



Project ID: 711

Junior Division

Microbiology

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San Diego Hebrew Day School

Gr. 8



Water Bottle Safety

The goal of this project was to see whether bacteria will grow and accumulate on a plastic water bottle rim over time. It was hypothesized that the bacteria colonies would increase with more human contact over a several-day stretch. The rim of a water bottle was swabbed before human contact and transferred to an agar dish. A drink was then taken from the water bottle. The rim was again swabbed and transferred to the agar dish. After 24 hours, and then 48 hours, the entire process was repeated. Colonies were counted and logged into the data table, for both the "before" and "after" human contact. After testing it was concluded that "before human contact" readings of bacteria growth increased over the 3-day testing period, while the "after" readings stayed consistently similar. It is possible that the before readings increased over time because the human mouth contains lots of bacteria, which was transferred to the rim of the water bottle. A potential reason the "after" readings stayed so consistent is that the number of bacteria left behind after human contact would be similar regardless of the previous day's bacteria levels.

**Project ID: 712****Junior Division****Microbiology****Abby Anderson****St. Peter the Apostle Catholic School****Gr. 6****Cooper Fountaine****St. Peter the Apostle Catholic School****Gr. 6**

Don't Be Gross, Clean Your Produce

People are always looking for the best ways to clean their fruits and vegetables. In this experiment, it was believed that the commercial product, Veggie Wash would be the best to properly clean produce. As more information is learned about the bacteria accompanying the fruit and vegetables bought from a store, and potentially pesticides used to protect them, the greater the need to find the best way to clean them. In this experiment, multiple methods, including the use of off-the-shelf products, were used to clean strawberries. The skin from the clean strawberries were studied over time. The clean samples were compared to an unwashed sample to find the least and most effective cleaning procedures and agents.

There were four groups: Control (unwashed), Water rinse, Home solution (baking soda, vinegar and water), and Veggie Wash. The strawberries were cleaned and then swabbed according to the directions and placed on a petri dish, the petri dishes were labeled and then observed for bacterial growth over three days.

The amount of germ growth on average over three days was 149 spots for the control group, 134 for the water rinse, 69 for the home solution of baking soda and vinegar and the best was 35 spots for the Veggie Wash. The experiment included counting spots in petri dishes. Due to the numerous amounts of growth the quadranting method was used to determine how many spots of bacteria grew in the petri dishes. Quadranting is where four separate imaginary corners are identified in the petri dishes and bacteria is counted in that corner and then multiplied by four.

The results of this experiment clearly show the benefits of washing produce and give credit to the claims made by store bought products because the bottle says it will clean better than water and therefore should prevent illness.



Project ID: 713

Junior Division

Microbiology

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Bright Horizon Academy

Gr. 8



Bacteria in Bagged Salads

The purpose of this science fair project is to investigate the presence of bacteria in bagged salads. The project also aims to evaluate if the bacterial composition and quantity changes with time and if older packages of lettuce contain a higher concentration of bacteria due to cell deterioration. The results of this study will provide insight into the potential health risks associated with consuming bagged salads and inform consumers on the shelf life and safety of these products.

The study involved fresh unwashed/ washed lettuce and three types of pre washed bagged lettuce, with each sample having a different expiration date. The agar dishes were labeled with the type of lettuce and expiration date. Bacterial samples were collected from the lettuce bags by swabbing 10 pieces of lettuce from each and streaking the swab onto a designated nutrient agar plate. The agar plates were then incubated in an incubator for 24 hours. After the incubation period, the number of bacterial colonies that had grown on each plate was observed and recorded. The data was recorded in a table and charts were created to compare the different types of bagged lettuce to the un-bagged lettuce.

The results of the experiment reveal that two out of three pre-washed bagged lettuce samples showed a significant presence of bacteria when compared to freshly washed lettuce. Conversely, the Tri brand of pre-washed bagged lettuce demonstrated a considerably lower level of bacterial contamination and was almost comparable to the number of bacteria colonies found in freshly washed lettuce. These findings indicate that some pre-washed bagged lettuce products may not meet the expected standards of food safety, while others, like the Tri brand, can provide a safer and more convenient option for consumers.

In conclusion, our research has shown that pre-washed bagged lettuce has a higher level of bacteria compared to fresh lettuce. This is a concerning finding, as consuming contaminated lettuce can lead to foodborne illnesses.

**Project ID: 714****Junior Division****Microbiology****James Cao****Muirlands Middle School****Gr. 8****Vera Muller****Carmel Mountain Middle School****Gr. 8**

Identification of Microorganisms that Effectively Degrade Compostable Polymers

Plastic is a major environmental issue. Even bioplastics, made from biological sources instead of petroleum, often degrade extremely slowly in nature. However, fungi such as *Aspergillus terreus* may be able to degrade these bioplastics efficiently. We hypothesize if some variants of *Aspergillus terreus* and microbes in compost soil samples have an increased ability to degrade bioplastics, such strains and/or microbes can be selected via serial culture of *Aspergillus terreus* and compost soil samples with bioplastics under a low nutrient condition. Procedure: Two experiments were run in parallel testing two different bioplastics, PLA (polylactic acid) and PHA (polyhydroxyalkanoates). In each experiment, five test tubes were created: two controls to measure the effect of being put on a shaker and three other tubes, all shaking with growth media, fungi samples, and the bioplastics. All samples except the standing samples were put on an orbital shaker with growth media exchanged every 3-4 days. After a 14 day period, the weight of the bioplastics was measured. Results: All samples incubated with microbes except the PHA and soil sample showed a 0.3-0.5 gram increase in weight. The PHA+Yeast Peptone+compost sample, showed a 0.0037 decrease in weight. Conclusion: Compared to the controls, no end weights of the bioplastics showed a significant weight decrease. This may have been because the duration of the experiment wasn't long enough for the microorganisms to adapt, or that the chosen media didn't create enough of a low nutrient condition.



Project ID: 715

Junior Division

Microbiology

Charlotte Capaldi

The Rhoades School

Gr. 8



Are Antibiotic Resistant Bacteria Present in Local Water Sources?

AWARDS:

WaterReuse Association - San Diego Society - Winner

CSEF Qualified

Thermo Fisher Scientific Junior Innovators Challenge Nominee

The increasing pervasiveness of antibiotic resistant bacteria has become a serious challenge. I wondered if antibiotic resistant bacteria might be present in local waterways or the ocean. I hypothesized resistant bacteria might be present, and prevalence would vary depending upon the water source.

88 trypticase soy agar plates were used in this experiment. The plates were inoculated with water from five different locations in North County San Diego: Moonlight Beach, San Elijo Lagoon, Lake Hodges, Encinitas Creek, and San Dieguito Lagoon. The antibiotics investigated were doxycycline hyclate and a combination of penicillin and streptomycin. Antibiotic sensitivity disks were placed in the inoculated plates. The plates were incubated at 37°C, and the results were analyzed.

The majority of bacteria exposed to the antibiotics did not appear to be resistant. However, resistance was observed in water samples from two locations, San Elijo Lagoon and Lake Hodges. In fact, in a plate inoculated with water from Lake Hodges, resistant bacteria completely covered the sensitivity disks and the entire plate.

I hypothesized the prevalence of antibiotic resistant bacteria would vary depending upon the water source and antibiotic to which the sample was exposed. I was glad to see that I encountered far less antibiotic resistance than anticipated. In most plates the antibiotics were effective in inhibiting the growth of bacteria as was evidenced by the large zones of inhibition. However, in water samples from a local lake and local lagoon, bacteria resistant to both streptomycin and penicillin were observed.



Project ID: 716

Junior Division

Microbiology

Audrey Castillejos

De Portola Middle School

Gr. 8



A Comparison of Disinfectants Based on Brand and Type

The goal of this project was to compare wipe and spray disinfectants on how effective they are at cleaning bacteria from a surface. There were 4 disinfectants tested in total (Clorox wipes, Lysol wipes, Clorox spray, and Lysol spray). Using the information found, it determined the following: The Lysol spray disinfectant was the most effective out of the 4 products, on average disinfectant sprays clean more bacteria than wipes, and Lysol makes more effective products than Clorox.

To find this, there were 4 samples collected for each disinfectant. These were a control sample from before the surface was cleaned and 3 samples from after the surface was cleaned. The amount of bacteria found from the 3 samples was averaged to determine the amount of bacteria left on the surface after the disinfectant was used. Then, using this number, the percentage of bacteria cleaned off of the surface was found. Each disinfectant was tested on separate tables.

I hypothesized that the wipes would be more effective at cleaning bacteria than the sprays. After considering all of the data collected, this hypothesis was proven to be wrong. Spray disinfectants on average caused a 70% decrease in bacteria on the tables they cleaned. Wipe disinfectants, on the other hand, caused only a 46% average decrease. It was concluded that this happened because you are able to put more product onto the surface being cleaned when using sprays. With wipes you can only use the amount of product that's on the wipe.

**Project ID: 717****Junior Division****Microbiology****Ali Dieujuste****De Portola Middle School****Gr. 8**

Which is the Better Disinfectant: Clorox or Seventh Generation

This project analyzed the effects of using Clorox wipes and seventh-generation wipes to disinfect different surfaces and help determine which brand is the better cleanser. The natural one or the more toxic one? It was hypothesized that Clorox would be the more effective cleanser, killing more germs. 18 total samples were collected. 6 control samples, 6 Clorox samples, and 6 seventh-generation samples. The samples were put into agar plates and left to grow surface bacteria for 5 days, being tracked each day for new growth. Results and data signified that the hypothesis was incorrect. The more natural disinfectant, seventh generation, ended up killing more germs/bacteria than the Clorox wipes. In total for all of the plates, the Clorox-cleansed surfaces had around 181 total bacteria showing on the 6 Clorox plates combined, while the seventh-generation plates had around 144 (181>144). While seventh generation was the better disinfectant, Clorox did still kill some bacteria. In total, the 6 control plates collected around 231 bacteria, indicating that Clorox did still kill around 50 total bacteria. But in the end, neither brands managed to kill 99.9% of bacteria, as they both claim to have the ability to do. The seventh-generation wipes may have been the better disinfectant because the main ingredient, thymol, subsequently kills cells. Alkyl, the main ingredient in Clorox simply interferes with membrane integrity, not necessarily killing it. Because thymol kills cells, it makes it a better and more effective disinfectant, rather than Clorox, which is one of the top disinfectant brands in the US.



Project ID: 718

Junior Division

Microbiology

Amaya Fernandez

Chula Vista Middle School

Gr. 8



Bacteria on City Buses

AWARDS:

CSEF Qualified

The statement of purpose was Which area of San Diego City buses contains the most bacteria over the course of a week ? The hypothesis stated that if different areas of San Diego city buses are swabbed for bacteria then the fabric covered seats will contain the most bacteria because it is one of the areas most utilized. To conduct the experiment, swab 5 areas and 2 different features of the area , then take the swabs home in sample tubes, swab the agar plate and let them grow for a week. The results of the experiment demonstrated that stop request chords on average contained the most bacteria. In conclusion, the hypothesis was refuted because, in the end, stop request chords had the most bacteria.



Project ID: 719

Junior Division

Microbiology

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Bright Horizon Academy

Gr. 7



Preserving Food

The objective of this project is to evaluate the effectiveness of various antioxidants and preservatives, including green tea, rosemary, vinegar, and salt, in inhibiting bacterial growth in ground beef. By systematically applying different treatments to meat samples and monitoring bacterial growth over a 5-day period, the project aims to determine which antioxidants and preservatives exhibit the strongest antimicrobial properties. Through this investigation, the project seeks to provide insights into potential natural alternatives for food preservation and contribute to the development of safer and more sustainable food handling practices.

It is hypothesized that increasing the concentrations of preservation solutions in the food will result in a decrease in microbial growth.

Divide 500g of ground beef into 5 equal portions, each weighing 100g, and shape them into patties.

Label 5 plastic bags as follows: Control, Green Tea & Rosemary, Rosemary, Vinegar, and Salt.

Take one patty at a time and use a sterilized cotton swab to collect a bacterial sample from its surface.

Transfer the collected bacterial sample onto a designated petri dish.

Add 100g of meat to each of the labeled plastic bag and coat with 1 mL of the preservation solutions according to the label. Store all bags in the refrigerator. After 24 hours, streak the cotton swab over the surface of each designated petri dish in a zigzag pattern. Incubate the petri dishes in the incubator at the appropriate temperature for 48 hours. After incubation, count the number of bacterial colonies present on each petri dish.

Repeat for 5 consecutive days. Repeat four more times for a total of five repetitions.

In conclusion, vinegar was the best long term inhibitor of bacterial growth in ground beef. Salt was also an effective inhibitor. Rosemary and Green Tea were inconsistent inhibitors of bacterial growth. This proved my hypothesis to be partially correct. Some antioxidants and preservatives are effective inhibitors of ground beef while others are inconsistent. (This abstract was edited due to length exceeded the maximum number of words allowed)



Project ID: 720

Junior Division

Microbiology

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Bright Horizon Academy

Gr. 7



Effect of Antibiotics on Bacterial Growth: A Comparative Study

Antibiotics are crucial to save the lives of those who fall victim to bacterial infections. However, limited access to commercial antibiotics can further threaten the lives of people with limited access to healthcare. In some parts of the world, people reach for naturally occurring antibacterial remedies when they cannot access pharmaceutical grade ones. This project looks into the effect of different antibiotics, pharmaceutical grade antibiotics (penicillin, streptomycin, and ampicillin) and naturally occurring antibacterial remedies (garlic, ginger, and turmeric extracts), on the growth of bacteria.

It was hypothesized that the pharmaceutical grade antibiotics will exhibit more antibacterial effects than the naturally occurring antibiotics.

To do the experiment, *Lactococcus lactis* bacteria were swabbed onto nutrient agar plates. Then, antibiotic discs were applied. As for the naturally occurring antibacterial remedies, sterile discs were soaked in the extracts before application. After applying the discs, the plates were incubated for 72 hours. After 72 hours, the diameter of inhibition zones was recorded for each antibiotic.

The results showed that turmeric was the best antibiotic, because there was zero bacterial growth on the Petri dishes containing turmeric extract. Ginger and streptomycin came in second and third places, respectively. My hypothesis was therefore proven incorrect. To conclude, these findings show that naturally occurring antibiotics, such as turmeric and ginger extracts, can be notably effective at fighting bacterial infections. This finding could be very useful in places where pharmaceutical grade antibiotics are limited in availability, especially since the natural antibiotics are significantly cheaper and do not require prescription.



Project ID: 721

Junior Division

Microbiology

Lana Robertson

Mt. Helix Academy

Gr. 8



Hot-Air Hand Dryers vs. Paper Towel Dispensers in Public Bathrooms

This project compared the bacteria between hand dryers, electric paper towel dispensers, and paper towel dispensers with levers. It is hypothesized that the hot-air hand dryers in public restrooms will have more bacteria, meaning they are less sanitary than paper towel dispensers. Results showed that the least hygienic way to dry your hands is by using hand dryers followed by the electric hand dryers, then the hand dryers with levers, meaning the hypothesis was correct.



Project ID: 722

Junior Division

Microbiology

Catherine Soriaga

Stella Maris Academy

Gr. 8

Mabel Strott

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What Preserves a Carved Pumpkin for the Longest?

The goal was to preserve a carved pumpkin for the longest amount of time. Our hypothesis was that bleach would preserve it for the longest, because multiple sites suggested bleach and bleach kills spores and mold and other microbes that cause rot. To test our theory, we compared three of the most common methods recommended for preserving carved pumpkins we read about online: bleach, petroleum jelly, and brine. We applied the treatments and observed daily changes over 5 days compared to no treatment. On Day 5, we observed the least mold growth and softening with bleach treatment, the least weight decrease and softening with petroleum jelly, and found comparable weight decrease, softening, and mold growth between brine treatment and control. Overall our observations suggest that bleach treatment would preserve pumpkins longest especially if trying to avoid mold/microbial growth.

**Project ID: 723****Junior Division****Microbiology****Omar Sultan****Bright Horizon Academy****Gr. 8**

Cleaning for Health: Comparing Cleaning Methods on School Table

The objective of this project is to evaluate the effectiveness of various cleaning materials—Clorox, All-purpose cleaner, and Wet Cloth—in reducing bacterial colonies on different surfaces. By measuring the percentage decrease in bacterial colonies after cleaning, the project aims to identify the most effective cleaning materials for maintaining cleanliness and hygiene across diverse surface types. It was hypothesized that Clorox wipes will be the most efficient in cleaning tables and tissues will be the worst method at cleaning tables.

The experiment began with boneless chicken thighs placed on each surface, left undisturbed for one hour to allow bacterial colonization. After removing the chicken, surfaces were left for an additional three hours. Bacterial samples were collected using sterile cotton swabs and transferred onto labeled petri dishes with nutrient agar, then incubated for 24-48 hours. Baseline bacterial counts were established by counting colonies. Surfaces were then cleaned with Clorox, All-purpose cleaner, or Wet Cloth as per instructions. Post-cleaning, bacterial sampling was repeated, and colonies were counted. The percentage decrease in bacterial colonies was calculated. This process was repeated for each cleaning material and surface combination, and data analysis determined the effectiveness of the cleaning materials in reducing bacterial contamination.

Clorox showed the highest efficacy, averaging a 95.22% reduction in bacterial colonies. All-purpose cleaner followed closely with a 94.40% decrease, while Wet Cloth achieved an 87.40% reduction. Across surfaces, Clorox and All-purpose cleaner consistently achieved near-complete elimination of bacterial colonies, with percentages often exceeding 98%. Wet Cloth was slightly less effective, particularly on wood and glass surfaces where reductions ranged from 81.42% to 88.33%.

In conclusion, the study shows that Clorox and All-purpose cleaner work very well in reducing bacteria on different surfaces. Wet Cloth also helps, but not as much, especially on wood and glass. Choosing the right cleaner for each surface is important. More research could help us understand how cleaners work better and improve our cleaning habits for a healthier environment.



Project ID: 724

Junior Division

Microbiology

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Gr. 7



The Impact of Wearing Shoes Inside on Bacterial Growth Rates

In this experiment, the purpose of this project is to test the effects of wearing, or not wearing shoes in the house on bacterial growth rates. The hypothesis is if no shoes are worn in the house then, there will be more bacteria on the ground compared to wearing shoes in the house.

To conduct this project, I first wiped down the Control inside area of the house, swabbed it with a saline-dipped swab, and applied it to a petri dish to incubate and started the dilution process (Control inside). Then, I repeated that step outside (Control outside). Then, I walked outside with shoes on, walked into the area of the house, and swabbed the area with a saline-dipped swab and applied it to a petri dish to incubate (With shoes). Then, I started the dilution process. Lastly, I repeated that step without shoes on (Without shoes). Then, I incubated all the petri dishes (48 hrs), observed, and sent them to the qualified scientist for disposal.

The data from this experiment showed that the average amount of bacteria for the Control inside no dilution category was 10 colonies, 252 colonies for the Control outside group, 167 for the Without shoes category, and 149 colonies for the With shoes category.

Overall, the experiment supported my hypothesis, showing the outside control group had the highest bacterial growth (252 colonies), while the inside control had the least (10 colonies). Notably, going without shoes led to 18 more colonies than wearing shoes.