# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Sabreen Alam

**Project Number**
**J1901**

**Project Title**
## Natural Foods: Better to Fight Angiogenesis than Cancer Drugs?

**Abstract**

**Objectives/Goals**
The objective of this project is to test if natural foods are just as effective as cancer drugs in stopping the growth of a cancerous tumor at its different stages.

**Methods/Materials**
A variety of foods were selected to be tested for their kaempferol, myricetin, and quercetin amounts. The USDA Flavonoid Content Database was used to find the amount of each flavonol in the selected foods. Two scientific papers that had scans of a cancerous tumor and its blood vessels were used to find the growth pattern of the tumor at three key stages as well as the number of major blood vessels connecting to the tumor at each stage. The amount of quercetin, kaempferol, and myricetin needed to stop the growth of the tumor at each stage was then found, as well as food combinations that would help the person recover or stop benign tumor growth. All of the information collected was used to compare the effectiveness of natural foods with cancer drugs. Then, I created an app using Android SDK to provide the food combinations to the public. The combinations were generated based on the region they live in, the size of their tumor, and their dietary restrictions.

**Results**
Green chili, red onion, and ginger had inhibitor levels that met the average amount of angiogenesis inhibitors in cancer drugs. Other foods did not have as much angiogenesis inhibitors in them individually as cancer drugs did, but when they were combined, they had equal inhibitor levels as modern cancer drugs. Unlike cancer drugs, natural foods do not have any dangerous side effects, such as liver and kidney damage. This indicates that eating the proper amount of natural foods will stop the growth of a tumor just as well as cancer drugs would. In addition, this shows that an inexpensive and safer option than cancer drugs is available to stop cancer.

**Conclusions/Discussion**
Using this data, cancer can be eradicated from the human body. To do this, the patient would have to eat angiogenesis inhibitor-containing foods on a daily basis. These foods would be just as effective as cancer drugs, but safer because they contain none of the adverse side effects of modern drugs, nor do they have to be assisted with sessions of chemotherapy. Being of low cost to grow, these foods could be cultivated all around the world. Third-world countries would especially benefit from this since cancer drugs are inaccessible to citizens because of the extremely high price of these medicines.

**Summary Statement**
This investigation clearly demonstrates that natural foods are just as effective, but safer than modern cancer drugs in stopping the growth of a cancerous tumor.

**Help Received**
The USDA Flavonoid Content Database (v. 3.2) was used to find the amounts of angiogenesis inhibitors in natural foods. Dave Barney, a Product Manager in Google, suggested that I use the Android SDK to develop my app. I would like to thank my parents, Dr. Li, and Mr. Grubb for their moral support.

# CALIFORNIA STATE SCIENCE FAIR
## 2016 PROJECT SUMMARY

**Name(s)**
Addison L. Arsenith

**Project Number**
**J1902**

**Project Title**
# Which Preservative, Synthetic or Natural, Will Inhibit the Growth of Bacterial Microorganisms?

**Abstract**

**Objectives/Goals**
The purpose of my project was to determine which preservative, synthetic or natural, would best inhibit the growth of bacterial microorganisms.

**Methods/Materials**
27-5% blood agar plates, 1 oz. Potassium Sorbate, ¼ cup of sea salt, 6 cups low sodium chicken broth, 27 UL inoculating loops, 1 ½ cups water, 3 glass jars with lids, marking and measuring tools
This experiment was done by selecting a synthetic preservative-potassium sorbate and a natural preservative-sea salt and adding a 25% solution of each to separate mason jars each filled with 2 cups of low sodium organic chicken broth. The control had 2 cups of the same broth. The mason jars sat out for 3, 6, and 9 days at room temperature. On the third day, I took an inoculating loop, 3 blood agar plates labeled for each solution and then streaked each agar. Plates were set in a warm room for 5 days to incubate. Observations were made daily on bacterial intensity observed on the agar plates. Process was repeated on Day 6 and Day 9 with 3 plates for each solution.

**Results**
My hypothesis, that the sea salt solution would work best at preserving foods, was not supported by the experimental data. The results showed in all of the observations I made, that the sea salt was the worst at preserving the chicken broth. The potassium sorbate was the best for preserving the chicken broth.

**Conclusions/Discussion**
I believe that I got these results because the agar plates with sea salt allowed bacteria to grow quickly because of hemolysis. The appearance of these plates after incubation was notably different. Also, the bacteria on these plates were visible before the control group and the potassium sorbate group. The potassium sorbate preserved the broth solution so well that bacteria was unable to grow until after the fourth day of incubation.
The information gained from this project could be used by supermarket owners trying to keep their food from spoiling. This information could also be used by ordinary people who don't want their food to spoil.

**Summary Statement**
This experiment tested two preservatives, sea salt and potassium sorbate, to determine which was most effective at inhibiting the growth of bacterial microorganisms in chicken broth at room temperature for 3, 6, and 9 days.

**Help Received**
Mom purchased supplies. Dad held plates during streaking process. My teacher, Mr. Scott helped to edit my project report. Dr. Musau Wakabongo provided a safe place to view my final agar plates and made sure that the materials from my experiment were safely disposed of using the lab#s autoclave.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

Andrew I. Cardoso

**Project Number**

**J1903**

**Project Title**

## Determining the Effectiveness of Teeth Whitening Paste vs. Natural Remedies

**Abstract**

**Objectives/Goals**

This project is to determine the most effective way to whiten teeth using natural remedies vs over the counter teeth whitening products. Teeth are stained by the food and drinks that are consumed daily. Teeth whitening is the number 1 requested cosmetic service today and its popularity continues to soar. Americans spent more than 1.4 billion dollars on over the counter teeth whitening products last year alone. That being said, it is essential to determine the safest method of teeth whitening without damaging the enamel leading to early tooth decay.

**Methods/Materials**

Test includes 6 independent variables and control group.Obtain molars from dental office.Soak teeth in soda, coffee, pomegranate juice each for 24 hrs. Brush control molars with crest toothpaste daily for 10 days.Repeat with Crest 3D whitening and Colgate Optic Whitening toothpaste.Next mash strawberries and brush with strawberries daily for 10 days.Then rub next test group with olive oil for 10 days.Finally rub banana peel on each tooth in test group for 10 days.Observe each test group for color changes and damages to surface enamel MATERIALS:Gloves,CrestToothpaste, Molars,Colgate Whitening Toothpaste,Crest Whitening Toothpaste,Coffee,Soda,Pomegranate juice,Olive Oil,Banana peel, Strawberries,Cotton Swabs,Tooth Whiteness chart.

**Results**

It has been determined that all the variables used slightly lightened the stained molar. The hypothesis was correct:Crest 3D Whitening tooth paste was the most effective method used to remove stains from Molars. The strawberries were the most effective of the natural remedies, almost as affective as whitening toothpaste and more effective than regular Crest Paste in the control group. The olive oil and banana peel were least effective however did remove some of the stains on the molars.

**Conclusions/Discussion**

In conclusion, the whitening toothpaste was most effective at whitening stained molars. However, the chemicals that these contain can be harmful to the enamel on teeth over time. Strawberries would offer a natural solution to whitening teeth, but not always practical and somewhat acidic. Trying to find safe natural remedies would still be more beneficial to the enamel on teeth over time, rather than using over the counter whitening products. Society wants a pretty white smile but, over whitening can be very harmful to teeth causing unnecessary root canals, tooth extractions and decaying of teeth.

**Summary Statement**

Analyzing the effectiveness of natural remedies versus over the counter teeth whitening toothpastes to produce a whiter smile and protect the enamel on teeth.

**Help Received**

Mom helped with photos and board. Dentist helped with research and providing molars used in project.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Isabella E. Cawley

**Project Number**
**J1904**

**Project Title**
## Clorox Wipes vs. Clorox Green Works Wipes: Is Green as Clean?

**Abstract**

**Objectives/Goals**
"Going green" is trendy, but is it actually worth it? The purpose of this project was to decide which wipe, Clorox or Clorox Green Works, kills the most bacteria.

**Methods/Materials**
In this experiment, Clorox and Clorox Green Works wipes were tested with soap and water sanitized tiles and chicken as a source of bacteria. A baseline reading was taken the first day. The two tiles were then rubbed with chicken. Clorox and Clorox Green Works wipes were used to clean the tiles. The tiles were swabbed. Then the swabs were introduced to petri dishes with nutrient rich agar. The petri dishes were checked for five days. To measure the percentage of area colonies covered in each petri dish, the petri dishes were placed on top of a grid of 88 squares. The area was determined by counting the number of squares that included colonies.

**Results**
By the third day, a few of the petri dishes showed some bacteria. On the fifth day, some petri dishes seemed to have milky colonies, some had a multitude of pin prick-like colonies, and some had bacteria growing on the rims. The Clorox petri dishes had 49, 66, 13, and 42 of the 88 squares covered in colonies of bacteria. The Clorox Green Works petri dishes had 62, 82, 73, and 81 of the 88 squares covered in colonies of bacteria. The Clorox wipes killed 51% of the total bacteria while the Clorox Green Works wipes killed 13% of the total bacteria.

**Conclusions/Discussion**
I hypothesized that Green Works wipes would kill the most bacteria. But after the trials were over, it was clear that the Clorox wipes were more effective at cleaning bacteria from the tiles.

**Summary Statement**
I tested whether "green" wipes performed as well as normal antibacterial wipes.

**Help Received**
My parents purchased the items needed to complete the project and helped time me while I worked with the tiles. My science teacher helped me with my data tables and graphs.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

Logan A. Dalton

**Project Number**

**J1905**

**Project Title**

## Design and Evaluation of an EZ Tie Emergency Temporary Vascular Shunt

**Abstract**

**Objectives/Goals**

The objective of this experiment was to evaluate the (test device) EZ TIE EMERGENCY TEMPORARY VASCULAR SHUNT. The time and feasibility, was compared to the (control device) Improvised Vascular Shunt with Silk Ties referred to in the South African Journal of Surgery.The device is designed to be used by lay people, and be included in First Aid medical kits that contain tourniquets. It functions to extend the time needed to present the patient to a vascular surgeon for permanent repair limiting complications potentially saving lives and limbs.

**Methods/Materials**

Generated on a 3D printer, the shunt clip incorporates the use of micro zip ties and catheter tubing. The brachial artery and vein were modeled with a loop of surgical tubing embedded in a silicon arm. A pump and reservoir circulated green water through the severed brachial artery analog. A tourniquet was employed and repairs with both devices were made by a group of 20 participants representing the general population. The tourniquet was released to test the repairs. The ease of use of each device was measured by timed trials for comparison. Heart rates of each participant were recorded before and after each trial to monitor stress. There were 40 trials for each device (2 for each participant) for 80 total trials.

**Results**

The EZ TIE was an average of 36.92 seconds faster than the control. The control device, Improvised Vascular Shunt with Silk Ties increased heart rates an average of 2.65 beats per minute more per trial than the test device. No failures were observed when the tourniquets were released.

**Conclusions/Discussion**

This experimentation with the EZ TIE EMERGENCY VASCULAR SHUNT with Micro Zip Ties supported my hypothesis, it was quicker to employ than the Improvised Vascular Shunt with Silk Ties.

**Summary Statement**

This project showed that the EZ TIE EMERGENCY TEMPORARY VASCULAR SHUNT Design, utilizing a shunt clip, micro zip ties and catheter tubing was easier and quicker to employ than the Improvised Temporary Vascular Shunt With Silk Ties

**Help Received**

KNB EFX Group, loaned me a silicone arm. Calvin Loesser, my neighbor, helped me print my drawing of the shunt clip on his 3D printer. My parents, Drew and Patricia, supervised with trials and subjects, and also encouraged me. Mrs. Shah, my advisor, Mr. Okimura, my science teacher advised me.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Aria Delgado

**Project Number**
**J1906**

**Project Title**
## Food Preservation: Natural vs. Chemically Modified

**Abstract**

**Objectives/Goals**
The objective of this study is to determine which food preservative is more effective, natural or chemically modified.

**Methods/Materials**
Make rice in a sterile environment, using sterile utensils and gloves to do so. Food process the cooked rice with each of the food preservatives: (natural) ginger, pickled plum, and perilla leaves, (chemically modified) high fructose corn syrup, citric acid, hydrogenated oil. Once each batch is complete seal each in petri dishes and measure the bacterial growth in millimeters for each trial.

**Results**
The results of my investigation on which food additive is most effective at preserving food were that on average after 12 days, pickled plum and perilla leaves were more effective at preventing bacterial growth and preserving food than the other additives, both natural and chemically modified, and the control with no additives.

**Conclusions/Discussion**
After my investigation, I learned which type of additive preservative was the most effective at preserving food and preventing bacterial growth. When doing this investigation, research and my own experiment taught me much information about all of my variables for this investigation. I have learned that perilla leaves are a healthy additive preservative and a better substitute for chemically modified preservatives, since it is a natural food additive and can preserves many foods just as well, if not better than, chemically modified preservatives. In addition I concluded that using healthier types of preservatives in combination with eating healthier foods can be a potential benefit to anyone#s health.

**Summary Statement**
I designed an investigation and learned which type of additive preservative, natural or chemically modified, was the most effective at preserving food and preventing bacterial growth.

**Help Received**
I designed and conducted my investigation with minimal help from my teachers and parents. My teachers, Mr. Nelson and Mrs. Lickey did help me with understanding the implications of my results, and how to compare my data.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

**Mohona R. Ganguly**

**Project Number**

**J1907**

**Project Title**

## Measurement of Potassium in Four Varieties of Rice by Atomic Emission Spectroscopy

**Abstract**

**Objectives/Goals**

The objective of this experiment was to determine the amount of potassium in four different varieties of cooked rice. This study was made to assist in the meal plan of a patient with hyperkalemia (excessive potassium in blood) due to advanced kidney disease. I hypothesized that brown rice would contain the most potassium because it retains the bran layer which contains most nutrients compared to white rice which is polished.

**Methods/Materials**

To accomplish this, I used atomic emission spectroscopy by working in the Chemistry laboratory of the Occidental College, Los Angeles on 12/04/2015 and at Chandler School, Pasadena on 01/12/16. Three known potassium standards were created and the atomic emission spectrometer (AES) was used to generate a calibration curve. Potassium was extracted by mashing up rice samples, adding dilute hydrochloric acid, followed by continuous stirring and heating. The isolated potassium was filtered out and diluted. Each sample was then run through the AES and compared with the calibration curve to determine the amount of potassium it contained. From the results, potassium in each gram of rice was determined. I then weighed one cup (typical serving) of each type of rice to determine the mass. Combining these results the amount of potassium in each cup of rice was calculated.

**Results**

I found that parboiled rice contains the most potassium in one serving and brown rice the least, although the difference between the four different types of rice was not too drastic. Ideally it would be best to choose brown rice for hyperkalemia patients.

**Conclusions/Discussion**

As an extension of the experiment I would like to repeat the experiment with other staple foods and build different meal plans for hyperkalemia patients. The sources of errors in this experiment are low due to the fact that the AES instrument is very accurate and the readings are repeated several times in the instrument itself. However, my hypothesis stating that one serving of brown rice would have the most potassium was proven to be incorrect. According to my experimental findings, parboiled rice contains the most and brown rice contains the least potassium in it.

**Summary Statement**

Using Atomic Emission Spectroscopy I determined Potassium content in four different varieties of rice which would help in the diet plan of a patient with hyperkalemia (excessive Potassium in blood).

**Help Received**

The idea of the project was my own. I learned Chemistry from Professor Michael Hill. I conducted the experiment at Occidental College, Prof. Hill showed me basics and Dr. Andrew Udit showed me how to run the AES. I also received guidance from Ms Newman and other science faculty at my school.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

Lucy L. Golden

**Project Number**

**J1908**

**Project Title**

## Disinfectants: Environmentally Safe Homemade vs. Toxic Brand-Name Products

**Abstract**

**Objectives/Goals**

My objective was to compare household disinfectants: Brand Name products and Homemade (HM) to see which killed the most bacteria. My goal - to see if environmentally safe ingredients can kill bacteria just as well as the store bought brands, and which was more cost effective.

**Methods/Materials**

My experiment included 5 disinfectants: Lysol (Sodium Hypochlorite (bleach)), Clorox (Dimethyl/Ethylbenzyl Ammonium Chloride), and 3 Homemade (HM) solutions (combinations of white vinegar, water, tea tree oil, lemon juice, Borax, dish soap). Each disinfectant was applied first to a surface contaminated with raw chicken juice/blood, then inoculated onto 20 agar petri dishes (4 per disinfectant, and 5 for controls) and incubated at 87ºF over 72 hours. Bacteria were counted and compared every few hours. With this data I did further experimentation using the most effective Brand Name product and HM* solution (*varying the concentration), by performing the same test, plus testing them on contaminated toilet water.

**Results**

My initial experiment showed Lysol worked significantly better than the others, killing nearly all the bacteria. Second was HM+Lemon Juice, then Clorox, HM Regular, and lastly HM+Borax, barely killing any bacteria. My further experimentation showed again Lysol worked far better than HM+Lemon Juice on bacteria from the chicken juice/blood, and the toilet water. My objective was met by clearly showing which disinfectant was most effective in killing bacteria, however this was not the safest nor cheapest product.

**Conclusions/Discussion**

The data from my experiment proved that Lysol killed more bacteria than Clorox and my 3 HM solutions. The HM+Lemon Juice came 2nd, but with far more bacteria surviving compared to Lysol. The toxicity of bleach is potentially harmful to the environment and our health, whereas vinegar proves to have very little harmful effects. Hospitals and areas with many dangerous bacteria, germs and viruses can clearly benefit by using a bleach based disinfectant, but in most household situations a simple vinegar + lemon solution is perfectly adequate, plus at a fraction of the cost (23%) of a Brand Name product purchased from the store. We also have to remember that not all bacteria are harmful, and some are beneficial to our bodies and the environment.

**Summary Statement**

My project tested the disinfecting power of Brand Name household cleaners, and Homemade solutions to see which one kills the most bacteria.

**Help Received**

Dr. Cooper (UCSB Life Science) and Mr. Evans (DPHS Biology) gave feedback on testing ideas. Mrs. Farris (retired Micro-biologist) showed me how to analyze and count the bacterial colonies. My sister and mom reviewed and checked that my data was accurately calculated.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Emily A. Hsi

**Project Number**
**J1909**

**Project Title**
## Increasing the Longevity of Cut Roses

**Abstract**

**Objectives/Goals**
My project's goal was to see if different substances (nutrients, antimicrobials, or both), different stem heights, and different water levels increase the longevity of cut red roses.

**Methods/Materials**
21 dozen red roses were purchased to conduct 4 trials to assess rose longevity: 1) stem height and water level, 2) nutrients (sugar, Sprite, flower food, aspirin), 3) antimicrobials (copper, bleach, vinegar, vodka), and 4) best of nutrients and antimicrobials combined. Each assessment was evaluated with a dozen roses, which were checked twice daily for stem turgor and petal wilt on a scale of 0-3. Longevity was determined by time from start until a score of 3 in either category. Averages of survival were compared using a two-tailed Student t-test at $P<=0.05$. Sample size (12) per assessment was based on 80% power to detect a half day (12 hour) difference in rose longevity assuming the average rose lives one week.

**Results**
For Trial 1, a shorter stem height of 15 inches and a lower water level of 5 inches significantly prolonged rose life. For Trial 2, Sprite (1:3 ratio with water) significantly improved rose longevity by 47 hours. In Trial 3, no antimicrobial substance significantly improved rose longevity over water control. Vinegar and bleach were toxic to roses. Water, copper, and vodka were carried into Trial 4. For Trial 4, Sprite alone (1:3 ratio with water) again significantly prolonged rose longevity.

**Conclusions/Discussion**
For cut red roses with a 15 inch stem in 5 inches of water, Sprite (1:3 ratio with water) was the only substance that significantly increased rose life. Flower food was not beneficial and vinegar and bleach were toxic, even in small quantities. Limitations included placing only 3 roses per vase, which may have minimized microbial activity and limited antimicrobial benefit. Results are applicable to the millions of people who receive cut red roses each year.

**Summary Statement**
After evaluating a variety of nutrient and antimicrobial substances, only Sprite in a 1:3 ratio with water significantly increased the life of cut red roses by up to 2 days.

**Help Received**
I conceived of the project, searched online rumors for substances to test, and conducted all experiments, but I received training on t-test and sample size calculations from my mother (Dr. Susan Huang, Professor of Infectious Diseases at UC Irvine). I also received help purchasing all materials.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Juliesen E. Jaime

**Project Number**
**J1910**

**Project Title**
## The Effectiveness of Active Ingredients in Hand Sanitizers

**Abstract**

**Objectives/Goals**
This project was designed to discover whether ethyl alcohol, benzalkonium chloride, or benzethonium chloride would kill the most bacteria on human hands.
Ten subjects were recruited and swabbed for bacteria before and after each of the hand sanitizers were applied. Data was collected after the dishes were placed in an incubator for a week. The three active ingredients were compared to determine which was the most effective at eliminating bacteria. Results showed that benzalkonium chloride was the most effective.

**Methods/Materials**
Materials:30 petri dishes,Purell Sanitizing Wipes, Wet Ones Hand Wipes,Purell Liquid Sanitizer, marker,30 swabs, incubator, liquid agar,tape

Prepare 30 petri dishes,label the dishes with the active ingredient, the subject #, and the date. Draw a line down the middle and label #before# and #after# on each half. Recruit 10 subjects (each will test 3 times) Swab the subject's palm and transfer the bacteria collected from the swab onto the petri dish on the #before# side.
Apply one hand sanitizer product on the subject (rub for 30 seconds).
Then, swab their palm and transfer it on the #after# side of the dish.
Seal the dish with tape and place it in the incubator. Repeat using the other 2 products(2 days in between).
After one week in the incubator, remove the dishes and count the number of bacteria by using a 5 by 5 grid, which estimates the percentage of bacteria present. Record the data.

**Results**
Results of this experiment show that benzalkonium chloride is more effective at eliminating bacteria from human hands than ethyl alcohol and benzethonium chloride. The total percentage of bacteria killed from ethyl alcohol= 47.90%; the total percentage from benzalkonium chloride=67.90%; the total percentage from benzethonium chloride= 22.22%.

**Conclusions/Discussion**
The hypothesis for this experiment was:ethyl alcohol will kill more bacteria on human hands than benzalkonium chloride and benzethonium chloride. Results proved that benzalkonium chloride killed more bacteria than ethyl alcohol and benzethonium chloride. Therefore, the hypothesis was incorrect.In the future, researchers should conduct experiments comparing the concentration of each active ingredient, as well as which active ingredient works most effectively at killing the different types bacteria.

**Summary Statement**
I tested three hand sanitizers that had different active ingredients (ethyl alcohol, benzalkonium chloride, and benzethonium chloride) to find out which worked most effectively at killing bacteria on human hands.

**Help Received**
My teacher, Ms. Griffith, helped me understand how an incubator works, the proper way to safely transfer bacteria onto a petri dish, and how to count/estimate the amount of bacteria in each petri dish.

# CALIFORNIA STATE SCIENCE FAIR
## 2016 PROJECT SUMMARY

**Name(s)**
Maya A. Johnson

**Project Number**
**J1911**

**Project Title**
## Which Mouthwash Is More Effective in Killing Oral Bacteria?

**Abstract**

**Objectives/Goals**
The objective of the experiment is to determine which types of mouthwashes are the most effective in killing oral bacteria.

**Methods/Materials**
Petri dishes, Three mouthwashes: Listerine, Crest and Tom's of Maine, Camera. Measured the amount of bacteria grown before and after using mouthwash.

**Results**
Three mouthwashes were used to determine which would kill the most oral bacteria. The Xylitol mouthwash killed the most bacteria at a 84% reduction, then the alcohol based mouthwash at 77% reduction and lastly the chemical substitute mouthwash at a 145% growth.

**Conclusions/Discussion**
I performed several trials and contrary to what I expected, the alcohol based mouthwash did not perform the best. Xylitol was the most effective in killing oral bacteria. After observing my results, I did more investigation about xylitol and discovered it is used in sugar-free candies and toothpaste.

**Summary Statement**
I investigated which mouthwash is the most effective in killing oral bacteria and observed that mouthwash with xylitol kill the most bacteria.

**Help Received**
My father helped me with the data analysis.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

Kaelyn S.K. Luebke

**Project Number**

**J1912**

**Project Title**

## Cool Idea, Hot Topic: Personal Temperature Management

**Abstract**

**Objectives/Goals**

Find the body#s best spot(s) for #heating# (heat received) & #cooling# (heat removed) effect, and use this information for future design of energy efficient clothing to change a person#s temperature comfort level.

**Methods/Materials**

Comfort level was measured as heating and cooling was applied to different locations on the body. A custom vest with Peltier devices was designed and created, to apply this heating and cooling and rapidly collect data.

**Results**

The best spots of the body were identified for heating (upper chest & armpit, as well as the neck & lower back) and cooling (upper back, as well as neck, chest & lower back). This is expected as these areas are considered #pulse points# and areas of high blood & nerve flow. Differences also occurred between Test Subjects, based on body fat, age & circulatory system health.

**Conclusions/Discussion**

Peltier devices can be effectively used to heat and cool the body, for personal temperature management without the need to heat or cool an entire room. As we struggle to reduce global energy usage, personal temperature management may offer a potential solution.

**Summary Statement**

As we struggle to reduce global energy usage, personal temperature management may offer a potential solution.by using carefully placed and controller Peltier devices to heat and cool the body without the need to heat or cool an entire room.

**Help Received**

My Grandma helped me make the vest and over-watching me while I took data. My Mom helped and taught me how to put together the presentation. My Dad let me borrow some of his equipment and keeping me safe when I used it.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

Faatima Zahra Motala

**Project Number**

**J1913**

**Project Title**

## Joggin' Your Noggin

**Abstract**

**Objectives/Goals**

Will Lumosity, a brain-training app focused on improving cognitive flexibility, have a positive effect on participants who suffer from diminishing mental abilities? I wanted to analyze mental decline and determine the effects of Lumosity, upon the mental capacities of senior participants.

**Methods/Materials**

I found a geriatric facility that holds elderly people 65 years and older. I interviewed the residents and found 10 eligible participants (5 variable and 5 control). I downloaded the Lumosity App onto my iPad. Next, I assigned a Lumosity account to each participant to maintain confidentiality. During each session we played a series of 3 games, testing various mental abilities (memory, flexibility, speed, attention, and problem solving). I consistently held sessions 3 times a week for 5 weeks with my variable group. I met with my control group twice in the beginning and end of my study. I recorded scores and took observations.

**Results**

All variable participants had an overall increase in scores. One participant's initial score was 600 points and his/her final score was 7,650. The average increase of the variable group was approximately 250 points per session. Conversely, the control group displayed an average decrease of about 150 points per session.

**Conclusions/Discussion**

I hypothesized that the variable group of participants would display an overall increase in scores, indicating cognitive improvement. One of my participants recently had brain surgery and had lost parts of her memory- she benefited the most from playing this app. She remembered things from her past during certain sessions. Lumosity improves pattern recognition. As an extension, I further tested Lumosity with another brain-training app called Elevate. While both apps have the same premise, Evelate focuses on a different set of skills than Lumosity, with an emphasis on writing, reading and listening. Lumosity works as an educational tool, while Elevate appears as a mobile game. This creates the next question; will improved pattern recognition improve fluid and crystal intelligence?

**Summary Statement**

The effects of a brain training application on the cognitive flexibility of participants who suffer from diminishing mental abilities.

**Help Received**

Dr. Faisal Qazi is a neurologist in Pomona, California for allowing me to interview him. Ms Naz Hai from The Heights Senior care facility for allowing me to carry out my study on the people who live there. My Science teacher for helping me develop my topic.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

**Will A. Myatt**

**Project Number**

**J1914**

**Project Title**

## Clash of the Creams: Which Skin Moisturizer Prevents the Greatest Amount of Moisture Evaporation?

**Abstract**

**Objectives/Goals**

The objective of my experiment was to find out which skin moisturizer prevented the greatest amount of moisture evaporation.

**Methods/Materials**

Petri Dishes, Gelatin, Skin Moisturizers, Scale, Ruler, Measuring Tools. I weighed and measured Petri dishes of gelatin and skin moisturizers over the course of one week.

**Results**

I applied one tablespoon of each moisturizer to each petri dish. I had three petri dishes for each moisturizer (+ 3 controls). I weighed and measured each dish every day at the same time to calculate the percentage of moisture loss.

**Conclusions/Discussion**

After finding the percentage of moisture loss for each moisturizer, I found that Coconut Oil prevented the greatest amount of moisture loss. This shows that a natural moisturizer has the power to be better than human created moisturizers.

**Summary Statement**

After testing various moisturizers, I found that Coconut Oil was the best at preventing moisture evaporation.

**Help Received**

My parents helped me on writing Excel formulas. The rest of the project was done myself.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Rohan R. Navale

**Project Number**
**J1915**

**Project Title**
## Solubility of Sugar Cubes in Soft Drinks: A Measure of Saturation

**Abstract**

**Objectives/Goals**
The objective of the experiment is to demonstrate that many of the commercially available soft drinks have high sugar content by trying to dissolve an increasing number of sugar cubes.

**Methods/Materials**
Soft drinks like coffee, sprite, coke, diet coke, lemonade, and seven up. Sugar cubes, measuring cup, beakers, and stirrer. Recording devices such as camera, and stationary.

**Results**
The above listed soft drinks were tested for solubility of increasing number of sugar cubes. Some soft drinks dissolved the sugar cubes at a faster rate while the others showed slow down.

**Conclusions/Discussion**
This experiment demonstrated that certain soft drinks had a very low rate of solubility of sugar cubes. Evidently these drinks had started off with a high sugar content. Consuming such drinks in large quantities poses health risk.

**Summary Statement**
As measured by the time it took to dissolve sugar cubes, I showed that certain soft drinks had a high concentration of sugar.

**Help Received**
I designed and performed the experiment by myself with some advice from my science teacher Mrs. Heather Brown.

# CALIFORNIA STATE SCIENCE FAIR
## 2016 PROJECT SUMMARY

**Name(s)**
Sofia A. Navarro

**Project Number**
**J1916**

**Project Title**
## What Types of Nuts, According to their Calorific Values, Are Best to Store for Emergencies?

**Abstract**

**Objectives/Goals**
The objective of the project is to measure the calorific value of different types of nuts, in order to determine which type is best for storage during emergencies.

**Methods/Materials**
Build the calorimeter from an aluminum sheet, grind and measure the nut samples, measure the amount and the initial temperature of the water, burn the nut samples, measure the ending temperature of the water.

**Results**
The difference between the initial and ending temperature of the water was used in a specific formula to determine the calorific value of each type of nut. Each type of nut presented a distinctly different calorific value.

**Conclusions/Discussion**
The pecans were found to have a greater calorific value than the other types of nuts, almost double of the nuts with the least calorific value, which proved that they can provide more energy to sustain a human during an emergency and storing them is a better option.

**Summary Statement**
I found that pecans have the greatest calorific value and offered the best benifits when being stored for emergencies.

**Help Received**
I designed the calorimeter myself, had help from my father to build it, and conducted the experiments on my own.

# CALIFORNIA STATE SCIENCE FAIR
## 2016 PROJECT SUMMARY

**Name(s)**
Maggie E. O'Rourke

**Project Number**
**J1917**

**Project Title**
## Candy Confusion

**Abstract**

**Objectives/Goals**
The objective is to see if preschoolers, teens, or adults can identify the candy from the medicine visually most accurately.

**Methods/Materials**
10 medicines and 10 candies that look alike, 10 preschoolers, 10 teens, 10 adults, Ziploc plastic bags. put medicine and candy into separate bags and hold them up and ask the person to point at which ever one that looks like the candy.

**Results**
The adults had the most correct answers with an average of 87% correct answers, then the teens with 86%, and last the preschoolers with and average of 59% correct answers.

**Conclusions/Discussion**
This project helped me to realize how many children and people are effected by overdosing on medicine that they don't realize is medicine thinking it's candy. Adults may have had the best results, but there are still adults that have eaten medicine thinking it is candy or because the medicine tastes good.

**Summary Statement**
This project tested preschoolers, teens, and adults to see which age group could identify the medicine from the candy visually most accurately.

**Help Received**
Chris Donohoe, my teachers at Holy Cross School, and my parents

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Sakhi G. Patel

**Project Number**
**J1918**

**Project Title**
## Effectiveness of Turmeric in Relieving Arthritis Pain

**Abstract**

**Objectives/Goals**
The objective of this study is to test the effectiveness of turmeric in relieving arthritis pain.

**Methods/Materials**
*In this study, the materials used were 20 arthritic people, a month supply of turmeric tablets(Nature's Bounty, 450 mg) per subject, and an arthritis pain level questionnaire(WOMAC) per subject.
*First, each of the 20 test subjects were given a WOMAC questionnaire to assess the severity of arthritis pain.
*Next, the subjects were divided into two equal groups: an experimental group and control group.
*The subjects in the experimental group were given a month's supply of turmeric capsules and were asked to take one capsule daily for a month. The control group was asked to be strictly compliant with their existing medications and to avoid any strenuous activity for a month.
*Both groups were told that the procedures they followed for the month would help their arthritis pain. The subjects were contacted weekly for the duration of the month.
*At the end of the month, all 20 test subjects were given the WOMAC questionnaire again. Finally, the two questionnaire scores were compared and a conclusion was formed.

**Results**
After studying the effects of turmeric capsules on arthritis pain, turmeric proved to be strongly effective in treating arthritis pain. According to the WOMAC questionnaires, the experimental group had an average pain decrease of 22 percent. On the contrary, the control group had little to no changes in their arthritis pain.

**Conclusions/Discussion**
This study proves that turmeric is effective in relieving arthritis pain. Many of the test subjects in the experimental group reported having a reduction in arthritis-induced inflammation. Some subjects even reported not needing their arthritis medications because turmeric stopped the majority of their pain and inflammation. Others reported relief from other ailments as well, including sinus infection and night cramps. Turmeric is also proven to be an outstanding liver cleanser, that can reverse some of the damage done by prescription or over-the-counter pain medicines over time.

**Summary Statement**
This project tests to see if turmeric can help to relieve arthritis pain.

**Help Received**
A local pharmacy provided the turmeric capsules free of charge. Besides this, all the experiments were performed myself.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Rahul Ravi

**Project Number**
**J1919**

**Project Title**
## Ultra-Protection against Ultra-Violet

**Abstract**

**Objectives/Goals**
The objective of this experiment is to determine which SPF value protects the skin from skin cancer, skin aging, sunburns, cataracts, a weakened immune system, and other effects of UV radiation the most.

**Methods/Materials**
Two experiments were conducted. Experiment 1 needed sunlight; however, in December, it was raining, so I moved on to Experiment 2, an indoor project. For Experiment 1, SPF 8,15,30,50, the UV checker, and the homemade sunscreen (Aloe Vera juice, carrot seed oil, olive oil, and coconut oil) were needed. The UV checker was used to determine the UV index of each of the Ziploc Bags with the sunscreens on and the blank Ziploc Bag for 5,10,15,20, and 30 minutes. The UV black light, UV beads, and Petri dishes were the main materials used in Experiment 2. The UV beads in different Petri dishes and SPF values were exposed to the UV black light for 5 minutes and turned from a white to purple color. Finally, I took the lids out and recorded the amount of time it took for the UV beads to turn from purple back to white.

**Results**
The results were that the blank Ziploc bag had the highest UV index, SPF 50 had the lowest UV index, and the homemade sunscreen and SPF 30 had approximately the same UV index. On an average, the UV beads in the blank Petri dish took about 3 minutes 16 seconds, and SPF 50 took the shortest time of 7.52 seconds.

**Conclusions/Discussion**
According to the results, the increase in organic ingredients in SPF 50 block more UV radiation. The organic ingredients absorb the UV radiation and release it back as harmless heat, a chemical block. The organic ingredients are carbon compounds which consist of carbon,hydrogen,nitrogen, and oxygen atoms. Homemade sunscreen doesn#t have chemicals which are better for our skin. We should stop pollution because it releases more chlorofluorocarbons into the air, causing the ozone layer to deplete. Therefore, more UV radiation will be able to pass through. So when you go outside, use sunscreen and be safe!

**Summary Statement**
After I tested all of the sunscreens in both experiments, I found out that SPF 50 blocks the most UV radiation, but SPF 30 and the homemade sunscreen's results were closer to SPF 50.

**Help Received**
My mom helped me in understanding some concepts of this project and the design of how to conduct both of the experiments.

# CALIFORNIA STATE SCIENCE FAIR
## 2016 PROJECT SUMMARY

**Name(s)**
Audrey L. Robinson

**Project Number**
**J1920**

**Project Title**
## Examination of the Most Effective Sunscreen

**Abstract**

**Objectives/Goals**
The objective of this study is to determine which sunscreen is the most effective.

**Methods/Materials**
I tested four brands of sunscreen using three testing methods: ultra violet beads, a UV meter and Sun-sensitive paper.

**Results**
The Ultraviolet beads and UV Meter were not satisfactory testing methods. I then focused my efforts on the sun-sensitive paper and repeated my trials three times for each sunscreen. The sunscreen with the most zinc oxide was the most effective.

**Conclusions/Discussion**
Repeated trials of sunscreen on sun-sensitive paper proved the sunscreen with the most zinc oxide had the best protection against UV rays. It is concluded that sunscreen with at least 10% of zinc oxide is the most effective.

**Summary Statement**
I showed that zinc oxide based sunscreens provide the most protection from the sun.

**Help Received**
None. I researched methods and tested the sunscreens on my own.

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**

Josue H. Rodriguez

**Project Number**

**J1921**

**Project Title**

## Are Hand Sanitizers and Antimicrobials Effective?

**Abstract**

**Objectives/Goals**

The purpose of this experiment was to test the effectiveness of 9 common store bought antimicrobial, a 30% and 50% dilution of ethanol, and a 5% dilution of bleach on 5 types of bacteria.

**Methods/Materials**

10 bacterial lawns were made utilizing k-12 E. coli, Pseudomas fluorescens, S. epidermidis, Bacillus subtillus, and Enterobacter aerogenes on Mueller Hinton agar. Sterile disks were placed on the different dilutions and antimicrobials, then placed on the bacteria lawns. Plates were incubated for 24 hours at 37 degrees Celsius, and the zone of inhibition of each antimicrobial was measured in millimeters using a ruler. The experiment was repeated 3 times.

**Results**

After 3 trials, the zones of inhibition for each antimicrobial was averaged out. The averages show that 409 All-Purpose had the overall average zone of inhibition of 14.26 mm, making it the most effective antimicrobial.

**Conclusions/Discussion**

409 All-Purpose cleaner was the most effective antimicrobial due to having a higher quantity of a specific quaternary ammonium compound. This can help kill bacteria more effectively and prevent the development of MDR.

**Summary Statement**

I discovered how effective commonly used antimicrobials are, and that 409 All-Purpose Cleaner is the most effective antimicrobial tested.

**Help Received**

I received guidance and help for this project by Adan Rodriguez who is a medical student at CSUN studying microbiology and his professor Dr. Cooper

# CALIFORNIA STATE SCIENCE FAIR
# 2016 PROJECT SUMMARY

**Name(s)**
Lauryn O. Wang

**Project Number**
**J1922**

**Project Title**
## The Effectiveness of Physical Sunblocks Compared to Chemical Sunscreens

**Abstract**

**Objectives/Goals**
The objective of this study is to identify whether physical sunblock is more effective than chemical sunscreen in reducing ultraviolet ray exposure.

**Methods/Materials**
The materials utilized in this experiment include ultraviolet detecting beads to measure the effectiveness of the products in reducing ultraviolet ray exposure on the beads, an ultraviolet ray detecting device to measure the UV index, four boxes of identical size to place the bead inside, sheets of acrylic plastic to apply the sun protecting products on, two chemical sunscreens, two physical sunblocks, one teaspoon measuring spoon, four timers, and one camera to capture the shade of the ultraviolet detecting beads to compare to the bead shade scale.

**Results**
The chemical sunscreens resulted in an average bead shade lower than the physical sunblocks. As a result, the chemical sunscreens proved to be more effective than the physical sunblocks in reducing ultraviolet ray exposure.

**Conclusions/Discussion**
The results of this experiment provided important insight on the most effective sun protecting product. Previous studies have shown that physical sunblocks are healthier for the epidermis than chemical sunscreens, but this experiment concluded that physical sunblocks will not protect people from the ultraviolet rays of the sun as well as chemical sunscreens. As a result of this experiment, people will be more knowledgeable regarding the most effective way to protect themselves from the significant repercussions of ultraviolet rays.

**Summary Statement**
I measured the effectiveness of physical sunblocks and chemical sunscreens and discovered that chemical sunscreens are more effective than physical sunblocks in reducing ultraviolet ray exposure.

**Help Received**
My parents and sister provided assistance with timer-setting and bead placement during the execution of the experiment, and Orchard Supply Hardware cut and sanded the acrylic plastic incorporated in this experiment. In addition, my teacher helped me determine what type of sun-related product to test.

# CALIFORNIA STATE SCIENCE FAIR
## 2016 PROJECT SUMMARY

**Name(s)**

**Josephine V. Woldemar**

**Project Number**

**J1923**

**Project Title**

## Bristly Clean Bristles

**Abstract**

**Objectives/Goals**

The objective of this study was to determine the best way to wash your toothbrush using commonly used methods and the American Dental Association's recommendation.

**Methods/Materials**

10 Toothbrushes, 20 Agar prepped Petri Dishes, 20 Cotton Swabs, Sterile Gloves, Hydrogen Peroxide, Crest Pro Health Mouthwash, Hot Tap Water, Salt Water, Baking Soda Water, Microscope, Notebook

**Results**

The results showed that all variables except for hot tap water caused some type of bacteria by 48 hours. The variables of baking soda water, Crest Pro Health mouthwash, salt water and hydrogen peroxide were very inconsistent. However, the variable of hydrogen peroxide actually added more bacteria. After 48 hours, the only one that had little to no effect was hot tap water.

**Conclusions/Discussion**

This experiment showed similar results to the American Dental Association's recommendation that while there is evidence to show bacteria grows on your toothbrush there is no consistent evidence to show that soaking your toothbrush in any type of rinse makes a significant difference. Therefore, the slightly best way to clean your toothbrush may be to use hot tap water and follow the American Dental Association's recommendation to rinse in water and change your toothbrush at least every 3 to 4 months for better bristly clean bristles.

**Summary Statement**

This experiment tested how to properly clean your toothbrush to avoid growing more bacteria and despite some inconsistent results, found that rinsing it in hot tap water is the best way to have more bristly clean bristles.

**Help Received**

I researched information from several sources, especially the information provided by the ADA, and used an experiment found on education.com website. I spoke with my dentist to get better understanding of how bacteria impacts your teeth and health. My mom helped me buy materials and checked my spelling.