



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Arshia Anand	Project Number J1901
Project Title Antacids: Synthetic vs. Natural	
<p style="text-align: center;">Abstract</p> <p>Objectives Antacids are medicines taken to increase the pH of stomach acid to treat indigestion and heartburn (acid reflux). While they play an important role in balancing the pH of stomach acid, synthetic antacids contain chemical compounds that remain unabsorbed by the human body and cause harmful side effects when consumed over a long period of time. On the other hand, natural antacids may take longer to impact but have no side effects. This experiment was conducted to find out if natural antacids are as effective and efficient as synthetic antacids in treating acid reflux. The hypothesis stated that natural antacids will be as effective and efficient as synthetic antacids in increasing the pH of simulated gastric acid. There exist many natural antacids that have been proven to be effective, and none of the synthetic antacids being tested have a delayed reaction, so they should be just as efficient.</p> <p>In order to simulate stomach acid, a solution of potassium chloride, sodium chloride, and HCl was made creating a solution with a pH of 1. Two tablets of each antacid were diluted in the solution immediately after which the pH was measured. Then, the pH was to be measured again after 15 minutes, 30 minutes, and 60 minutes. Our hypothesis was not supported through experimental results. The findings were that the natural antacids barely increased the pH of the acid, but between the two natural antacids, Apple Cider Vinegar and Ginger Root, Ginger Root worked better. As for the synthetic antacids, Tums increased the pH too much, while Gaviscon was perfect at the start of each trial. Three of the antacids, Tums, Ginger Root, and Apple Cider Vinegar did not exhibit a change in pH over time, but Gaviscon did. In conclusion, natural antacids evaluated were not effective nor efficient, Tums is both the most effective and efficient, and Gaviscon is effective, but not efficient. Though Gaviscon takes longer to have an impact, it is better because it doesn't increase the pH of the acid too much like Tums does. Finally, natural antacids are not an effective substitute of synthetic antacids.</p> <p>Methods</p> <p>Materials- Tums (calcium carbonate 500mg); Gaviscon (aluminum hydroxide 160 mg and magnesium carbonate 105 mg); HCl; Potassium Chloride; Sodium Chloride; Distilled Water; pH meter; Ginger Root capsules (organic ginger root powder 500mg); Apple Cider Vinegar capsules (apple cider vinegar 450mg); 4 100 mL beakers; 1 1 liter beaker; 1 glass stir; Goggles; Nitrile Gloves; Mask</p> <p>Procedures-</p>	
Summary Statement I found that natural antacids are not as effective as synthetic antacids in treating acid reflux.	
Help Received I would like to thank my teachers and high school mentors- Mrs. Tsai for providing the pH meter, simulated gastric acid, and feedback on my notebook. Mrs. Orosz for science fair meetings on how to improve our writings. Lauren Chong, my high school mentor for editing the background research and	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Kamran Ansari	Project Number J1902
Project Title Characterizing the Dosage Profiles of PEMF Products by Evaluating Their Magnetic Field Distributions	
<p style="text-align: center;">Abstract</p> <p>Objectives The project objective was to measure the magnetic field dose profile of various PEMF devices and generate dosing maps that consumers could then use to position their bodies in order to receive a desired magnetic field dose.</p> <p>Methods OMI Pulsepad PEMF, OMI Full Body PEMF System, HL Healthyline Infrared PEMF, Oska Wellness Pulse device, Adafruit LSM9DS1 Magnetometer 9 Degrees of Freedom Breakout, Arduino Board, Excel, Wood Router, MotionCal program, EXTECH Instruments magnetometer</p> <p>I divided the surface areas of four different PEMF devices into a grid. I created my own magnetometer using an Arduino board with an Adafruit LSM9DS1 Magnetometer 9DOF, which can detect microTesla level changes in a 5 to 25 Hz frequency range. I programmed the board to acquire magnet field flux data using code I wrote in Arduino. I used MotionCal software to calibrate data in the X, Y, and Z directions as I moved the magnetometer over the grid. At each grid point, I collected over 1000 points of data over 10 second sample period, imported the data into Excel and calculated the magnetic field flux values. I automated the process by creating a dolly that automatically moved and collected data from each grid points because of the large number of grid points that needed to be measured.</p> <p>Results 3-D surface and contour maps of root mean square values show that the OMI Small generates an effective magnetic field dose across about 13% of its surface area and only partially in the upper left, lower left, and upper right quadrants, the other 87% of the device has a magnetic field of 20 microTesla or less (non-therapeutic levels). OMI large generates a sufficient magnetic field across about 36% of its surface area, largely in the center. HL Mat generates a therapeutically effective dose across about 55% of its surface area. The Oska device generates a uniform magnetic field across over 60% of its surface area.</p> <p>Conclusions Magnetic field strength, and therefore potentially the therapeutic dose, of PEMF devices vary greatly over their surface areas, a critical fact that manufacturers have failed to disclose to the public. Therefore, to effectively use a PEMF device, it is essential to know the distribution of its magnetic field strength and to adjust one's body position to properly align with the desired magnetic field dose, which my results have documented.</p>	
Summary Statement My project provides patients with data that is essential for the effective use of PEMF devices but not currently provided by their manufacturers: the magnetic field dose profile generated across the surface of each PEMF device.	
Help Received My Dad helped me with cutting the wood for the dolly and my teacher provided me guidance. The rest of the project I worked on independently.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Matthew Bedrosian	Project Number J1903
Project Title Which Type of Paper Tray Dehydrates Grapes the Fastest?	
<p style="text-align: center;">Abstract</p> <p>Objectives The Objective of my project is comparing various paper tray types: Wet Strength, Wet Strength Vented, Poly Coated, Poly Vented, and Poly Coated Slitted Vented to see which type dries grapes the fastest. My goal is to prove that Coated trays will have a faster drying time than the non-Coated trays. Also taking the coated trays benefit of protecting the grapes from rain into consideration.</p> <p>Methods The materials I used in my experiment were a scale, 2 picking knives, a wooden tray, 4 trays of each tray type, and a picking pan. The first step I took in doing my procedure was purchasing the different tray types from Michelson Packaging company in Fresno. The trays I purchased were the Wet Strength, Poly Coated, Poly Vented, and Poly Coated Slitted Vented paper trays. After doing this, I poked holes in the Wet Strength tray, with the following measurements: 13 rows, 16 holes in each row, 5 centimeters apart covering the entire tray to create the Wet Strength Vented tray. I then picked 8,165 grams of grapes for each tray. I had 5 tray types and 4 trays for each type, and had a total of 20 trays. Lastly, I let the grapes dehydrate for 7 days, and weighed the grapes on the different tray types. Repeated this procedure 7 days later for my final results for tray drying rate average.</p> <p>Results The result of my experiment showed that the Wet Strength tray had the highest impact on drying grapes; the final weight average of the tray was 1,719 grams. The 2nd best tray type was the Wet Strength Vented tray at 1,798 gram average. The third best tray type was the Poly Coated Slitted Vented tray with an average weight of 1,826 grams. The 4th best tray type was the Poly Coated tray at a weight of 2,090 gram average. The worst tray for dehydrating grapes was the Poly Vented tray type, at a 2,219 gram average. This information proves my Hypothesis was incorrect.</p> <p>Conclusions After Completing my investigation, I can conclude my Hypothesis was incorrect. My experiment Showed that both Non-Coated trays had a higher impact on drying than the Coated trays. Comparing the Wet Strength tray to the Poly Coated slitted vented, The Wet Strength had a 6% faster dehydration speed. Comparing The Wet Strength tray to the Poly Coated, I found that the Wet Strength tray had a 18% faster drying rate, which is significant. When comparing the Wet Strength tray to the Poly Vented tray, it dried 22% faster, which is also Significant. In a 40 acre Vineyard Wet Strength would cost \$2000 vs. \$3,800 for Poly Coated or Vented. Although, the Wet strength tray may have the best dehydration speed and cost the</p>	
Summary Statement The Wet Strength paper tray proved to dehydrated grapes the fastest with more crop risk, vs poly Coated trays with less crop risk.	
Help Received Mrs. Florence Peters, Ranch Owner ;Chad Gregerson , Michaelson Packaging Fresno, Salesman	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Gabriella Biittner	Project Number J1904
Project Title KT Tape: Help or Hype?	
<p style="text-align: center;">Abstract</p> <p>Objectives Does Therapeutic Kinesiology Tape (KT) actually improve an athlete's performance and does the athlete's opinion about whether KT tape is helpful affect their performance.</p> <p>Methods I had athletes at a Cross Fit gym perform a series of 4 different varied exercises with and without KT Tape applied and measured the affect it had on their exercise performance. Also, prior to each athlete's participation I asked each one about their opinion of KT Tape and whether they thought it would or would not improve their performance. Materials: KT Tape, tape measure, stopwatch, Cross Fit gym athletes, barbells, dumbbells.</p> <p>Results My overall results show that KT Tape improved an athlete's performance in 3 of the 4 exercises. Athletes who thought that KT Tape would help their performance, performed better with KT tape on in 3 of the 4 exercises. Athletes who felt KT tape would not be helpful also performed better in 3 of the 4 exercises.</p> <p>Conclusions In my experiment KT tape did produce an improvement in the althetes' exercise performances. This was a surprise to me because I thought KT tape would be ineffective. I thought that athletes' opinions would have more of an affect on their performance. I was surprised to find that athletes who originally thought KT tape would not be beneficial actually showed improved performance with the KT tape on. I expected there may be a placebo effect with the athletes that thought KT Tape would help, but was surprised to find even the athletes who felt KT tape would be ineffective performed better with KT Tape. My thoughts as to why KT tape was effective at increasing exercise performance is that the tape may improve the athletes awareness of movement as they feel the pull and tension the tape applies during joint movement making the athlete more focused on the specific movement during the exercise.</p>	
Summary Statement Testing the ability of KT Tape application to improve exercise performance in Cross Fit athletes, and trying to detect a placebo effect based on athletes' prior opinions of KT Tape effectiveness.	
Help Received Andi Hodorowski, Cross Fit Gold Rush owner and certified instructor, provided access to Cross Fit gym, equipment and athletes. Dr Eric Dickerson, Radius Physical Therapy Clinic, provided instruction about KT Tape application technique	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Ashley Bishop; Charlee Sullivan	Project Number J1905
Project Title Battling Bacteria	
<p style="text-align: center;">Abstract</p> <p>Objectives The purpose of this science fair project was to figure out what mouthwash brand kills the most bacteria in your mouth. Our hypothesis was if one mouthwash brand has more alcohol content than the other, it will do a better job of killing bacteria on your teeth than mouthwash without alcohol because alcohol is good at killing bacteria.</p> <p>Methods The constants and controls in our experiment were the amount of time the mouthwash or water was in the petri dish, how we swirled the petri dish, the amount of mouthwash or water in the petri dish, and the mouth that we swabbed with the q-tip. The independent variables were the water and the brand of mouthwash that we used. The responding variable was measured by swirling different mouthwash brands around in petri dishes that had bacteria in them to see which petri dish had the least amount of live bacteria in it compared to before the mouthwash.</p> <p>Results The results of this experiment were that Spry killed the most bacteria overall. Act was close to Spry, but it killed less of the different bacteria, and Colgate killed the most white dots, but that was all it killed. The results show that our hypothesis should not be accepted, because Spry, the brand that did the best overall, is only 8% alcohol, which is far less than Listerine.</p> <p>Conclusions Our results show that Spry killed the most overall bacteria, and Act killed the second most overall bacteria. This happened because the ingredients in Spry do a better job of killing bacteria than the ingredients in the other mouthwash brands. Our hypothesis said that the mouthwash brand that had the most alcohol in it would kill the most bacteria because alcohol is good at killing bacteria, but our hypothesis was wrong. Spry is only 8% alcohol, so our hypothesis was very wrong. Our data proved that alcohol does not always kill the most bacteria. We forgot to start the timer a few times, so the mouthwash might not have been in the petri dish for exactly one minute, but it was really close.</p>	
Summary Statement We tested the effectiveness of different mouthwash brands on common bacteria found in the mouth.	
Help Received We designed the project by ourselves. Mr. Hofsteen was our mentor, and he helped us with the formatting for our abstract. Dr. Valerie Aoki helped answer some questions, as did a Spry employee named Arie.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
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Name(s) Darina Dang	Project Number J1906
Project Title Cutting Board Bacteria	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study is to find out what type of cutting board would have the least bacteria.</p> <p>Methods Cutting boards: Wood, Bamboo Wood, Plastic, Glass, Petri dishes, Sterile Swab, Incubator. Swab cutting boards and then swab onto Petri dish. Incubate for 5 days to look at bacteria growth.</p> <p>Results The plastic cutting board had an average growth of 227.33mm² after 5 days. 0.33mm² for Wood, 3.5mm² for Bamboo, and 0mm² for glass. Glass cutting boards did the best with no bacteria growth.</p> <p>Conclusions Glass cutting boards are most resistant to bacteria rather than plastic, wood and bamboo wood. Plastic had the most growth of bacteria. Comparing the bamboo and wood cutting boards to the plastic cutting boards, the bamboo and wood are more sanitary.</p>	
Summary Statement I swabbed different types of cutting boards and learned that a glass cutting board is the most sanitary type of cutting board.	
Help Received I swabbed the cutting boards and incubated the Petri dishes myself. My neighbors and family members gave me their consent to use their cutting boards. My mother paid for all materials and guided me to using Excel. My teacher, Mrs. Conrad, allowed me to use her incubator.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Marc Denis	Project Number J1907
Project Title How Much Glucose Is in That Drink?	
<p style="text-align: center;">Abstract</p> <p>Objectives I want to see if a glucometer, commonly used by diabetics, can be used to accurately determine whether or not a drink has glucose in it and can it tell how much glucose is in a drink. Knowing whether to not a drink contains glucose and roughly how much is critical for people with Type 1 Diabetes who require insulin for all carbs consumed.</p> <p>Methods A FreeStyle Lite glucometer and test strips commercially available from Abbott were used. The following drinks were purchased: Coke (x2), Sprite (x2), Sprite Zero, TreeTop Apple Juice, TreeTop Orange juice (x2), Bai Watermelon, Honest Tea Green Tea Each drink was tested at room temperature using the Freestyle Lite and a new test strip each time. Each drink was tested 3 times and the average and standard deviation were calculated.</p> <p>Results Several of the drinks gave somewhat reproducible results, Coke (300-400 mg/dl), Sprite (300-425 mg/dl) apple (~170 mg/dl) and orange juices (~150mg/dl) All four of these have very similar amounts of sugars per 100ml, but the measured amounts were much lower for the apple and orange juices. Three of the drinks, Bai Watermelon, Sprite Zero and Honest Tea Green Tea all gave errors when they were read. These were tried multiple times, on different days and even with a different meter and still gave errors.</p> <p>Conclusions The data obtained were largely unexpected and somewhat different from what we had expected. The glucometer worked relatively well for some of the drinks (Coke, Sprite and the juices) but did not work at all for the others. Within the drink group that did work there was a fairly large range within the same drink and between different drinks even though all of them have very similar amounts of sugars per 100ml. The other drinks that gave error readings are difficult to interpret because they have little in common. The only common ingredient is citric acid, but the orange juice has high levels as well and worked fine. This experiment shows that glucometers can be used to determine whether or not certain drinks have glucose in them, but not all drinks. Glucometers are designed and calibrated to detect glucose levels in blood, so the chemical makeup of the drinks may interfere with the readings. It would probably be best for individual diabetics to test the drinks they commonly consume using their particular meter to determine which drinks give accurate results and which ones give errors.</p>	
Summary Statement Can a common glucometer be used to determine whether or not a drink contains glucose and if so, roughly how much?	
Help Received Rita Armstrong and Paul Denis	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
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Name(s) Faith Helms	Project Number J1908
Project Title Sugar Rush: Good to Eat a Bunch?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study is to determine if a healthier sugar substitute provides equivalent or better taste in a Tollhouse Chocolate Chip Cookie recipe.</p> <p>Methods Sample A, no substitution. Sample B, replaced white sugar with honey. Sample C, replaced white sugar with maple syrup. Sample D, replaced white sugar with stevia. In a blind taste test, 42 6th grade subjects tasted all four samples and ranked them by taste on a scale of 1 to 5.</p> <p>Results I calculated the mean of four samples from the 42 subjects. The healthier sugar substitutes of maple syrup and stevia received better mean ranking results than the standard ingredient white sugar. Stevia received the highest mean ranking in taste while honey received the lowest mean ranking in taste.</p> <p>Conclusions Although I did not have the 42 subjects rank the cookies on health, two of the healthier cookies, maple syrup and stevia, outperformed the traditional cookie recipe on taste. Based on my study, people should use a healthier substitute for sugar since they are not sacrificing taste. Per this experiment, stevia would be the recommended choice in substitute.</p>	
Summary Statement In a blind taste test, I statistically found stevia to be an optimal substitute for white sugar in a Tollhouse Chocolate Chip Cookie recipe.	
Help Received I received help in my statistical analysis of the data from Eric Helms, math teacher at Fortuna High School.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
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Name(s) Sadie Henry	Project Number J1909
Project Title Skin Care Moisturizers for Swimmers	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this project is to determine which skin product provides the most hydration when applied to chlorinated skin.</p> <p>Methods Four moisturizers (shea butter, glycerin, coco butter and aloe), digital moisturizer monitor, pig skin, chlorine water and liquid droppers. Pig skin is soaked in chlorinated water, then each moisturizer is applied onto pig skin and after 2 hours the hydration level of the skin is measured using a moisturizer monitor.</p> <p>Results After 40 individual trials of each moisturizer, results showed that glycerin had the highest hydration level with 40.8% and aloe had the least with 10.85%; coco butter and shea butter had similar hydration levels with 20.46% and 18.68% respectively.</p> <p>Conclusions I set out to identify which product would be most moisturizing for skin exposed to chlorine for long periods of time. My hypothesis was that shea butter would be the most moisturizing because it had the highest concentration of oil; however, glycerin was the most moisturizing product.</p>	
Summary Statement Based on the results of this experiment swimmers should use glycerin-based moisturizers to keep their skin most hydrated.	
Help Received I designed and performed the experiment on my own. My science teacher, Ms. Blickenstaff supported and guided me through the process and helped prepare me for GSDSEF.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
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Name(s) Ava Johnson	Project Number J1910
Project Title The Effectiveness of Different Brands of Deodorants	
<p style="text-align: center;">Abstract</p> <p>Objectives Testing the effectiveness of different types of commercially available deodorants to determine which one works the best.</p> <p>Methods Petri dishes with nutrient agar, E. Coli sample, distilled water, syringe, four different brands of deodorants (Arm and Hammer, Sprouts, Schmidt's, and Native), heating pad, and a camera for pictures.</p> <p>Results Various deodorants were given 6 days to kill active cultures of E. Coli living in nutrient agar petri dishes. E. Coli was chosen to mimic the naturally occurring bacteria in human armpits. Data was collected every other day and pictures were taken. In order to decide which deodorant worked the best, a rating system was applied (1-10, 1 being barely any bacteria and 10 being the whole dish was covered in bacteria).</p> <p>Conclusions Surprisingly, the control petri dish with no deodorant had the least amount of bacteria and the best rating, but, out of the deodorants, Sprouts Mineral Salt was the most effective in killing the E. Coli bacteria and hence would be the most effective in killing bacteria in the human armpit.</p>	
Summary Statement After testing different brands of deodorants, I found that the control worked the best and Sprout's Mineral Salt worked the best among the deodorants.	
Help Received I received help making the nutrient agar petri dishes and starting the E. Coli cultures.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Levi Katriel; Krishna Nagarajan	Project Number J1911
Project Title From Caged to Free-Range: Comparing Nutritional Profiles in Hens' Eggs	
<p style="text-align: center;">Abstract</p> <p>Objectives People all around the world enjoy eating eggs, but may be overwhelmed by so many choices. Free-Range? Cage-Free? Organic? To address this question, we decided to test the nutritional profiles of different types of eggs. At the outset, we expected the eggs with the best nutritional profiles to be the pasture-raised eggs because these hens have access to a varied diet.</p> <p>Methods We tested the following types of eggs: battery-cage, organic cage-free, grain-fed cage-free, free-range and pasture-raised. We ran 165 tests on 15 samples. For each sample, we measured monoglycerides, diglycerides, free fatty acids, triglycerides, sterol esters, cholesterol, cholesteryl esters, and phospholipids including phosphatidylcholine. We first weighed the eggs, separated the whites and the yolks, then the lipids were extracted from each yolk by Folch extraction. Lipids were separated and identified by thin layer chromatography to define the lipid composition described above. The chromatographed bands were then quantified using Image J.</p> <p>Results Interestingly, the results fell into two groups. Organic cage-free and pasture-raised eggs showed significant increases in sterol esters, which are thought to promote health, and significant decreases in triglycerides, which are considered less healthful. The battery-cage, grain-fed cage-free and free-range eggs contained negligible amounts of sterol esters and had increased triglycerides. We did not observe significant differences in the phospholipids or in the cholesterol levels across the egg types.</p> <p>Conclusions According to our results, organic cage-free eggs, and pasture-raised eggs have the most diverse nutritional profiles with the lowest level of triglycerides and the greatest amount of health-promoting sterol esters. Remarkably, although free-range eggs come from more humanely treated hens than battery-cage hens, the lipid profiles of their eggs were very similar, and not as diverse as the former group. We did not observe a simple correlation between the cost of the eggs and the diversity of their lipid profiles, suggesting that neither the most expensive nor the cheapest eggs would be the best choice.</p>	
Summary Statement We measured and compared the lipid profiles for five different types of eggs: battery-cage, grain-fed cage-free, organic cage-free, free-range and pasture-raised eggs.	
Help Received We performed the extraction of lipids from egg yolks and the thin layer chromatography ourselves. We received some help from Professor Supriya Srinivasan at The Scripps Research Institute regarding the protocols to perform thin layer chromatography, understanding the Image J quantifications and with	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
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Name(s) Alice Mardanian	Project Number J1912
Project Title Effects of Sodium Chloride, Acetic Acid, and Honey on the Contamination of Raw Meat	
Abstract Objectives The objective of this experiment was to test the differences in performance of 3 natural meat preservatives. Methods 10 grams of uncooked beef was left in tubes containing 14.79 mg of Sodium Chloride, Acetic Acid, and honey. Because cooking meat is already a method of preservation, the meat used in this experiment was left uncooked to provide a constant variable. The tubes, which were left at 22 degrees Celsius, were observed over a 5 day period and the percentage of meat rotten was determined by the amount of beef that became stickier, slimier, smellier, or changed color. Results The meat with no preservatives made around 88% of the meat rot, while vinegar made around 29% of the meat rot. Salt made around 17% of the meat rot, and honey with an average of 1% rotten meat. Conclusions Honey was the best preservative because of its antimicrobial properties. Repeated trials show that salt and vinegar lack the preservative properties that honey has, making it the best preservative. Honey is a reasonable alternative to artificial preservatives because artificial preservatives are harmful to human health.	
Summary Statement I proved that honey is the best natural preservative for raw meat.	
Help Received None. I created the procedures and gathered the materials on my own.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Simra Mirza	Project Number J1913
Project Title Diffusing Rates of Nonsteroidal Anti-Inflammatory Drugs Containing Naproxen Sodium in a Stomach Acid Mimicking Solution	
<p style="text-align: center;">Abstract</p> <p>Objectives More than 30 million people use NSAIDs every day, and they account for 60% of the US over-the-counter analgesic market, the majority for conditions such as arthritis or bursitis. The goal of this project was to investigate which type of NSAID (nonsteroidal anti-inflammatory drug) Aleve pill would dissolve the fastest in an acidic solution (to mimic stomach acids) in order to relieve pain the fastest by reaching the bloodstream.</p> <p>Methods Aleve Gel Caps, Aleve Caplets, Aleve Liquid Gels, and Aleve Tablets were the types of pills used to compare each of their dissolving rates in a concentrated acidic solution simulating stomach acids. The acidity of pH between two and three was acquired by using lemon juice and adding it into boiling water. The pills were dissolved in 100ml each. The amount of time required for each pill to completely dissolve in the solution was recorded. Five trials were conducted per pill.</p> <p>Results The pills with the fastest dissolving rate were the Liquid Gel pills, dissolving at an average of 661 seconds and the pills with the slowest dissolving rate were the Gel Caps with an average of about 2395 seconds. The results were concluded significant by performing a statistical analysis.</p> <p>Conclusions The results didn't support my hypothesis that stated the Aleve Tablets would be the fastest dissolving pills. Instead, the Liquid Gels were the fastest dissolving pills. It could be inferred from this information that the Liquid Gels would reach the bloodstream the fastest to relieve pain.</p>	
Summary Statement This project compared the different solvating rates of Aleve naproxen sodium pills, which are nonsteroidal anti-inflammatory drugs, in a solution created to mimic stomach acids to infer which type would reach the bloodstream the fastest.	
Help Received None. I researched, designed, and performed the experiment on an individual basis.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Priyanka Soe	Project Number J1914
Project Title Comparing the Efficacy of Backcountry Water-Treatment Methods	
<p style="text-align: center;">Abstract</p> <p>Objectives Most water purifiers designed for hikers claim to eliminate over 99% of bacteria. I tested four different water-purifiers for my project: a hollow-membrane filter (Sawyer Squeeze), chlorine dioxide drops (Aquamira Treatment), chlorine tablets (MSR Aquatabs), and iodine tablets (Potable Aqua Tablets). I believed the Aquatabs and Aquamira treatment would destroy the least bacteria, since research has shown that chlorine does not destroy as much bacteria as iodine. I believed the iodine tablets and hollow-membrane filter will be effective and result in sterile plates.</p> <p>Methods I performed two trials and used 40 plates. I filtered water from Escondido Creek and Moonlight Beach effluent, and followed the necessary procedures on the product description to filter/clean the water. I then inoculated each plate with 2mL of the filtered water into the Coliscan Easygel. I sealed each plate and placed them in an incubator at 37°C. I documented the bacteria and analyzed the results.</p> <p>Results I tested each filter twice on creek and effluent water. In both trials, the Sawyer Squeeze Filter results were sterile. In the Aquamira Drops plates, I observed coliform and noncoliform colonies too numerous to count, and E. coli colonies. In plates containing water treated by the Aquatabs Tablets, I documented mold colonies, some E. coli colonies, and coliform and noncoliform colonies too numerous to count. Three plates containing iodine-treated water had at least 1 coliform colony, and one plate also contained 2 noncoliform colonies. The rest of the iodine-treated plates were sterile. The coliforms and noncoliforms in the positive control plates for both the creek water and the effluent were too numerous to count. An average of 21 E. coli colonies were also found.</p> <p>Conclusions I hypothesized that all of the water-purifying methods would work to some extent, however, this was not supported. The Aquatabs tablets and Aquamira Treatment did not live up to their claims to remove 99% of all bacteria. The iodine treated plates destroyed approximately 96% of the bacteria, but the plates were not sterile, which was surprising. The Sawyer Squeeze Filter plates supported my hypothesis, as every plate was sterile. I would most recommend the Sawyer Squeeze filter. Although it does cost the most, it is efficient and contains no chemicals. Given the right care, the filter can last longer than any chemical solution.</p>	
Summary Statement I tested several different brands and types of water-treatment products (Sawyer Squeeze filter, Aquamira Treatment, Aquatabs Tablets, Potable Aqua Iodine Tablets) for their effectiveness in treating contaminated creek water.	
Help Received My science teacher provided me guidance while I performed the procedures myself.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Luke Tanguay	Project Number J1915
Project Title Do Environmentally Friendly Dish Soaps Clean Oil Off Feathers as Well as Dawn?	
<p style="text-align: center;">Abstract</p> <p>Objectives My objective is to evaluate the effectiveness of dish soaps in removing oil from bird feathers in case of an oil spill. Dawn Ultra Dish Soap is the current standard for cleaning birds, but is known to have petroleum as a trace ingredient. I want to see if one of the new, more environmentally friendly dish soaps will perform as well or better than Dawn.</p> <p>Methods Feathers, 4 different dish soaps, digital scale, synthetic motor oil, pipettes, protective gloves. Weighed 5 feathers for each brand of dish soap before applying oil, after applying oil and after each of two cleanings. Measured percent of oil removed for each trial to determine effectiveness of dish soap.</p> <p>Results Removing oil from feathers is difficult, none of the dish soaps removed more than 33% of the oil after the first cleaning. After two cleanings Dawn removed 67% of the oil and the best environmentally friendly dish soap only removed 55% with the remaining two only removing about 33%. Dawn performed best in both cleaning stages.</p> <p>Conclusions Dawn Ultra was the best dish soap I tested at removing oil from bird feathers. The more environmentally friendly dish soaps did not perform as well. My results show Dawn Ultra should remain the standard for cleaning oil soaked birds.</p>	
Summary Statement I found that Dawn Ultra dish soap should remain the standard for cleaning oil soaked birds, none of the more environmentally friendly dish soaps removed oil from feathers as effectively.	
Help Received Curt Clumpner, Deputy Director, Animal Care Operations, Oiled Wildcare Network, UC Davis, suggested articles for me to read. My parents helped me get supplies and supported me with timing and measurements while I conducted the experiment.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Carys Thompson	Project Number J1916
Project Title Trapping the Kitchen Pest	
<p style="text-align: center;">Abstract</p> <p>Objectives An experiment was conducted to scientifically investigate which among the commercially available fruit fly traps (BEAPCO Drop In, Aunt Fannies Fly Punch, Terro Fruit Fly Trap) and homemade fruit fly traps (apple cider vinegar, and soda) will collect the most fruit flies</p> <p>Methods To summarize the procedure, it is necessary to start with collecting the traps that are being tested and culture of fruit flies. Fill in the traps with the liquid that is being tested and place it under a mesh food cover along with the culture of fruit flies. Arrange the item in a circle, with the fruit flies in the middle. Quickly undo the lid to the culture of fruit flies.</p> <p>Results The outcome finalized with the experiment were the results that fruit flies are attracted to traps that contain sugar which, by reasoning that fruit flies are attracted to fermenting sugar, is found the most in Aunt Fannies Fruit Fly Punch which the fruit flies were more drawn to.</p> <p>Conclusions It is therefore concluded that the hypothesis is rejected. The hypothesis is that the commercially available fruit fly trap ,BEAPCO Drop In, will receive the most amount of fruit flies. To defy the hypothesis, Aunt Fannies Fruit Fly Punch received the most amount of fruit flies, therefore rejecting the hypothesis.</p>	
Summary Statement My project was designed to determined which kind of homemade or commercially available fruit fly trap would trap the most amount of fruit flies and prove successful	
Help Received My father drove me to the store and bought my materials	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) John Van Parys	Project Number J1917
Project Title How Long Til You Burn?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study is to determine the effectiveness of sunscreens with varying SPF values over the course of 2 hours and if the higher SPF value corresponds to better protection.</p> <p>Methods Varying SPF values of sunscreen, UV Sunlight Reader, UV Beads, Nature Print Paper. Measure the effectiveness of 4 sunscreens with different SPF values over the course of 2 hours.</p> <p>Results Several trials were conducted using different SPF sunscreens, the Nature Print Paper and the UV Beads. The results observed using the UV beads yielded the most helpful data and showed that the higher SPF value the more effective the sun protection was during the course of 2 hours.</p> <p>Conclusions I was able to show that higher SPF values offer better sun protection for a longer period of time over the course of 2 hours. This can help consumers select a sunscreen product when presented with varying SPF values in order to prevent sun damage and potentially skin cancer.</p>	
Summary Statement I showed that higher SPF values of sunscreen offer better protection over the course of 2 hours.	
Help Received None. I performed and modified my experiment by myself.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Aislin Warkentin	Project Number J1918
Project Title What Is the Best Way to Disinfect a Toothbrush?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study was to determine the best way to disinfect a toothbrush. I compared five different disinfection techniques (salt water, mouthwash, ultra-violet toothbrush sanitizer, hot water, and 3% hydrogen peroxide) to determine which disinfection method killed the most bacteria on a toothbrush.</p> <p>Methods I brushed my teeth with 10 new toothbrushes for 4 days. Toothbrushes (2 each) were labeled for the 5 disinfection methods (salt water, Crest ProHealth Mouthwash, ultra-violet toothbrush sanitizer, hot water, 3% hydrogen peroxide). I used sterile swabs soaked in distilled water to swab toothbrushes and transfer bacteria to LB agar plates. I then used sterile inoculating loops to spread bacteria over the agar plates using the four-quadrant streaking technique. I labeled these agar plates B1-B10 (before disinfection toothbrushes 1-10). I then disinfected each toothbrush for 5 minutes according to its assigned disinfection method. I used the same techniques to swab the toothbrushes after disinfection using new agar plates labeled A1-A10 for after disinfection. Each toothbrush had a before disinfection and after disinfection agar plate. All agar plates were sealed with tape and placed in an incubator for 48 hours (Kaiser Permanente Lab) to allow bacterial growth. After incubation, I took pictures of all agar plates and used the pictures to count the number of bacterial colonies that formed. I used the before and after disinfection counts to determine the % reduction of bacteria for each disinfection method for comparison.</p> <p>Results Trial #1 showed hydrogen peroxide and mouthwash both eliminated 100% of bacteria, hot water reduced bacteria by 71%, UV toothbrush sanitizer 31%, and salt water 16%. Trial #2 showed hydrogen peroxide and mouthwash again eliminated 100% of bacteria, followed by hot water (79%), UV sanitizer (34%), and salt water (12%).</p> <p>Conclusions My hypothesis was that the UV toothbrush sterilizer would reduce the most bacteria on a toothbrush, but averaged results for trials #1 & #2 showed Hydrogen Peroxide and Mouthwash (Crest ProHealth) both reduced the most bacteria (100%), followed by hot water (75%), UV Toothbrush Sanitizer (33%), and Salt Water (14%). Brushing teeth with clean toothbrushes may help to decrease illnesses and/or dental diseases. Cleaning toothbrushes may also be beneficial for people with suppressed immune systems by decreasing their exposure to large amounts of bacteria found on toothbrushes.</p>	
Summary Statement This research project showed that the best way to disinfect a toothbrush is to soak it for 5 minutes in either hydrogen peroxide 3% or mouthwash (Crest Pro Health). Both methods showed no bacterial growth after disinfection.	
Help Received Charleane Salvador-Abat, M.S., CLS / Kaiser Permanente Lab - Charleane provided supervision in the lab & taught me how to streak an agar plate. Kaiser Permanente allowed me to use their lab, some supplies (gloves, inoculating loops, etc.), incubator, and disposed of my agar plates in their biohazardous waste	