa. Protozoa are the little microscopic animals that keep our water clean in the first place. So keep food out of our water supply.

Summary Statement
My project is about how protozoa are affected by the six different food groups on the USDA food pyramid.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Clarissa E. Merz

Project Number
J1319

Project Title
Raisin' Alcohol Yields: A Study of Ethanol Production by Different Yeast Strains

Abstract

Objectives/Goals
What type of yeast strain: Bread Yeast, Champagne Strain, Pasture Red, or Ruby Ferm yeast will be the best to use when fermenting raisins to yield ethyl alcohol for use as an automobile fuel?

Methods/Materials
METHODS: Gather 1 kg of raisins and boil it in 6 cups of water. Boil for five minutes to sterilize and rehydrate raisins. Put the raisins and water on "mix" in the blender for 10 seconds. Filter out pumice using cheese cloth. Let cool. Check brix level using hydrometer. Adjust to 16 brix. Measure 300 mL of raisin juice and add 50 mL of it to six bottles. Cap off with balloons. Call this trial one. Repeat procedure three times. Let all trials ferment for three days. Check alcohol level using an ebuliometer. Before next trials, clean equipment/bottles with a 2 percent chlorine solution.

MATERIALS: Raisins, blender, thermometer, hydrometer,water, cheese cloth, Bread Yeast, Ruby ferm yeast, Champagne strain yeast, Pasture red yeast, Dujardin Salleron ebullometer, graduated cylinder, pencil and data sheet.

Results
The results are as follows: Bread yeast had an average percent of ethanol 6.9%. Pasture red had an average percent of ethanol of 6.9%. Champagne strain had an average percent of ehtanol 4.9% and Ruby ferm had an average percent of ehthanol 7.9 %.

Conclusions/Discussion
My hypothesis was, that based on my research of the yeast strains , Bread Yeast, Champagne strain, Pasture Red and Ruby ferm, Ruby ferm yeast would produce the most ethanol when fermented in raisin juice. The results showed that Ruby ferm yeast yielded the most ethanol from raisin juice fermentation. Therefore, the hypothesis was supported.

Summary Statement
This project focuses on the investigation of which yeast strain is most effective in producing alcohol for fuel additive replacement.

Help Received
My Parents helped with my board and using the ebullometer , my teacher helped with research information and project input, Phoenix Bio Industries for supplies used

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Kelli M. Muirheid

Project Number
J1320

Project Title
Is Punica granatum an Effective Antibacterial against Escherichia coli?

Abstract

Objectives/Goals
The objective is to determine if punica granatum (pomegranate) has antibacterial properties versus E. coli. I believe that it will, based on the medicinal use of punica granatum in ancient cultures for treating gastrointestinal and urinary tract infections.

Methods/Materials
Five sterile petri dishes, each marked into quadrants, were inoculated with E. coli. Using aseptic technique, sterile filter disks were saturated with one of four pomegranate treatments: rind (R), juice (J), pulp (P), or seed (S). A disk from each treatment was placed in the corresponding quadrant of each of five petri dishes. The control, a disk treated only with sterile water, was placed in the center of each dish. Incubation was at 37C, with observations at 12, 24, and 36 hours.

Results
Observable, consistent staining of the agar occurred among all treatments in all samples. For example, all of the pulp (P) discoloration was similar in size, color, and pattern. However, there was NO measurable zone of inhibition for any of the treatments against the E coli.

Conclusions/Discussion
The observed discoloration of the agar was likely due to the acidity of the treatments. Of significance is that punica granatum demonstrated no antibacterial properties versus E coli, which disproved my hypothesis. I used a fresh, ripe, unblemished pomegranate as the source for all treatments. A direction for future research may be to study unripe or overripe (fermented) fruit vs. E coli.

Summary Statement
The rind, juice, pulp, and seed of the pomegranate is tested as to its effectiveness vs. E coli.

Help Received
Mr. K from Fresno State provided most of the supplies; St. Agnes Hospital provided the agar dishes; my mother helped obtain the supplies and chaperoned me; my father helped with the digital photos.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Oanh K. Nguyen

Project Number
J1321

Project Title
Varying Concentrations of Ginkgolic Acid

Abstract

Objectives/Goals
The purpose of this project is to see how various concentration of ginkgolic acid affect the growth rate of Mycobacterium smegmatis. My hypothesis is that ginkgolic acid will have an inhibiting affect on the growth rate of the bacteria and that the stronger the concentration the greater the overall effect.

Methods/Materials
I used the seed coat of the Ginkgo biloba seeds to make the ginkgolic acid concentration, along with 1800 milliliters of distilled water for purpose of liquefying. From the initial concentration, I created 10%, 30%, 50%, 70%, and 90% solutions. I pour the concentrations and the control, which is just nutrient agar, into 90 plates, 15 plates per concentration. I placed the colony of Mycobacterium smegmatis on each of the 90 plates. I let the plates establish the growth bacteria and measured their subsequential growth. I record my data in a series of 7 days for two weeks.

Results
Average growth rate from the control plates was 4.68mm after one week and 1.87mm after two weeks.
Average growth rate from 10% ginkgolic acid was 1.32mm after one week and 0.48mm after two weeks.
Average growth rate from 30% ginkgolic acid was 0.48mm after one week and 0.13mm after two weeks.
Average growth rate from 50% ginkgolic acid was 0.31mm after one week and 0.13mm after two weeks.
Average growth rate from 70% ginkgolic acid was 0.21mm after one week and 0.08mm after two weeks
Average growth rate from 90% ginkgolic acid was 0.13mm after one week and 0.06mm after two weeks.

Conclusions/Discussion
The results of the experiment had proven that ginkgolic acid is a Mycobacterium smegmatis inhibitor. Since this strand of bacteria is very similar to the Mycobacterium tuberculosis, same genus, further experimentation would be able to prove if the ginkgolic acid would have the same effect on human tuberculosis.

Summary Statement
Varying concentrations of ginkgolic acid affect upon Mycobacterium smegmatis.

Help Received
The test bacteria was established from a larger cultivation of the bacteria which came from Dr. Wright from Fresno State.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jonathan Noguchi

Project Number
J1322

Project Title
North American Vectors of the West Nile Virus

Abstract

Objectives/Goals

Problem Statement: Which birds are spreading the West Nile Virus? My objective is to find the main vector, or spreader of the West Nile Virus.

Hypothesis: I believe that the West Nile Virus is being spread by a select few species of birds traveling along a major bird migratory route near New York and not by all birds.

Methods/Materials

Materials:
O Internet
O Government Health Organizations

Procedure:
A. Find list of dates and localities of the West Nile Virus
B. Obtain a map of the spread of the virus across the United States
C. Find a list of species of birds found positive of the West Nile Virus.
D. Find list of birds that migrate to or go past the site of the first outbreak (New York)
E. Find the common birds on the migration pattern list with the birds found positive of the West Nile Virus
F. Compare new bird's migration pattern with the spread of the virus

Results

Result: I have found several birds that are spreaders of the West Nile Virus that travel both within the North American continent and from other places across the Atlantic Ocean.

Conclusions/Discussion

Conclusions: All the species found spreading the West Nile Virus are found primarily traveling along the Southeastern U.S. Route. They are the following: Double-crested Cormorant, Black-crowned Night Heron, Mallard, Sanderling, Laughing Gull, Ring-billed Gull, Herring Gull, Rock Dove, American Crow, Fish Crow, American Robin, European Starling, Red-winged Blackbird, and the Common Grackle.

Summary Statement

My project is about identifying the main vectors, or spreaders/carriers, of the West Nile Virus

Help Received

Received tips in methodology from my brother. Received information from the C.D.C, Pan American Health Organization, and from Dr. Dominick Travis of the Lincoln Park Zoo in Illinois

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Sara J.W. Pachelbel

Project Number
J1323

Project Title
Lysozyme vs. Odor

Abstract

Objectives/Goals
The objective is to determine if lysozyme, an enzyme used to kill gram positive bacteria, can be used to control odor in shoes.

Methods/Materials
Two identical pairs of shoes were purchased. Samples of the insoles were removed and stored in a sterile container. Over a period of three weeks, Pair A and Pair B were worn for eight hours a day (without socks) on alternating days. At the end of each day, Pair A was sprayed with a lysozyme solution. Pair B was sprayed with a sterile water solution. Samples of the insoles were removed and plated along with the original insole samples. The shoes were submitted to a blind smell panel for odor evaluation.

Results
Pair A, the lysozyme treated shoes, had ten times less bacteria than pair B, the sterile water treated shoes, as determined by the plating results. This supported the idea that lysozyme inhibited bacteria growth in shoes. However the lysozyme treated shoes were judged to have the worst odor as determined by the blind smell panel.

Conclusions/Discussion
Lysozyme is an enzyme used to kill gram-positive bacteria in the food and pharmaceutical industries. It kills the bacteria by destroying the cell membrane causing the cell to collapse. It only kills gram-positive bacteria. Foot odor, a problem everyone has experienced, can be hard to get rid of. Foot odor might be caused by bacteria in the shoes. The data suggests that lysozyme helps to control the bacteria, but it also contributed to the odor in the shoe.

Summary Statement
My project is about the effect of lysozyme on shoe odor.

Help Received
Rodger and Cheryl Pachelbel, smell test panel volunteers, and GusmerCellulo (use of lab equipment under the supervision of Lars Petersen.)

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Arthur G. Platel

Project Number
J1324

Project Title
Does Ocean Temperature Affect the Microbial Degradation of Oil Spills?

Abstract

Objectives/Goals
I wanted to see if water temperature had any affect on the amount of oil digested by microbes. I thought that this would be important in cleaning up oceanic oil spills. The microbes I used occur naturally in seaweed and they could have evolved in cool ocean temperatures. I hypothesized that microbes in cold water would eat the most oil.

Methods/Materials
I investigated a total of 30 cultures of Lactobacillus microbes in test tubes. Each test tube had uniform amounts of water, microbes, and unused car oil. 10 where refrigerated. 10 were placed in heated water baths. 10 were kept at room temperature. All were kept in the dark. I took temperatures to insure consistent conditions. I measured the amount of remaining oil and microbes in mm at regular intervals.

Results
After 5 weeks, the refrigerated microbes had eaten all the unused motor oil. The second group of microbes to digest the most oil were the cultures at room temperature. The heated group digested the least amount of oil.

Conclusions/Discussion
Cool temperature water was the best environment for oil digesting Lactobacillus. Lactobacillus, therefore, appears to be "psychrophiles," or cold loving bacteria. In terms of cleaning oil spills, since microbes are sensitive to temperature, it would be important to use microbes viable in the local water temperature to get the job done quickly and reduce harm to the environment.

Summary Statement
What is the effect of temperature on the microbial degradation of petroleum?

Help Received
Mother helped type report and made sure I didn't contaminate our garage; Dad bought test tubes and microbes, took pictures, and disposed of microbial oil at recycling center; science teacher helped get my project into the GSDSEF.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

Lisa S. Rotenstein

Project Number

J1325

Project Title

Using Earth Derived Antibiotics to Effectively Inhibit Staphylococcus aureus

Abstract

Objectives/Goals

Antibiotic resistance ever-growing problem in the scientific community·In terms of financial cost, over $122 million are spent each year· An important part in solving this problem is to find new remedies. I experimented with using earth-derived antibiotics such as Echinacea, salt, and clay to inhibit S. aureus. I hypothesized that while the area-specific salts and clay will kill some bacteria, they will not be as effective as the Bacitracin and Novobiocin, and the Echinacea will kill a significant amount of S. aureus, being nearly as effective as the Novobiocin and Bacitracin.

Methods/Materials

I used the Kirby Bauer method to measure effectiveness of the antibiotics by dividing an agar plate into four sections, then swabbing the nose of a human subject and evenly distributing the substance onto the agar. I placed a specific substance in center of each section, and measured its zone of inhibition, recorded my measurements, and placed the plates upside down in an incubator heated to 37 degrees Celsius. I repeated my measurements for 4 days, and had 4 rounds of experiments, with 7 different agars containing different substances in each round of experiments.

Results

Novobiocin had steady zones of inhibition that grew at about 0.2 or 0.3 cm per day. Bacitracin had small zones of inhibition that were not constant and sometimes did not exist at all. Salt and clay showed inconsistent, miniscule zones of inhibition . Echinacea did not always have a constant zone of inhibition, but it was large when it did exist.

Conclusions/Discussion

Area-specific clays and salts did not work effectively in inhibiting the growth of S. aureus. They never showed performance on a consistent basis. Echinacea somewhat worked though slightly under the performance level of Novobiocin. Echinacea does not meet inhibition standards on a regular basis. The results set forth were averages, not reflecting the findings that Echinacea occasionally did not inhibit the bacteria at all. This may have been caused by the subject used for samples during the 2nd and 3rd sets of experiments being sick (not known at time of swabbing)and leads to the conclusion that Echinacea will only kill healthy, normal S. aureus, only preventing illness. My hypothesis was correct in stating that the salts and clays will not kill a significant amount of bacteria and partially correct in saying that Echinacea will be nearly as efficient as Novobiocin and Bacitracin.

Summary Statement

Using earth-derived antibiotics to effectively inhibit Staphylococcus aureus, thereby tackling the problem of antibiotic resistance

Help Received

Used incubator and laboratory at Medea Creek Middle School, Dr. Keith Garb helped provide agar and antibiotic disks, Jillian and Gretchen Waldron used as swabbing subjects

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Caroline G. Salyer

Project Number
J1326

Project Title
Don't Spoil Your Appetite!

Abstract

Objectives/Goals
I compared three different ways of detecting tomato spoilage. I did this by following the steps of the Malthus Method, the Direct Microscopic Count, and the Petri dishes method. I counted the bacteria on the glass slides in the direct microscopic count, I looked at the graphs that the Malthus Machine produced, and counted the bacteria colonies in the Petri dishes. I then compared them and the time that it took to do each one.

Methods/Materials
MRS broth, test jar, my saliva, Malthus Machine, PC computer, tomato paste, 2 glass slides, "ultra violet", emersion oil, microscope, 4 petri dishes, MRS agar, incubator, pipet.

Results
The results show which process I used was the fastest, and which one produced the most accurate results. The Direct Microscopic Count took only 18 minutes, the Petri dish method took over 5 days, and the Malthus Method took 19.6 hours. The results showed the Malthus Method was the most accurate.

Conclusions/Discussion
One petri dish contained too much bacteria, and two of them had too little. This does not mean that the food is not spoiled, it just means that there was too much bacteria to count and that it was useless because I had other samples that would be more helpful. The Malthus Method was the most accurate process.

Summary Statement
Which tomato spoilage detecting system works the most accurately and the fastest?

Help Received
Dad for teaching me, and Glenn Long for supervising me.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Taylor J. Sarkaria

Project Number
J1327

Project Title
Hand Washing: A Thing of the Past?

Abstract

Objectives/Goals
The Center for Disease Control has recently published new guidelines for hand hygiene in health-care settings. The guidelines recommend using alcohol-based products as an alternative to traditional soap and water. Alcohol-based products have been shown to be much more effective in their antimicrobial activity and also much more time-efficient than ordinary hand washing. This project evaluates the effectiveness of several hand cleansers.

Methods/Materials
Seven trials were conducted, each with the same 24 subjects. Unwashed hands were swabbed for the control trial. Then students washed their hands according to the protocol with ordinary liquid soap. Their hands were again swabbed, and the swabs placed in sterile transporters. On another test day, the students' hands were washed according to the hand washing protocol, but this time with anti-bacterial soap. In the next trial, the test students followed the hand cleansing protocol for the alcohol-based gel. Another control test was repeated with 12 students, and then a test of another brand of antibacterial soap. A second control test was repeated, and then again a test of the alcohol based gel. The first antibacterial soap alone was also plated to assess whether or not the soap itself was contaminated.

Results
The unwashed hands(the control) plates had an average colony count of 60. Surprisingly the antibacterial soap plates also produced an average of 60 colonies per plate. The anti-bacterial soap was plated alone, but grew no colonies, and so the soap itself was not contaminated. The ordinary liquid soap plates yielded an average of 48 colonies per plate. The alcohol-based gel plates grew only very few bacterial colonies compared to the others. The alcohol-based gel plates produced an average of only four colonies per plate.

Conclusions/Discussion
According to the results, the antibacterial soap was not effective in removing bacteria from the hands. The ordinary liquid soap was more effective in reducing colony counts. The alcohol gel (with humectants to prevent dry skin) was by far the most effective in eliminating bacteria. Based upon my results, it appears that alcohol-based products should be introduced into daily hand hygiene routines to reduce the spread of transient bacteria. I plan to test the effectiveness of antibacterial soap on those who do not normally use antibacterial soap to evaluate whether or not resistance develops.

Summary Statement
This experiment compares the effectiveness of ordinary liquid soap, antibacterial soap, and the new alcohol-based gels (with humectants) in removing bacteria from the hands.

Help Received
Used lab equipment at Tri-City Medical Center under the supervision of Dr. Paveglio and the Microbiology Director.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nicole B. Sheldon

Project Number
J1328

Project Title
Bacteria to the Future

Abstract

Objectives/Goals
To find out if a dog, cat, or human has the most bacteria in its saliva.

Methods/Materials
Foil; wooden box; insulation, board; thermometer; 40 watt light bulb; lamp; electrical tape; 4 blood ager dishes; 6 cotton swabs; human, cat, and dog saliva; microsope; pad; paints; colored pencils. Scraped saliva from cat, dog, human mouth and observed for 36 hours.

Results
A cat has the most bacteria, then human. A dog has the least bacteria.

Conclusions/Discussion
I found out that when a cat gets exposed to certain bacteria, it carries the disease for 2 to 5 years before it shows the disease and that a dog has an antibiotic enzyme in its saliva.

Summary Statement
My project's goal is to determine whether a dog, cat, or human has the most bacteria in its saliva.

Help Received
Father helped get vicious cat's saliva, microscope borrowed from school

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Barbara A. Shinaver

Project Number
J1329

Project Title
Comparing Bacterial Growth in Various Types of Natural Baby Foods

Abstract

Objectives/Goals
The purpose of my science project is to determine which types of commercially prepared natural baby foods are the most susceptible to bacterial growth.

Methods/Materials
I used ten different types of Beach Nut Naturals baby foods as my test material. I first unsealed each jar of baby food and let it sit at room temperature for two days. I then took a sample of each baby food and reduced each sample to an one-in-one hundred solution. I then swabbed this dilution solution for each baby food into ten different agar plates, each. I incubated these plates for two days and then counted the bacterial colonies in each agar plate. My control was a sample of each baby food taken from the jar immediately after opening, and then diluted and incubated exactly as described above. I took great care in following proper scientific procedures in testing, and in properly disposing of the bacterial waste afterwards.

Results
The results of my experiment showed that the vegetable and fruit based baby foods generated the least amount of bacteria, and thus were the safest for the longest period of time once they were opened and left exposed. The meat based baby foods overall generated the highest bacterial counts. Most surprising of all, however, was that the combination of meat and vegetable baby foods (such as Chicken & Vegetable) generated the very highest bacterial counts # more than each type of baby food generated separately.

Conclusions/Discussion
After finishing my investigation, I found that baby foods containing meat products produced the highest bacterial counts of all natural baby foods. The lowest bacterial counts came from fruit based baby foods. Bacterial counts from vegetable baby foods were also low. I was very surprised by the finding that the highest bacterial counts of all were from those baby foods that combined meat and vegetables in one jar. From this I learned about the synergistic effect. In conclusion, while it is unwise to leave any unfinished baby food out for very long, mothers can feel safer with the fruit and vegetable baby foods once they are opened. All other baby foods must be immediately refrigerated after opening to prevent bacterial growth.

Summary Statement
Comparing bacterial growth in various types of natural baby foods.

Help Received
Mr. Nathan Whittington helped by providing supplies and necessary equipment. My Mom helped with the display board, taking me to the library, and properly bleaching and disposing of the petri dishes. My Dad helped with sterilizing the glass bend after each swab.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jennifer B. Smith

Project Number
J1330

Project Title
Clean Hands?

Abstract

Objectives/Goals
The objective of my project was to determine how long an antibacterial soap prohibits bacterial growth on human hands. An outbreak of illness at my school made everyone extra careful about washing hands. I wondered how long I would be protected. I think the soap will prohibit growth for approximately thirty minutes because it is probably difficult to produce a long-lasting soap.

Methods/Materials
Two controls and five different treatments were set up. The Agar Control verified the agar plates were not contaminated and the Innoculate Control verified the agar plates were capable of supporting bacterial growth. The five different treatments were Zero, Ten, Twenty, Thirty, and Forty minutes. I washed my hands for ten seconds, waited the allowed treatment time with my treatment finger isolated from everything surrounding it, and then collected bacteria by swabbing the mouth of my dog. An agar plate print of my finger was taken and the plates were stored in a dark cabinet. I checked the plates for growth every twelve hours for 36 hours. During these checks, the temperature was recorded and the number of colonies was counted. This procedure was repeated four times in sequential days.

Results
The results did not show an immediately clear picture. However, when I averaged the data, patterns were easier to see. The highest bacterial colony count occurred after the twenty minute treatment time. The least growth occurred after the ten minute treatment time. At zero minutes an unexpected high count emerged. My hypothesis was not supported by the data, but several interesting patterns appeared. Recorded temperatures in the cabinet never ranged farther apart than three degrees Celsius.

Conclusions/Discussion
My conclusion is that Dial anti-bacterial soap prohibits bacterial growth most significantly after allowing the soap to sit on tissue after twenty minutes. Between zero and ten minutes, I think the soap took a few minutes before becoming most effective. This accounts for the unexpected count at zero minutes, and the lowest count at ten minutes. Finally, between ten and twenty minutes, I believe the effectiveness of the soap ended and produced the high growth count at twenty minutes, and subsequent counts at thirty and forty minutes (as compared to the ten minute count). I recommend people continue to use anti-bacterial soap, but not assume it will prohibit bacterial growth for a long time.

Summary Statement
The purpose of my experiment was to determine how long antibacterial soap prohibits bacterial growth on human hands.

Help Received
Humboldt State University Department of Biology provided the agar plates; my dog, OB, provided the bacteria; my dad advised me on my procedure; my mom reviewed my grammar.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Quinn Y. Stewart

Project Number
J1331

Project Title
Does the Type of Water Purification Method Affect the Amount of Bacteria in Lake or Stream Water?

Abstract

Objectives/Goals
My goal was to learn about the fundamentals of water purification. I used three treatment methods: iodination, boiling, and filtration. I believed that boiling would be the most effective method, filtration would be the second most effective method, and iodination would be the least effective method. I thought this because my background research told me that boiling kills all harmful bacteria in a matter of minutes, filtration physically removes debris, but may not completely eliminate all bacteria, and iodination does not physically remove debris and may not kill all bacteria that the chemical does not reach.

Methods/Materials
The key materials I used were samples of lake and creek water, my three purification materials (iodine tablets, a pump filter, and a saucepan and a stove), and nutrient agar plates. I gathered water from a lake and a stream, then applied my three water purification methods to the different samples. I manipulated the type of water purification methods on two different sources of water. I used replicates instead of trials to reduce the risk of inconsistency of the water quality within the samples. I used 4 replicates for each combination of water source and treatment method, for a total of 32 different cultures. I estimated the amount of each plate covered by bacterial growth after letting the cultures stand for four days. I also observed samples through a microscope.

Results
I found that the percentage of visible bacterial growth on each plate ranged from 0% for the boiled lake water, to an average of 3.41% for the iodinated lake water. I also found that the average untreated lake plate was 11% covered in bacterial growth. My obervations using the microscope showed more debris in the iodinated samples than the filtered samples.

Conclusions/Discussion
I concluded that the type of water purification method does affect the amount of bacteria left in water from a lake or stream. I also found that thermal purification was the most effective, filtration was the second most effective, and iodination was the least effective. Thus my hypothesis was correct.

Summary Statement
My project is about the effectiveness of water purification methods on two sources of water.

Help Received
My father reviewed drafts of my report.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Eric W. Strege

Project Number
J1332

Project Title
Herbs and Organics: Bacterial Inhibitors?

Abstract

Objectives/Goals
To analyze through tests what is the most effective herbal/organic substance, (curry, garlic, ginger root, jalapeno pepper, mint, onion, red pepper, thyme, contant) that will inhibit the growth of E. Coli and Bacillus Cereus strains.

Methods/Materials
Eighteen petri dishes were filled with nutrient agar. Three petri dishes served as a constant for E. Coli strain and three as the constant for Bacillus Cereus. The other twelve petri dishes were divided into four sectors with a
grease pencil. Six dishes were inoculated with E. Coli and six with Bacillus Cereus. Each sector was labeled for each herb and organic and test number. After macerating each herb and organic, paper disks soaked for 10 minutes each absorbing the herbal and organic qualities, dried the paper disks and placed each one in the appropriate sector in the petrie dishes. Three tests, for five twenty four hour periods were done in two incubators set at 37 degrees centigrade.

Results
In all three tests of Bacillus Cereus Garlic rated the highest at P3 & P4 then ginger root right below it at P2. Curry rated P2 & P3 in some tests then dipped down into the low negatives, Mint and Thyme struggled in the P1 to N1 ratings. Onion, jalapeno pepper and red pepper remained in the negatives. In the three tests of E. Coli Garlic had the hightest rating at P3 & P2, Ginger root again held it own in the P1 & P2 range, suprisingly mint and red pepper and Thyme held the low positives at P1, however curry sank down into the negatives. The onion and jalapeno remained in the negatives. The constant petri dishes were thriving with growth.

Conclusions/Discussion
The herbs and organics I used in all tests at their highest rating never made it past the mid-positive inhibition range, incubating at 37 degrees centigrade.
The results showed that some herbs and organics stuggled to keep a positive rating, sometimes dipping back into the negative scale then climbing back up to the positive, many times back and forth, and then some never could leave the negative scale. The most effective way to kill the strains of E. Coli and Bacillus Cereus is to keep all food or things of spoiling nature at the heat of 60 degrees Celcius and refrigerated to the temperature of 4.45 degrees celcius.

Summary Statement
To analyze how herbs and organics with their natural properties, will effect the growth of E. Coli and Bacillus Cereus strains and measure the inhibition of bacterial growth.

Help Received
Mr. Robert Finnell, Biology Teacher at La Quinta High School, helped me with the lab equipment and incubators I needed for my experiements.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
John Thomas; Peter Zellman

Project Number
J1333

Project Title
How Do Different Temperatures Affect the Fermentation Rate of Yeast?

Abstract

Objectives/Goals
We assessed how different ambient temperatures affect the fermentation rate of yeast. We also observed how yeast minerals and nutrients affect the rate of fermentation. Beginning with the 2003 harvest, there is an over-supply of California winegrapes that exceeds the tank capacity of wineries to ferment into wine. One application of our research could be to determine the best temperature to ferment the grapes so that if we could increase the rate of fermentation it would free up tank space for more winegrapes to be harvested.

Methods/Materials
We established five temperature treatments (0, 10, 20, 25, 30C). Each temperature treatment consisted of three replicates. Each replicate was a 1.5 liter vessel of sodium-free, non-chlorinated water.
For each replicate we added: 150gm of corn sugar; 10gm of diammonium phosphate (DAP); 5gm Fermaid K; and, 3gm of Pasteur Champagne strain yeast. We stirred until all clumps dissolved.
We repeated procedure for each treatment.
For nitrogen and nutrient starvation trial we did not add Fermaid K or diammonium phosphate.
Each treatment (three replicates) was placed in the appropriate temperature controlled water bath for the duration of the experiment.
We took hydrometer (Brix) and temperature (C) readings three times per day (7A, 4P and 9P.)

Results
The fermentation rate increased with temperature. The fermentation never began for the 0C treatment. We would like to determine at what temperature (between 0 and 10C) yeast would begin fermentation and if the yeast would die if we increased the temperature to 40 or 50C.

Conclusions/Discussion
From our data tables and graph of fermentation rates, it appears that the fermentation rate roughly doubles for each 10C rise in temperature. This was predicted by the temperature coefficient rule of Q10. However, there is the exception to this rule for the change in temperature from 0C to 10C. At this time, the 0C has still not begun fermenting.

Summary Statement
The fermentation rate of Pasteur Champagne yeast roughly doubles for each 10C increase in temperature.

Help Received
My dad helped us buy our materials and advised us in our project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Alex J. Thompson

Project Number
J1334

Project Title
Do Different Types of Manure Affect the Growth of Microorganisms?

Abstract

Objectives/Goals
The purpose of this experiment is to find out whether or not the different types of manure affect the growth of micro-organisms.

Methods/Materials
1)Collect the samples of steer, goat, pig, sheep, chicken, and rabbit manures. 2)Dilute the manures by taking one gram of manure and adding it to nine mil. of water in a testing tube. Then take one mil. of that dilution and add it to nine more mil. of water. This is a 1:100 ratio dilution.
3) Using an eyedropper and a spreader apply each dilution to both agar plates.
4) Seal the agar plates with parafilm aqnd put them in the incubator for 24 hours.
5) After 24 hours, take the plates out of the incubator and and count the micro-organisms growing. Do this by dotting the colonies with a sharpie.
6) Put 10 grams of each manure in the oven until they are completely dry.
7)Weigh the manure when it is completely dry using a triple-beam balance scale.
8) Find the micro-organisms growing in the actual dry manure itself and noy the water in the manure that may also have micro-organisms growing.

Results
It was found that the rabbit manure ranked the highest in the Nutrient agar, and it had the most micro-organisms growing. The goat manure had the lowest count on the nutrient agar plates. In the Potato Dextrose Agar Plates the goat manure had the highest count of micro-organisms and the sheep had the lowest. Each type of agar plate grew a different type of micr-organism which could account for the goat being the highest and the PDA and the lowest in the nutrient agar. In the end, the rabbit and chicken maure had the highest overall ranking.

Conclusions/Discussion
In conclusion, the rabbit and chicken manures had more micro-organisms growing than any other animals. This isn't what I had expected. The ruminant animals have larger digestive systems, which led me to think that it would allow the manure more time to pick up micro-organisms. This didn't prove my hypothesis correct. These unusual outcomes may have been caused by something as little as the manure laying in a different position when it was collected to the food being digested differently. This may have also been why the goat manure came out first and last in the two different categories.

Summary Statement
My project is focused on trying to find out if different types of manure affect the growth of micro-organisms using two different agar plates.

Help Received
Mr. Joe Nunez of the Kern County Livestock Advisory Office helped me with the math; Mother and Father helped me with board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jessica L. Tune

Project Number
J1335

Project Title
Bacteria Breath

Abstract

Objectives/Goals
My objective was to learn who had the most bacteria, cats or dogs.

Methods/Materials
I contacted and collected dog and cat samples from T.H. Veterinary. Gathered materials needed. I watched and recorded results for 7 days. Needing a more scientific approach for measurement, I redid the experiment. This time, measuring(using graph paper)graphing and taking pictures daily. After 7 days I recorded the results.

Results
The dogs had 8% more bacteria than cats, after one week of testing.

Conclusions/Discussion
Even though dogs had 8% more bacteria than cats, one individual cat had the most bacteria out of all the animals, but the dogs as a whole had more bacteria. I tested 6 dogs and 6 cats to make my results more exact and both times dogs had more bacteria.

Summary Statement
My project is an experiment of the comparison of bacteria in cats and dogs mouths.

Help Received
T.H. Veterinary Hospital helped with supplies and samples. My mom helped gather needed materials.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Catherine K. Yaw

Project Number
J1336

Project Title
Are You Eating Bacteria?

Abstract

Objectives/Goals
My purpose is to do a comparative study of bacterial counts on hamburger patties sold at 5 different fast-food restaurants. I was curious about whether the hamburger was contaminated with any harmful microorganisms such as E. coli.

Methods/Materials
My procedures took was 4 days. On the first day, I went to Westmont College to use their biology lab to make sterile petri dishes of MacConkey and Plate Count agar media. The next day, my parents bought the condiment-free burgers from 5 fast food restaurants. At the lab, I cut 1 gram of each hamburger patty into small pieces. Then I homogenized the hamburger meat and 9 ml of a sodium chloride to make a juice. From there, I made a 10 fold dilution. I took 0.1 ml of the direct burger juice and the 10 fold dilution onto 1 MacConkey and 1 Plate Count Agar plate for each of the burgers. After completing all the plates for all the burger samples, I placed the plates into a 37 degree C incubator for 24 hours. I also did a Gram Stain Test for the two plates that had bacterial growth. This allowed me to identify that the bacterium was a gram positive bacillus. I could not do further testing because the testing would take too long and too expensive to perform tests to find the exact bacterium.

Results
Sample E had 1110 colony forming units per gram of meat in the undiluted Plate Count Agar sample and 1600 cfu in the 10 fold dilution sample of PCA. All the burger samples grown on the MacConkey Agar showed no signs of bacterial growth. There was no presence of E. coli or Salmonella in the hamburger patties.

Conclusions/Discussion
It seems that the burgers from the restaurants that I tested are safe. There was no bacterial growth in the MacConkey Agar. However, the employees of the restaurant may contaminate the hamburger if they are sick or unhygienic when preparing the burgers. If I were to do my project over again, I would also test a raw hamburger patty along with the cooked hamburger patties from the various fast food restaurants.

Summary Statement
Detection of any bacterial contamination in hamburger patties from fast food restaurants.

Help Received
Parents helped put together board and provided transportation to University labs; Used labs at Westmont college and Cal Lutheran University unnder the supervision of Professor Frank Percival and Professor Barbara Collins

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Argen Youssefian

Project Number
J1337

Project Title
How Do Additives Affect the Growth of Microorganisms?

Abstract

Objectives/Goals
The aim of this project was to determine which of the chosen additives has the greatest inhibition effect on bacterial growth. The hypothesis was that vinegar will be the most effective additive comparing with sugar, salt and oil because vinegar is 4 to 6%acetic acid and most bacteria have difficulty growing in acidic conditions.

Methods/Materials
4 chicken cubes
1000ml hot water
One measuring cup
One large glass jar
18 glass jars with lid
Salt
Sugar
Vinegar
Vegetable oil
Teaspoon
Masking tape
Pen
Paper
18 nutrient agar plates

Dissolved 2 chicken broth cubes in 500ml hot water. Divided the solution in 9 jars. Added one teaspoon of salt, vinegar, sugar and oil to the first four jars. Then added 2 teaspoon of salt, vinegar, sugar and oil to the next four jars. The 9th jar had no additive. The plates were kept at room temperature and checked daily for their appearance and smell for one week. Samples were also taken from each jar after 1st,3rd,5th and 7th day and inoculated on agar plates to count the number of bacteria present in each jar. The experiment was repeated one more time for a total of 2 repeated trials.

Results
It was found that every additive used in this project had some bacterial growth inhibition in comparison with the control jar, but the most effective additive was vegetable oil. It was also found that the bacterial inhibition was dose related. As the concentration of each additive was increased, the number of bacteria in

Summary Statement
Would the chosen additives inhibit the bacterial growth?

Help Received
Mother helped me with the experimental set up and the board.