



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Leona Abrahamian	Project Number J1601
Project Title Hand Washing vs. Sanitizer	
Abstract Objectives/Goals That hand sanitizer is much more effective in reducing the amount of micro-organisms on hands than washing hands. Methods/Materials Materials <ol style="list-style-type: none">1. Warm running tap water2. Dial hospital grade soaps3. Surgical sterile towels4. Sheep blood agar plates5. Hospital microbiology incubator6. Purell aloe formula hand sanitizer Method/Procedure First, 10 individuals washed their hands with warm water and dial hospital grade soap for 20 seconds. Each of them dried their hands with sterile towels. I swabbed each individual's hands with culture swabs. After I applied the culture swabs to the blood agar plates. Second, 10 individuals sanitized their hands with hospital grade Purell aloe formula hand sanitizer for 20 seconds and dried their hands with sterile towels. I swabbed each individual's hands and applied it on to the blood agar plates. Third, I swabbed 10 individual's hands that did not wash their hands or sanitizer for comparison. Fourth, I took the blood agar plates to the lab and placed them in an incubator. It stayed in the incubator for 72 hours. Results Hand Sanitizer is more affective than hand washing. Conclusions/Discussion Post my experiment, my hypothesis was proven incorrect. The results indicate that sanitizer is much more affective in reducing micro-organisms count than hand washing.	
Summary Statement That hand sanitizer is much more effective in reducing the amount of micro-organisms on hands than washing hands.	
Help Received Father and science teacher	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Amalia C. Bernardi	Project Number J1602
Project Title Adaptation, Antibiotics, and Bacteria	
Abstract	
Objectives/Goals My project had two main objectives. The first objective was to determine how effective some natural products are against bacteria. I used Coconut oil, Cayenne Pepper, Vinegar, my dog's drool, my Mom's drool, and molded cheese to see if they would prevent bacteria from growing. Once I established the first experiment, I tried to see in a second experiment if I could grow some bacteria that were resistant to those substances and determine if I could see adaptation and evolution of bacteria.	
Methods/Materials For experiment 1, I grew the bacteria overnight and then recorded the effect of the substances. I then took bacteria that could grow (and possibly resist the substance) and plated those again for experiment 2. In experiment 2, I again recorded how the substance affected growth of bacteria. All experiments were done twice to control for variation.	
Results Experiment 1. Substances that I used had different effects on the bacteria: Coconut oil and Moldy cheese had little effect on the bacteria. Mom's drool had some effect but not as strong an effect as Dog's drool, which was quite effective. Cayenne pepper controlled bacterial growth effectively. Vinegar had the strongest effect at controlling bacterial growth Experiment 2. We predicted that bacteria that were picked from the region of inhibition of a substance would be more effective at resisting that substance in experiment 2, yet this was not always the case. I could not see a difference in the 4 weaker substances. In the two stronger substances, Cayenne Pepper and Vinegar, I did see an effect, where bacteria seemed more resistant in experiment 2 than in experiment 1.	
Conclusions/Discussion In conclusion, I have found that some natural products do prevent the growth of E. coli. For the second experiment, I was expecting growth of bacteria in most plates. The experiment showed me that there was a marked effect on the strongest antibiotics and this may mean that this is where I can actually see results.	
Summary Statement Antibiotic properties of natural products, and the adaptation of bacteria to those products are tested.	
Help Received I was advised by my mother and my father. I did the lab work at UC Santa Cruz on my own, under the supervision of my Dad.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Emmanuel P. Chan	Project Number J1603
Project Title Development of a High Throughput Real Time PCR Assay for Rapid Detection of Helicobacter Bacteria	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Helicobacter bacteria can be found in human and various animals. Some members of this genus are associated with gastric diseases and cancer formation. The diagnosis or screening of Helicobacter infection by culture method is difficult because of low sensitivity. In this report, a genus-specific high throughput real time PCR (polymerase chain reaction) procedure is developed to rapidly screen for subjects potentially colonized with Helicobacter bacteria.</p> <p>Methods/Materials Consensus PCR primers designed over the 16S rRNA gene of Helicobacter bacteria were used in a real time PCR reaction that incorporated a proprietary DNA binding fluorescent dye. Quantified <i>H. pylori</i> DNA was used to determine the lowest detection limit, and the intra-assay and inter-assay variations of the assay. The specificity of the assay was checked against twenty-nine bacterial DNAs.</p> <p>Results A flagpole that measured 150 centimeters was set perpendicular to the ground. The length of the shadow measured and recorded at 2:00 pm every five minutes until 2:30 pm for ten days. The angle of the Sun that produced each length was then calculated using trigonometry.</p> <p>Conclusions/Discussion A genus-specific real time PCR using DNA binding dye technology is developed for the detection of Helicobacter bacteria. Real time monitoring of amplification signal eliminates further processing of resultant PCR products before detection, increases the throughput of the assay and minimizes cross-contamination.</p>	
Summary Statement A genus-specific and sensitive real time PCR assay was developed for detecting Helicobacter bacteria.	
Help Received Used lab equipment from Zoologix, Inc. under the supervision of Dr. Perry Chan	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Yusuf A. Khan	Project Number J1604
Project Title Honey I Shrunk the Bacteria	
Abstract Objectives/Goals I am trying to find out which organic natural remedy (honey, olive oil or garlic) will kill Staphylococcus epidermidis and help sanitize the skin from any infections. Methods/Materials Built incubator Bought agar plates and ordered bacteria online Prepared bacterial solution by pouring Mueller's broth into tube of Staphylococcus epidermidis Used a sterile calibration loop to streak 1 micro-liter of the solution onto each agar plate. A new loop was used for each plate, and once used, discarded immediately after Put the plates into a pre-made incubator Counted and recorded the number of bacteria after 24 and 48 hours After 48 hours, I drew up 0.2 cc of honey, garlic paste/juice, and olive oil into 3 sterile syringes Added each remedy onto a separate agar plate and left it for 24 hours Counted and recorded the number of remaining bacteria after 24 hours Materials: Incubator, Styrofoam box, Lamp, Thermometer, Honey, Garlic, Olive oil, Agar Plates, Mueller's broth, Inoculation Loops, Sterile Syringes and gloves, Staphylococcus epidermidis. Results I observed that each natural remedy killed a certain amount of bacteria but some were better than others. Honey was the best natural remedy. In the first trial, the natural agents killed more bacteria than in the second trial. Lastly, in the second trial, I had little bacterial growth so I had to find a way to measure the amount of growth. That is why I used a relative scale instead of absolute numbers. Conclusions/Discussion I had hypothesized that honey would be the most antibacterial. By performing this project, I proved my hypothesis to be correct. In both trials, honey killed the most amounts of Staphylococcus epidermidis. I realized that although natural remedies are great at killing bacteria, pharmaceutical substances are better geared for the killing of bacteria because they are more specific. For example, each pharmaceutical product targets a specific structure of bacteria, some target the wall while others attack the DNA and growth cycle.	
Summary Statement In my project I was trying to determine which natural remedy (honey, garlic, olive oil) was most effective in preventing/treating skin infections.	
Help Received Mother ordered materials; Father helped oversee project and edited report; Dr.Nabeela Patel provided project guidance	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Michael L. Legge	Project Number J1605
Project Title Mysterious Bacteria vs. Evil Tobacco	
Abstract Objectives/Goals Research says that smoking educes blood flow and nutrients to your gums. Many believe that smokless tobacco is a safer alternative to cigarettes. It is not, cigarettes trigger the accumulation of bacteria in plaque. Sugar is added to smokeless tobacco which reacts to the bacteria in the mouth. All these factors lead to cancer, gum disease, loss of taste, etc. The reason for my project is to gain a greater understanding of the affect of tobacco products in the mouth. Methods/Materials I ordered a bacteria kit from Steve Spangler Science and used the agar to grow my bacteria. Agar provides nutrients for the bacteria to grow. Once I collected the bacteria and sealed the dishes the project was fairly easy. I just had to check and document my findings. Results During my project the results showed that the smoker before brushing had the most bacteria growth. The smoker after brushing had the second most bacteria. The smokeless before brushing came in third for bacteria growth follwed by the smokeless after brushing. The least amoutn of bacteria was the non tobacco after brushing, Conclusions/Discussion Upon completion my hypothesis was right on both ends; however, if I had additional equipment to use I would determine what is good bacteria and what is bad. I would also like to take microscopic pictures if I could to display my findings.	
Summary Statement The effects of tobacco on bacteria in the mouth.	
Help Received My mother helped type the report and take pictures. My dad and grandma supplied the mouths to collect bacteria from.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Connor J.K. Lyons	Project Number J1606
Project Title Ability of Natural Remedies to Inhibit Growth of Lactobacillus casei Bacteria	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this experiment was to determine which of the five natural substances (liquid vitamin C, goldenseal root, Echinacea, oil of oregano, and garlic) would most effectively prevent the growth of the bacteria.</p> <p>Methods/Materials The materials used were oil of oregano, Echinacea, goldenseal root, garlic, liquid vitamin C, Lactobacillus casei Bacteria, agar, petri dishes, heat lamp, thermometer, syringe, swabs and view graphs with grid lines. Prepared the bacteria and agar. Took a swab and dipped it into the bacteria and swiped both the top and bottom areas of the target square in the center of the petri dish. Put the natural substance on the bottom portion of the target square. Waited 2-3 days for the results. Repeated this for all substances and one that was used as a control.</p> <p>Results Goldenseal root prevented the growth of the bacteria the best and the Echinacea did the worst. The oil of oregano did the second best while the garlic was the most inconsistent. Surprisingly, the vitamin C performed the second worst. Trial 1- Goldenseal Root, Garlic, Oil of Oregano, Liquid Vitamin C, Echinacea Trial 2- Goldenseal Root, Oil of Oregano, Liquid Vitamin C, Garlic, Echinacea Trial 3- Goldenseal Root, Garlic, Oil of Oregano, Liquid Vitamin C, Echinacea</p> <p>Conclusions/Discussion My Hypothesis was proven wrong. I predicted that the oil of oregano would inhibit the bacteria the best. The best inhibitor was the goldenseal root. It did not allow any of the bacteria into the target area. The oil of oregano did the second best, the Echinacea was the least effective, the vitamin C was the second worst and the garlic had the most inconsistent results. This project is relevant to the real world because many people are exposed to bacteria. No matter how harmful they are, people should know what to use to prevent bacteria growing in order to reduce chance of being exposed to it. They should be prepared to know which natural substance could help contain and fight off bacteria the best. People can use this knowledge to reduce the risk of getting sick or getting other health related issues. They can also use this information to become aware that some natural substances are not as effective as they were advertised.</p>	
Summary Statement The ability of natural remedies to inhibit the growth of Lactobacillus casei bacteria the best.	
Help Received Mother helped put board together; Father helped make graphs; Mr. Blair helped to create procedure; Kristina from Ward's Science helped with preparation of agar and bacteria	



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Mayadevi B. Murthy; Neha S. Patchipala	Project Number J1607
Project Title The Current Cholera Crisis: A Possible Solution	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of our project is to find cost-effective methods to sterilize or pasteurize water and make it potable. Specifically these methods must be easy to use in countries such as Haiti where potable water is not easily available.</p> <p>Methods/Materials We obtained water from a fish tank and treated it using four methods: SODIS, Bleach, Polar Pure Iodine Crystals(PP) and Lemon Juice. SODIS (Solar Water Disinfection) is the process of placing a one liter PET bottle full of contaminated water in the sun for 6 hours. The Bleach method consists of adding three drops of bleach to a liter of water. The PP method uses an Iodine crystal and water solution which is added to each liter of water. Finally the Lemon Juice Method consists of adding 30 milliliters of lemon juice to one liter of water. First one milliliter of untreated water was used to inoculate each Petrifilm. Then we used one milliliter of treated water to inoculate the Petrifilm. Both sets were observed for bacterial growth. Each experimental method was repeated three times and the results discussed below are the average.</p> <p>Results The results of our experiments showed that the Polar Pure Iodine Crystals eradicated all bacterial colonies found in contaminated water. The Bleach method killed all except 17 colonies of bacteria, the Lemon Juice Method eliminated all except 243 colonies, and the SODIS method killed all except 303 colonies. For comparison, the untreated water had 914 colonies.</p> <p>Conclusions/Discussion Availability of clean potable water could prevent 3.6 million deaths from water-borne diseases yearly. Based on our results the PP method was both the most cost-effective and successful in eliminating all the bacteria. The Bleach method was next best. Lemon Juice was the third-most effective. Finally SODIS was least affective in our studies, but has been proven to destroy up to 99% of bacteria when tested in warmer climates such as sub Saharan Africa. We intend to repeat it under warmer conditions and expect it to be an effective method in killing bacteria as well as being cost-effective. In conclusion, both the chemical methods tested (Polar Pure Iodine Crystals and Bleach) were the most cost effective methods to obtain potable water. If this is not feasible, then we recommend the SODIS method as a good alternative in underdeveloped countries.</p>	
Summary Statement The purpose of our project is to find cost effective methods for sterilizing water for use in developing countries.	
Help Received Mother was advisor, Mr. Aochi, Science teacher, gave us use of his lab. Dr. Robert Metcalf gave experiences, advice about which methods worked best in his studies and gave us supplies. Bob Wallace gave us indepth information on use of his product, Polar Pure.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Mizuki A. Olivarez	Project Number J1608
Project Title Effectiveness of Various Contact Lens Cleaning Methods against Staphylococcus aureus	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine the most effective method of contact lens cleaning against the bacteria staphylococcus aureus.</p> <p>Methods/Materials Necessary equipment and materials were obtained, sterilized, and prepared. 100 filter disks were inoculated with 50 micro liters of the corresponding liquid to each method and were dried throughout the course of my procedures. An isolate of staphylococcus was obtained from the swab sample of human skin flora and was cultured in the presence of multi-purpose solution,(Alcon Replenish), enzyme (Unizyme), and saline solution with a combination of an incubation of 45 degrees Celsius for 45 minutes. All bacteria and disks were then placed onto 20 tryptic soy agar plates. Any zone of inhibition was accurately measured and recorded.</p> <p>Results Multi-purpose method using Alcon Replenish was shown to be the most effective with an average zone of inhibition resulting to be 9.675 mm, followed up by hydrogen peroxide using 3 percent concentration, with the zone of inhibition being 8.125mm. Methods enzyme and thermal were shown to be ineffective.</p> <p>Conclusions/Discussion Non-compliance with contact lens may lead to the invitation of microbial flora such as staphylococcus aureus. The accumulation of this bacteria may act as a precursor towards bacterial infection in the eye during contact lens wear. To avoid such infections compliance towards cleaning and care to contact lens and accessories would be essential. Using the method of multi-purpose solution would be most effective than the other methods of cleaning such as thermal for it is absolutely ineffective in eradicating the bacteria s. aureus. This shows that not only is this bacteria able to withstand the heat of 45 degrees Celsius but also the duration of its exposure being 45 minutes. In conclusion this data suggests that the method of cleaning contacts with multi-purpose solution would be most effective in eradicating the bacteria s. aureus.</p>	
Summary Statement Various contact lens cleaning methods (multi-purpose, enzyme, hydrogen peroxide, thermal) effectiveness against staphylococcus aureus.	
Help Received Used lab equipment at Pershing Middle, mentor assisted in drafting procedures and use of necessary equipment under supervision of Mrs. Marcarelli. Also, agar plates, hub, incubating units and safety equipment were also provided by Mrs. Marcarelli.	



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Pranav G. Reddy	Project Number J1609
Project Title Effects of Natural Agents on Strep Throat and the Body, Using an In Vitro Analysis of S. pneumonia and Mouse Mastocytoma	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Antibiotics are becoming less effective as the years go by (American College of Physicians.) Increased resistance, not enough antibiotics, side effects, and effects on recovery have brought down their efficacy, making searches for alternatives more important. Before prescription of natural remedies can become more common, I must determine their effects on a common disease, Strep Throat and the body. I determined the most common natural remedies for Strep Throat to be: Hydrogen Peroxide, Green Tea, Sea Salt, Colloidal Silver, Manuka Honey, Apple Cider Vinegar, and Cayenne Peppers.</p> <p>Methods/Materials In order to determine the antibacterial effects of the chosen natural remedies, Kirby-Bauer, Minimum Inhibitory Concentration, and Minimum Bacteriocidal Concentration tests were conducted. The turbidity of a probiotic was used to determine effects on intestinal flora. Third, in order to test whether natural agents and antibiotics were competitive or cooperative, I repeated Kirby-Bauer tests, using mixtures of antibiotics and natural agents. Finally, I tested effects on cellular recovery through Mastocytoma granulation, representing recovery from illness. This ideology is revolutionary in the medical field, basing off of the mast cell response in vivo. In this test, the more granules there were, the more successful the treatment.</p> <p>Results My study showed distinctive advantages in using natural remedies. Streptomycin, a leading antibiotic, is only 4.6% more effective than Manuka Honey. However, streptomycin resulted in 373% more damage to probiotics. The results from Competition Tests showed that Manuka Honey with Streptomycin was 20% more effective than Streptomycin alone. Most significantly, natural remedies were more beneficial to cellular recovery than antibiotics.</p> <p>Conclusions/Discussion Thus, my study shows that the use of natural remedies is almost as effective as antibiotics, but is less stressful on the intestinal flora. In addition, certain natural remedies can enhance the effects of antibiotics and are better for the body in recovering from a sickness. Only further research can tell, but it seems as though natural remedies are a viable treatment option for the future.</p>	
Summary Statement As antibiotic resistance increases, and more research is uncovered on the side effects, alternatives to antibiotics are necessary and must be discovered urgently.	
Help Received Worked at A Schmahl Science Workshop, Under the Supervision of Dr. Ronald Birrell	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Sriram Somasundaram	Project Number J1610
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Project Title
Curry Alleviates Stomach Pain: How Curcumin Inhibits Helicobacter pylori, Affects Probiotics, and Enhances Iron Absorpti

Abstract

Objectives/Goals
Curcumin is an active component of turmeric, which is a commonly used spice in many cultures and has astounding medicinal properties. Curcumin alone is an antioxidant, has anti-inflammatory qualities, produces anti-cancer activity, is antimicrobial, has anti HIV properties, and may slow down the development of Alzheimer's disease. My project is to test how curcumin inhibits Helicobacter Pylori in the epithelial lining of the stomach. Furthermore, through other tests I would like to show that curcumin preserves probiotics and enhances iron absorption in the body.

Methods/Materials
I used a Kirby Bauer Disk Diffusion assay with metronidazole and clarithromycin as the control for the initial stage of testing the efficiency of curcumin on H. Pylori. After that I carried out the MIC and the MBC methods to finalize the results. I repeated the tests for curcumin and probiotics, lactobacillus and bifidobacterium. For the iron absorption in the body I used dialysis tubing, centrifuging, and the spectrophotometer.

Results
The Kirby Bauer had repeated failed results with no inhibition. Curcumin separated from the ethanol in the incubator, so it was unable to spread into the disk. The MIC and MBC however were successful with the MIC at 0.25 mg/mL and the MBC at 1 mg/mL. I carried out the Kirby Bauer, MIC, and the MBC for curcumin and the probiotics and there was no inhibition whatsoever. The percentage of dialyzable iron enhanced by curcumin is approx. 100% within experimental error with the average aliquot concentration being 2.14×10^{-5} .

Conclusions/Discussion
My hypothesis was correct and my test results confirmed my hypothesis: Curcumin inhibits H. Pylori, does not inhibit bifidobacterium and lactobacillus, and enhances iron absorption. H. Pylori exists in 50% of all adults and is one of the causes of stomach cancers and ulcers. With a simple spice like turmeric, many lives potentially can be saved. Another pro is that curcumin does not seem to harm probiotics in the body. Finally, it can increase the amount of iron that can be absorbed and possibly be a cure for anemia.

Summary Statement
My experiments show that Curcumin inhibits Helicobacter Pylori, does not affect probiotics, and enhances iron absorption.

Help Received
I used the lab equipment at Schmahl Science Workshop under the supervision and mentorship of Mark Kent, Sarah Thaler and Ron Birrell.



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Beatrice M. White	Project Number J1611
Project Title Bad Water Gone Good: Determination of Most Effective Emergency Water Sanitization Method	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to test my hypothesis that boiling is the most effective method of sanitization of water, compared to bleach, iodine, and filtration.</p> <p>Methods/Materials Four water sanitization methods were evaluated for their effectiveness in reducing bioburden (bacteria, fungi, and yeast) in water obtained from San Benito River. The methods evaluated were boiling, adding bleach, adding iodine, and filtration. These are methods recommended for treating water in an emergency, such as an earthquake. A sample was taken from the San Benito River and divided into four equal parts. Each portion was subjected to one of the sanitization methods. The source water (San Benito River) was tested for bioburden load before and after treatment by the spread plate microbiological method. 0.1 mL of the sample is added to agar plate and evenly spread over the surface with a sterile spreader. The inoculated plates are incubated for one week at room temperature in the dark. On each day, the plates are visually inspected for microbial colonies or colony forming unit (CFU), which are counted. A final bioburden count is determined by the highest colony count. The colony count is then used to calculate the bioburden load (CFU/mL) in the source and treated water.</p> <p>Results The bioburden load of the San Benito River water, pre-treatment, was 141,250 CFU/mL. After treatment, the bioburden load was reduced to 1080 CFU/mL (iodine), 740 CFU/mL (bleach), 5 CFU/mL (boiling), and 0 CFU/mL (filtration). The reduction was calculated as 99.2%, 99.5%, 99.99%, and 100%, for iodine, bleach, boiling, and filtration, respectively.</p> <p>Conclusions/Discussion My hypothesis was incorrect. This experiment showed that filtration is most effective in making water safe to drink, but filters are expensive and not always available. Even though boiling did not remove all bioburden, it is a good, inexpensive alternative when filtration systems are not available. The high counts of bioburden in bleach and iodine treated water were surprising because these are recommended methods for making water safe to drink. Because of these unexpected results, a follow up experiment would be to investigate methods to improve the effectiveness of bleach and iodine treatment, as these methods also are inexpensive and require no specialized equipment. Based on the results of my experiment, I recommend families keep a filtration system in an emergency supply kit.</p>	
Summary Statement Comparison of emergency water sanitization methods to determine most effective method of reducing bioburden	
Help Received Microbiology supplies and advice was obtained from Ms. Suchi Kuo (MedImmune, LLC). My father helped me obtain water samples (drove me to the river) and with my questions about calculations and tables	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Alyssa R. LoGalbo	Project Number J1699
Project Title Testing the Effectiveness of Hand Washing vs. Using Hand Sanitizer	
Abstract Objectives/Goals Students are often presented with the option of using hand sanitizer to clean their hands instead of going to the bathroom and washing with soap and water. The purpose of my project was to determine which method actually does a better job of cleaning hands. Methods/Materials The dominant hands of 10 students chosen at random were swabbed before and after cleaning their hands. The first set of trials, students cleaned with soap and water and the second set of trials students used hand sanitizer. The bacteria gathered from the swabs were cultured in blood agar petri dishes for 40 hours at 26 degrees Celsius. Bacteria colonies that had grown in the dishes were counted and recorded for analysis. Results Five students' hands were cleaner when washing with soap and water and five students' hands were cleaner when using hand sanitizer. When compared to how dirty the hands were before washing, students' hands were 59% cleaner using hand sanitizer versus 50% cleaner using soap and water. Conclusions/Discussion I was not able to conclude which method of cleaning your hands worked better. There were different results for different students and some students' hands were actually dirtier after cleaning than before. From observing how students washed and considering the results of my research, I would conclude that it is less important what you clean with and more important that you do a thorough and proper job.	
Summary Statement My project was to determine, under real-life conditions, whether hand sanitizer or hand washing is more effective at cleaning students hands.	
Help Received Mother helped set up board; Father helped with the incubator; received agar and petri dishes from area hospitals.	