# Project ID: 801

## JR - Microbiology

Reagan Trinh

*Effects of Natural Preservatives on Fruit*

Farmers and citizens are looking for a natural way without pesticides to keep their fruit fresh for a long period of time. I also noticed that fruit would go bad after a couple days so I was wondering what could be a natural way to keep the fruit from going bad. So I wanted to find out the best natural preservative to keep the fruit fresh and without spoilage or mold. My hypothesis was that natural preservatives can prevent spoilage in fruits kept inside the fridge for 10 days.

Procedure: Step 1: Gather and prepare materials, Step 2: Wash each fruit in the natural preservatives, Step 3: Put fruit in sealed container (each fruit getting its own container), Step 4: Put in fridge and observe over the course of 9-10 days

Results: My hypothesis was refuted. The fruits all started spoiling before the 10th day. Although the natural preservatives kept mold spores from growing it did not keep the fruit from spoiling. Lemon juice kept the strawberries fresh for 8 days while strawberries in the aloe vera juice stayed fresh for 9 days. Garlic oil was least effective for just a week, 7 days. The blueberries in both lemon juice and aloe vera stayed fresh for 9 days. Garlic essential oil kept the blue berries fresh for 8 days. Out of all the preservatives, the tea tree oil and aloe vera juice is most effective, keeping the fruits fresh for 9 days while garlic oil was the least effective with only 7 days.

Conclusion: Though chemical preservatives like sulfur dioxides and sulphites preserve fruits for a much longer time. It can still be harmful to the body in the long run. My results show that natural preservatives are a good option to keep fruits like strawberries and blueberries fresh for an average of a week inside the fridge. Out of the different natural preservatives used, the aloe vera and tree oil had the best results. Both the juices are rich in antioxidants and have antifungal and antioxidant properties which make them an excellent choice to enjoy fruits with harmful preservatives and help in a waste free environment.

# Project ID: 802

## JR - Microbiology

Mia Wilson

*Kitchen Hygiene*

This project examined how often kitchen towels should be washed. It is hypothesized that when kitchen towels are tested for bacteria three days of use there will be high amounts of bacteria present. To conduct this experiment, a new kitchen towel was purchased. Ten swab samples were taken to establish a baseline bacterial count before use. The towel was then used over a 24 hour period. Again ten swab samples were taken and placed on agar plates to observe the amount of bacterial growth after 1 day of use. The test was repeated after a second day of use (48 hours) and third day of use (72 hours). Bacterial numbers were counted and recorded after 3 days of growth from initial plating. The results indicated that the hypothesis was supported, a significant increase in bacterial growth approximately 7000% was observed from the initial control to after 24 hours of use. This high level of bacterial presence on the kitchen towel after only one day of use, suggests that washing needs to occur daily compared to the recommended washing after 3 days.

# Project ID: 803

## JR - Microbiology

Ethan Leem

*Most Effective Natural Anti-Bacterial Agent*

For hundreds of years, tribal nations across the American continent have utilized the byproducts of their environment to treat diseases and wounds. Despite the presence of effective medicine, can the same natural resources be used to prevent microbial growth? For my project, my hypothesis was that if I administered different types of natural antimicrobial substances to an agar plate inoculated with bacteria, lemon juice would emerge as the most effective natural antiseptic tool.

Procedure:
I started by preparing the three antiseptic materials I would be testing for this experiment: lemon extract, Soapbark saponins, and Japanese Pine needle extract. After gathering microbial matter from a public restroom doorknob and streaking several agar plates, I inoculated the dishes with a single sample of each antibacterial substance. I then incubated the dishes in a 37-degree Celsius incubator and counted the number of colonies on a 24-hour increment basis for a total of 96 hours.

Results:
After 96 hours of growth, there was a significant variation in the growth of bacterial colonies between the test substances.
Quality control: 0 colonies
Negative control: 14 colonies
Lemon extract: 1 colony
Soapbark saponin extract: 3 colonies
Pine needle extract: 9 colonies

Conclusion:
In the end, my data suggested that vinegar and lemon were the most effective as agar samples that had been inoculated with such substances showed the least amount of bacterial growth. Considering my results, I conclude that there is a positive correlation between the pH of substances and their antibacterial potency.

# Project ID: 804

## JR - Microbiology

Stella Donboli

*The Effect of Household Cleaners on Bacteria*

Bacteria is always around us and since then we have made supplies to get rid of the bacteria, the main one being bleach. Though in the past 50 years we have made products that don't include bleach. So, if bleach is the main ingredient to get rid of bacteria then how does something with no bleach decrease the growth of bacteria? Procedure: Step one: gather materials. Step two: prepare agar solution and pour in petri dish, then wait an hour. Step three: collect and transfer bacteria into petri dish. Wait and collect data in the duration of four days. Step 4: Record final data and safely dispose of bacteria Results: I grew bacteria in room temperature and sprayed cleaner on top of it to see the growth of the bacteria. I tested a cleaner containing bleach, no bleach(natural), and water to see which would minimize the growth the most. Bleach had no growth at all with its average being 0. The cleaner containing no bleach showed much growth with its average being 742.5625. Finally the water showed the most growth with its average being 873.625.

# Project ID: 805

## JR - Microbiology

Emilia Hashemi

*The Rate of Bacterial Growth on Water Bottles, Keyboards, and Air Pods on a Period of 3 Days*

To begin, my experiment  is based on the bacterial growth on water bottles, air pods, and keyboards for a period of three days. This is important because in school there are many germs or microbes that grow on campus everyday.  A lot of germs contain the flu or Covid viruses that can cause people to get sick. I want people to be aware that germs are everywhere and we should be more careful about disinfecting certain items to stay healthy. To begin, I am going to be collecting my data by showing the results in a chart describing which items had the greater bacteria growth using a Petri dish divided into eighths to observe the microbes. Lastly, my hypothesis is the water bottle will have a greater bacteria growth because we use our mouths that contain  millions of bacteria.

# Project ID: 806

## JR - Microbiology

Victoria Capetanakis

*Which Harbors More Bacteria: a Phone or a Toilet?*

People are cautious to not touch things they think are covered in bacteria, especially public toilets. However, people fail to consider the one thing that essentially touches everything they touch, a cellphone. To demonstrate this, I decided to swab something that everyone generally agrees is dirty, a toilet - and compare the results against phones. Bacteria commonly found on toilets include Staphylococcus, Salmonella, and E.coli. Phones have been found to carry Staphylococcus, Streptococcus, Corynebacterium, and E.coli. These bacteria can cause life threatening complications. My hypothesis was that phones would grow more bacteria than school toilets.

To test this hypothesis, I swabbed eight cellphones and eight school toilets using agar solution. I then allowed each petri dish to grow in an incubator for five days. I measured and counted the results daily.

The toilets' largest bacteria measured 3.5 centimeters with a maximum of 9 colonies found in one petri dish. Phone bacteria grew as large as 3 centimeters in diameter; however, shockingly, the phones grew thousands of bacteria colonies with as many as 1,430! While I hypothesized cellphones would grow more bacteria than public toilets, I did not expect such impressive results.

The number of bacteria found on phones far exceeded the amount found on toilets. My hypothesis was supported by the findings of this experiment. Perhaps, if people were more aware of the bacteria growing on their phones, they would take preventative measures to stay healthier such as sanitizing cell phones and implementing better handwashing habits after using their phones.

# Project ID: 808

## JR - Microbiology

Gianna Alcaraz

*Germs Against Liquid Hand Soap*

The purpose of this experiment was to determine which liquid hand soap (SoftSoap, Dove, Dial, Raw Sugar, or Bath and Body Works Soap) will remove the most germs when people wash the hands. The experimental question is, “Which liquid hand soap will remove the most germs? SoftSoap, Dove, Dial, Raw Sugar (hand soap), or Bath and Body Works Soap?” The hypothesis is,  Raw Sugar will remove the most germs because it is organic and has plant-derived ingredients. In order to conduct the experiment, the experimenter has to first gather five different types of soap. Then, the experimenter has to rub Glo Germ Gel on the hands, and use a UV Flashlight to see how many germs are on the hands. Next, the experimenter washes the hands with one of the soaps that was gathered in the beginning. In addition, the experimenter shines the UV Flashlight on the hands again to check how many germs were removed from the hands. Finally, the experimenter documents on a data table the results of the experiment. The experimenter has to go through the whole process until they fill out the whole data table. The result of the experiment showed that Bath and Body Works soap removed the most germs. The hypothesis was refuted because the hypothesis stated that Raw Sugar (hand soap) was going to remove the most germs, but it did not.

# Project ID: 809

## JR - Microbiology

Charlotte Capaldi

*Investigating the Effectiveness of a UVC Wand on Bacteria Mortality*

Statement of the Problem: UVC wands are advertised to disinfect surfaces by delivering UVC light to the surface and killing the bacteria. UVC wands are also known to be harmful to the eyes and skin, when they aren't used with the proper precautions. Are they effective at killing bacteria and disinfecting surfaces?

Procedure: 68 plates were inoculated with three types of bacteria, and two plates were used as negative controls. I performed three trials. The first trial consisted of 30 plates and the bacteria were exposed to the UVC light for 5 to 10 seconds, which was the length recommended by the manufacturers. In the second round of testing, 30 more plates were exposed to the UVC light for 20 or 30 seconds. In the final trial, 10 plates were exposed to the UVC light for 30 or 45 seconds. Three benign strains of bacteria were tested: E. coli, Staphylococcus epidermidis, and Bacillus cereus. The plates were exposed to the UVC light at distances ranging from 2.5cm, 5.0cm, 10.0cm, or 20.0cm. Once the plates were inoculated and exposed to the UVC wand with the lid off, they were sealed and placed in the incubator, set at 37 degrees Celsius. After 24 hours, the plates were removed from the incubator and the results were recorded.

Results: The UVC wand had little impact on the growth of bacteria, even though it was advertised to kill up to 99 percent of bacteria on surfaces. The UVC exposed plates looked similar to the positive controls, with a lawn of bacteria in a zig-zag motion covering the plate. On plates 3, 4, 13, 14, (fill in other plates), 62, 65, and 66, there were visible areas of somewhat reduced growth near the center of the plates that were less than 5cm squared. The most prominent area of clearing occurred on an E. Coli plate of 2.5cm from the wand for 45 seconds.

Conclusion: My hypothesis was that one of the three strains of bacteria might be more effected by the UVC exposure than the other two strains. Surprisingly, the Bacillus cereus exhibited the heaviest growth throughout the testa dnd did not exhibit any impacts of UVC exposer. Only Staphylococcus epidermidis and Escherichia coli sometimes eshibited small areas of reduced growth when exposure was 2.5cm from the plate. Based on these results, the UVC wand appears to be a highly ineffective way to sterilize surfaces.

# Project ID: 810

## JR - Microbiology

Biancka Miranda

*Germs in Gyms*

The purpose of this experiment was to find out the amount of bacteria in items people touch when going to the gym and to push the workers to disinfect more often. The experimental question stated, which has more bacteria, gym lockers or gym door handles? The hypothesis stated that the door handles will have more bacteria than the lockers because people use door handles continually while lockers are used less. To conduct this experiment, organize the Petri dishes into two groups, one group being the lockers and the second group is the door handles. For each Petri dish split the Petri dish in half and label the side of the Petri dish of the location and the trial. Swab a door handle 5 times in a horizontal motion. Swab both sides of the Q-Tip. Swab the Q-Tip onto the Petri dish with the location swabbed, in a horizontal motion. Swab the locker 5 times in a horizontal motion. Swab both sides of the Q-Tip. After swabbing the locker, swab the Q-Tip onto the Petri dish with the location label in a horizontal motion. Put your sample on a clear glass plate under a microscope and count how many bacteria cells there are. Compare which has more bacteria. Record the results on the data table. The result of the experiment showed that lockers had more bacteria cells than the door handles. The hypothesis was refuted because lockers had an average of 526 total bacteria cells and door handles had an average of 422 bacteria cells.

# Project ID: 811

## JR - Microbiology

Khadija Paband

*How Well Does Expired Hand Sanitizer Work?*

The effectiveness of expired hand sanitizers on bacteria is uncertain as it may deteriorate over time, reducing its potency. The efficacy of an expired hand sanitizer may depend on various factors such as its storage conditions, the active ingredients, and the length of time since its expiration date. It is generally recommended to use new, unexpired hand sanitizers for optimal germ-killing performance. The objective of this experiment is to compare the efficacy of expired hand sanitizers with new hand sanitizers in killing common bacteria.

It was hypothesized that the sanitizers that are newer are going to be much more effective than the sanitizers that are expired.

The experimenters tested the effectiveness of hand sanitizers with different expiration dates by dividing school lunch tables into 6 sections, cleaning them with different sanitizers, and incubating bacterial samples taken before and after treatment. The results were recorded and compared to determine the effectiveness of new and expired sanitizers in killing bacteria.

In conclusion, the results of experiment showed that the expiration date of sanitizers does not seem to have a significant impact on their effectiveness. The results showed that expired sanitizers were still as effective as a new one. These findings indicate that sanitizers can continue to be used even after their expiration date without compromising their ability to kill germs and bacteria.

# Project ID: 812

## JR - Microbiology

Maxwell Eiseman

*LEDs Effect on Bacteria*

This project aims to determine what LED color would destroy the most bacteria. It is hypothesized that when LED lights are being tested for the most effective at killing bacteria on a tile surface, the violet LED light will effectively reduce the growth of bacteria colonies on the surface more than any of the other colors. If one were to conduct the tests they would make a 4x4 square grid on a floor tile in a science classroom that is frequently walked upon using masking tape. Sections were swabbed for bacteria which was then transferred to an agar plate, and then they were placed into an incubator and given 24 hours for growth. After 24 hours bacteria colonies were counted and logged. Once the “before” trials were swabbed, a box lined with LEDs was placed over the same 4x4 grid. After 24 hours of LED exposure, the grid was swabbed again using the same methods as before. After allowing 24 hours for growth, the “after” plates colonies were counted and logged. A total of 96 tests were done (16 trials per condition). Blue was the most effective at killing bacteria with an average before of 195.19 bacteria colonies and an average after of 47.56 bacteria colonies. Violet was the 2nd most effective, and red was the least effective. The percentage change decrease in bacteria colonies for each color was determined, and for blue was 75.63%, for violet was 74.67%, and for red was 29.39%.

# Project ID: 813

## JR - Microbiology

Avinadav Horowitz

*The Effect of Salt, Tap, and Carbonated Water on Bacteria Growth*

How does dripping different kinds of water samples on a surface affect the bacteria growth on said surface? It is hypothesized that salt and carbonated water would eliminate a lot of bacteria colonies while the effects of tap water on bacteria were unknown. If one were to conduct the tests for this project they would designate a surface for testing and divide it into the amount of tests that will be conducted. After that they would swab all the tests before applying the specific water on the testing surface and then apply the kind of water that they were testing and wait a minute until swabbing the afters. 15 trials were conducted for each condition, resulting in 90 total trials. The data that was found from such tests is as follows: the carbonated water had the biggest percent change of bacteria elimination with 67.94%. Salt and tap waters were slightly less than carbonated at 66.67% and 66.36% respectively. A possible reason that salt water performed the way that it did is because it uses osmosis to make the water leave the bacterium and since bacteria can't survive without water they die. It is also possible that the reason that carbonated water performed the way that it did is because it contains carbonic acid which can kill bacteria.

# Project ID: 814

## JR - Microbiology

Eliyahu Lugasi

*Artificial Vs Natural UV Light*

Which is more efficient in bacteria disinfection, natural or artificial UV? Natural and Artificial UltraViolet lights were concentrated on bacteria water for 7 hours to find which is more efficient at eliminating bacteria. The artificial UV tests were conducted inside a dark room under concentrated UV. The natural UV tests were conducted on top of a car in direct sunlight for optimum results. It was hypothesized that artificial UV bacterial disinfection would disinfect bacteria more effectively than natural disinfection. This was hypothesized because the artificial was more concentrated and focused on the bacteria while the natural was very inconsistent due to the fact that the UV index is different for different days. It was also hypothesized that the higher the UV index the higher the percent decrease in bacteria colonies. These hypotheses were supported by the data. The average before results for artificial was 71.67 bacteria colonies while the after results were 10.53, and the percent decrease was 85.30%. The average before results for natural was 91.47 bacteria colonies and the after result was 56.53, and the average percent decrease was 38.20%. When the UV Index was 2 the percent decrease in bacteria colonies was 26.21%. When the UV Index was 3 the percent decrease in bacteria colonies was 67%.

# Project ID: 815

## JR - Microbiology

Jayden Nakach

*Does a Different Environment Affect Bacteria Growth?*

This project tested if bacteria would grow in different temperatures. A bouncy ball and a soccer ball were tested in this experiment. It was believed that bacteria would grow in a 70°+ Fahrenheit environment. However, this hypothesis was not supported. The testing was done in a room-temperature area and in the trunk of a Honda Civic. There were 16 tests for each testing condition. Since there were two balls and two different settings, there were a total of 64 trials. Bacteria were swabbed before and after and were transferred into an agar dish. They were placed in an incubator for 15 hours. The percent changes for the pre and post bacteria amounts were then determined and compared. Results showed that the soccer ball had the mildest bacteria decrease after storage in the trunk and the percent change was 17.52%, and it also had the most bacteria already formed on it for both environments. The bouncy ball however had a very low decrease in bacteria due to the low amount of already formed. At room temperature, it started off at an average of 12.56 bacteria colonies and decreased to 8.38. In the trunk, it started off at 24 and decreased to 19.75. The soccer ball however had totally different percentages. At room temperature, it started off at 39.75 and decreased to 22.13. In the trunk, the ball already had 30.69 bacteria formed on it and it decreased to 25.31.