

# Abstract: Science and Engineering Fair of Houston

**1269**

## The Cut Above

Vivienne Hoang-Dugan

Alief ISD/Albright MS

Category:

Medicine and Health

"How do different household objects as dressings affect the absorption for an exudative wound?" I chose this experiment because it's useful to know the most optimal wound dressing in an emergency situation where improvisation is needed. I predicted that a t-shirt would perform the best as a wound dressing substitute. The independent variable was the different household items which impacted the dependent variable, the amount of simulated exudative absorbed. The main materials I used were the objects like t-shirts and sanitary pads, corn syrup and corn starch for the solution, and measuring cups for measurements. To act this out I tested how much each object absorbed of the simulated blood created by pouring the solution on the objects in the measuring cups. I recorded the data based on the volume in the measuring cups in a table with averages included. I found that more porous materials with larger surface area were better at absorbing. Yes, my hypothesis aligned because the t-shirts had the best attributes like the most surface, meaning the best alternative for an exudative wound dressing would be a t-shirt with material like cotton or polyester for an emergency. For improvement, I believe a variety of materials in the household objects could create more interesting data that could showcase more information. However, although improvements could be made, my experiment was successful in showing how to improvise in an emergency first aid situation.

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 Vertebrate animals       microorganisms       rDNA       tissue

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# Abstract: Science and Engineering Fair of Houston

**1270**

## Effects of Sports Drinks vs. Coffee on Heart Rate

Sarayu Katragadda

Conroe ISD /McCullough Junior High

Category:

Medicine and Health

My science fair project hypothesis is that sports drinks affect heart rate more than coffee. I am going to test this hypothesis by giving the participant 8.5oz of sports drink and allowing them to sit down for 15 minutes. After 15 minutes, I will measure their heart rate and determine the increase in beats per minute. The next or another day I will repeat the same thing but with Starbucks coffee. The materials I am using are a heart rate monitor, Starbucks Coffee mix with milk(80mg of caffeine for 8.5oz), and Celsius Orange Fizzy Flavor(80mg of Caffeine 3 fl oz). This can be harming to those sensitive to caffeine and stevia as well as the heart monitor device. after testing my hypothesis, I found it to be correct, as the beats per minute increased slightly more than when tested with coffee.

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# Abstract: Science and Engineering Fair of Houston

**1271**

## Comparing Accuracy of Diagnostic Tools on Predicting Myocardial Information

Saneyi Sanandi

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Medicine and Health

Heart disease remains the leading cause of death in the United States, accounting for an estimated 702,880 deaths in 2022, and early detection of heart attacks is especially challenging in individuals under the age of 40. This study investigates how changing the diagnostic method used for early heart attack detection in people under the age of 40 affects diagnostic accuracy in young adults. A literature-based research design was used, incorporating public medical databases to identify five diagnostic methods: Single high-sensitivity cardiac troponin (hs-cTn), Serial hs-cTn (0/2h), point-of-care (POC) hs-cTnI, electrocardiogram (ECG), and cardiac imaging (CMR/CT). The key parameters are sensitivity, specificity, cutoffs, testing speed, cost, and age-specific protocol considerations. Results show that the POC hs-cTnI is the best diagnostic method stands out for its combination of rapid turnaround (~15 minutes), high sensitivity (95%), reasonable specificity (90%), and moderate cost (\$30–\$80 per test). While ECG demonstrates the lowest diagnostic accuracy and serves primarily as a screening tool. The Serial hs-cTn (0/2h) has a high sensitivity (98%), a high specificity (97%) but takes about 2 hours which is a long time. Imaging offers balanced accuracy but is limited by cost and logistical barriers. Age-specific thresholds and serial sampling significantly improve diagnostic performance, as younger patients often require lower cutoffs to avoid missed myocardial injury. Based on comparative analysis, POC hs-cTnI is currently the most practical and accurate method among those evaluated for early detection of heart attack in individuals under 40, balancing diagnostic performance, cost effectiveness, and clinical workflow demands.

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# Abstract: Science and Engineering Fair of Houston

**1272**

## The Wound Watchers: Developing pH Sensitive Infection-Detecting and Infection-Healing Bandages

Ananya Ghanathay

Conroe ISD /Knox Junior High

Category:

Medicine and Health

The purpose of this experiment was to determine the best substance to apply in an infection-detecting and infection-healing bandage. The hypothesis states that if beetroot juice, red cabbage juice and turmeric are tested to see which has the most notable color change when exposed to the pH levels of an infected wound, which is the most antimicrobial, and which is the most antioxidant, then turmeric would be the best choice because it has the most eye-catching pH color change, the most antioxidant properties and 2nd most antimicrobial properties. In the first test, the scientist soaks pieces of gauze in the test substances. They then place those pieces of gauze in 14 separate substances with a range of pH 1-14 and observe the color changes at the pH levels of an infected wound (8-9) along with any other pH levels with a similar color change. In the second test, the scientist cultures bacteria in petri dishes. They then put pieces of gauze soaked in the test samples in each dish including one control and observe the bacteria growth over a few days while documenting each dish's inhibition zone size. In the third test, the scientist pours an antioxidant indicator solution into 3 cups and prepares the 3 test samples. They put drops of the test samples into their own cup of antioxidant indicator until it turns translucent and records the number of drops each took. Overall, the hypothesis was mostly supported. Turmeric ended up performing the best out of all of the samples due to having the most visible color change in response to the pH of a wound while not having that same color change at any other pH to prevent alarm to the normal wound healing process. It was also the 2nd most antimicrobial and the most antioxidant. This will be especially beneficial in future applications and current problems regarding the high costs of smart bandages, wound dressings not being biodegradable, the high wound infection rates, and the failure to diagnose infection before it's too late.

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# Abstract: Science and Engineering Fair of Houston

**1273**

**Lock in**

David ngo Ngo

Houston ISD/BCM Biotech Academy at Rusk - MS

**Category:**

**Medicine and Health**

I tested lubricants' to aid a weather affected lock to inform people which lubricant's helps a stuck lock the best. The results i found were that lubricant's A and B both had a reduction rate of 100% proving my hypothesis wrong my original hypothesis was that lubricant a would perform the best and lubricant A and B preformed equally well proving my hypothesis wrong

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# Abstract: Science and Engineering Fair of Houston

**1274**

## **The Impact of Ventilatory Support Timing on the Survival and Long-Term Respiratory Outcomes in Infants With Spinal Muscular Atrophy Type 0 and Type I: A Literature Review**

Thomas Kannala

Home School/Homeschool

Category:

Medicine and Health

Spinal muscular atrophy (SMA) is a genetic neuromuscular disorder characterized by progressive motor neuron degeneration and respiratory failure. SMA Type 0 represents the most severe form, with prenatal onset and respiratory failure at birth, while SMA Type I presents postnatally with variable respiratory progression. This study evaluated whether immediate initiation of ventilatory support at birth, compared to delayed or later initiation when clinically feasible, improves survival and reduces long-term dependence on invasive ventilation in infants with SMA Type 0 or Type I. A systematic review and qualitative meta-analysis of peer-reviewed literature were conducted, including case reports, case series, and observational studies describing respiratory outcomes in infants with severe SMA. Data regarding respiratory status at birth, timing of ventilatory support, survival, and long-term ventilator dependence were extracted and synthesized qualitatively due to limited sample sizes and study heterogeneity. Across all studies, infants with SMA Type 0 universally required immediate ventilatory support to survive beyond birth, and delayed initiation of ventilation was not compatible with survival. Despite immediate support, all surviving infants remained dependent on prolonged invasive ventilation. In contrast, infants with SMA Type I demonstrated more variable respiratory trajectories. Delayed or later initiation of ventilatory support, particularly when combined with early disease-modifying therapy, was associated with improved survival and a reduced progression to prolonged invasive ventilation. These findings indicate that immediate ventilation is essential for short-term survival in SMA Type 0 but does not improve long-term respiratory independence, while ventilatory timing plays a more flexible and outcome-influencing role in SMA Type I.

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# Abstract: Science and Engineering Fair of Houston

**1275**

## How does mental and physical stress affect body temperature?

Saraiya Holback

Houston ISD/BCM Biotech Academy at Rusk - MS

Category:

Medicine and Health

Stress is very common among a lot of people and happens in the mind and body. By researching this testable question, this will help determine how different types of stress affect the body. The results of this project can help discover healthier ways to manage stress. The temperature for the physical stress did not increase body temperature more than the mental stress. Throughout my trials, the temperature of the physical stress did not outrun the mental stress. The trials showed that the temperature of the body decreases while under physical stress. This happened because the body's natural way of cooling off. Although, physical stress got the heart rate pumping moving, sweat formed and cooled off the body.

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# Abstract: Science and Engineering Fair of Houston

**1276**

## Bone Remineralization

Phoenix Shrubsall

Clear Creek ISD /Westbrook Intermediate School

Category:

Medicine and Health

My project is about re-mineralizing bones that have lost density. When astronauts go to space, they lose bone density because their bones do not get used as intensely as they do on Earth. This is because in space there is no gravity. I want to see if there is a way to make fragile bones strong again using vitamin D and calcium supplements. Vitamin D helps bodies absorb calcium, but it also helps bodies build stronger bones. Calcium is very important for bones too because calcium is what bones are made of. To test this process, I will first weaken bones using an acidic solution for two weeks, then I will try to re-mineralize them using vitamin D and calcium supplements. In the last phase of this project, I will test the bones' strength to figure out if there are differences in their density.

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# Abstract: Science and Engineering Fair of Houston

**1277**

## Implementing Classification Type Machine Learning Models to Predict and Intervene with Cardiovascular Diseases

Rishik Sharma

Tomball ISD/Creekside Park JH

Category:

Medicine and Health

Cardiovascular Disease remains the leading cause of death worldwide. Many existing diagnostic approaches rely on data and measurements that fail to capture the growth of Cardiovascular Health inside a person. This creates a critical need for predictive tools that can model disease progression rather than simply identifying risk at a single moment. The Researcher's project addresses this problem by developing a digital twin of the cardiovascular system, predicting possible future Cardiovascular issues using personal health data. This allows for the prediction of future cardiovascular stress and potential disease trajectories based on current conditions. The Researcher creates his Model by inputting a Heart Disease Dataset available at Kaggle.com that contains over 70 K individuals data including age, blood sugar, ecg , sex etc. This data is used to build several classification models, and then the best model is selected to predict cardiovascular disease. Then a web app is prepared where an end-user can input different parameters to predict future Cardiovascular Health issues. The Web app is created by using Joblib to save and load the Researcher's Python Files. Then the Researcher uses Hugging Face to host the web application. Then the Researcher uses Streamlit which helps create User Interface to the Web Application.

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# Abstract: Science and Engineering Fair of Houston

**1278**

## Does Color Effect Memory?

Isabella Ayala

Stafford SMSD/Stafford STEM Magnet Academy

Category:

Medicine and Health

In this project, I will test if color helps students retain information more efficiently. I think that students may benefit from teachers using color strategically to help them retain new information. I believe that students who receive new information in a specific color will remember more than students who receive new information in the traditional black and white format. As part of my study, three groups of students read short stories for one minute and then took a basic recall memory quiz. I compared their performance scores to see if color increased a student's ability to recall new information quickly. My findings indicate that students performed better when a text was in red.

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# Abstract: Science and Engineering Fair of Houston

**1279**

## Sub-Herb Paste

Carlee Blume, Jules Rawson

Galveston ISD/Crenshaw School of Environmental Studies

Category:

Medicine and Health

Our project is an all natural medicinal ointment that is meant to be applied directly to a variety of wounds on both humans, and theoretically domestic household animals. It is formatted and curated only by natural herbs and plant sources. Our intentions and goals for creating this project were to create a sufficient method of recovery for a target subject, and analyze the progress of healing in a certain time period. We were hoping to bring relief, alongside efficient healing time to wounds of many categories and specifications. Burns would be cooled and protected, cuts would be cleaned and blocked off from infection, scrapes would be shielded from germs, and other wounds. Alongside these, many of the ingredients inside, if taken regularly in recommended doses, could provide long term effects having to do with internal problems related to organs. Some of these being related to Cardiovascular problems, and digestive problems; all of these are aided by some of the ingredients. Going back to physical, open wounds, the ointment is neuroprotective and should prevent scarring in minor cases. Overall, we met majority of our goals not related to specific tests. A scrape was tested over a week long period on a human being and was completely recovered in due time. We still have yet to test it on animals, but theoretically it would be completely safe. Also, the ointment is safe to consume if necessary and even has dental benefits. In all, we met our goals and each part of the process was perfectly golden in the end.

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# Abstract: Science and Engineering Fair of Houston

**1280**

## **In Silico Simulation of Avirin Molecules Inhibiting Adenosine Deaminase Acting on RNA 1 (ADAR1) Protein Targeting Glioma**

Dhruva Seelam, Sachin Melanis, Rayan Rathi  
Stafford SMSD/Stafford STEM Magnet Academy

Category:

Medicine and Health

Gliomas are aggressive brain tumors that are difficult to treat effectively. Standard treatments like surgery, radiation, and chemotherapy often fail to stop the tumor from coming back. Recent studies suggest that a protein called ADAR1, which is involved in editing RNA, plays a major role in helping gliomas grow and survive, especially when it is overactive. In this project, we will investigate whether a small engineered protein called a Fynomer can bind to and possibly block the activity of ADAR1. If successful, this approach could offer a new strategy for slowing down glioma progression. To begin, we will use AlphaFold 3 to predict the 3D structure of ADAR1 based on its amino acid sequence, which we will obtain from UniProt. We will analyze key structural and functional features of the protein using Protter, and prepare the Fynomer structure using ChimeraX. Next, we will perform docking simulations using HDOCK to model how the Fynomer interacts with ADAR1. These simulations will help us predict how strongly the two proteins bind, and which specific amino acids are involved in the interaction. We expect that the Fynomer will bind with high affinity to ADAR1, suggesting it could act as an inhibitor. We will evaluate the results by comparing docking scores and visualizing how the molecules interact. If our hypothesis is correct, this study could support the development of new protein-based therapies targeting ADAR1, which may lead to more precise and less toxic treatments for glioma patients. It will also contribute to our understanding of how RNA editing is involved in cancer.

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# Abstract: Science and Engineering Fair of Houston

**1281**  
**Science Fair**

Category:

Medicine and Health

STACY ABIAZIE

Houston ISD/BCM Academy at James D Ryan - MS

Abstract In this investigation, I found out if spending time on artificial intelligence each day will increase the improvement on academic performance over time. My independent variable is the use of artificial intelligence. (AI tools that the students will study with.) My dependent variable is academic performance. (Whether the scores over time will increase or decrease.) My control variable is changing the amount of time. (Increasing the time limit.) My testable question examines the use of artificial intelligence whether it makes a change to the learning environment. It pays attention to the growth of the student population for AI and academic performance. My procedures are two students studying on AI thirty minutes on three days then adding thirty minutes more after the second and last three days. During the nine days, I will create a survey to see how well they have been focused with AI. The results were that both of the students had growth in their scores. This was important because it shows the score results which have been improved over time. Seeing the test results meant that the increasing scores show that the students can trust AI with their work without plagiarizing and can understand the explanation from the answer. The conclusion is that changing the amount of time spent on artificial intelligence will improve academic performance.

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# Abstract: Science and Engineering Fair of Houston

**1282**

## Effect of Near-Infrared Light on Heart Rate in *Daphnia magna* Under Sugar Stress

Amira Oueini

Clear Creek ISD /Westbrook Intermediate School

Category:

Medicine and Health

Near-infrared (NIR) light has gained attention as a possible tool for reducing cellular stress because it interacts with mitochondria, the parts of cells responsible for energy production. The purpose of this experiment was to determine if NIR light exposure can decrease the elevated heart rate induced by sugar exposure in *Daphnia magna*. This study evaluated the potential of NIR light as a non-pharmacological method for managing sugar-induced cardiovascular stress, using the *Daphnia*'s heart rate as a measurable indicator. Sixty *Daphnia* were randomly divided into 4 equal treatment groups: Control, group only exposed to NIR, group only exposed to sugar solution, group exposed to sugar followed by NIR. Each *Daphnia* was observed under the microscope, and a 15-second slow-motion video was recorded to count heartbeats. Heart rate was calculated by multiplying the 15-second count by four. Average heart rates were analyzed using one-way ANOVA and a Tukey post-hoc test to determine statistical significance. The results showed that sucrose exposure increased heart rate, while NIR alone didn't significantly change the heart rate compared to control. However, the *Daphnia* that was in sugar solution then exposed to NIR light had decreased heart rate compared to the sugar-only group. These findings support the hypothesis that NIR light can reduce sugar-induced heart rate elevation. Although this was a small-scale study, it suggests that NIR light may have the potential as a non-invasive method for reducing physiological stress, warranting further investigation in more advanced models.

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# Abstract: Science and Engineering Fair of Houston

**1283**

**how sleep and age affect memory**

Nikita Srikumar

Conroe ISD /McCullough Junior High

Category:

Medicine and Health

My Science Fair project studies how sleep and age affect memory. My research is important because memory plays a huge role on health and the brain and without a good memory life can be challenging. Sleep is important to memory because your memories develops and strengthen while you sleep. Age is also a big aspect of memory because, as you get older it is know for the part of the brain that holds memories to shrink. My hypothesis for the experiment was that older people and ones with less amount of sleep will have a harder time remembering things than younger people and ones with a healthy amount of sleep. To conduct this experiment, a survey was used with sleep, age and memory questions which I sent out to people of all ages and genders. After I collected my data I have found out that the ideal sleep time for long and short term memory is 6-9 hours, a good quality of sleep is better for both long and short term memory, Also, the older you are the better your memory gets. In conclusion my research has given me a better understanding of how age and sleep affects memory. In the future I would like to improve my experiment and test more reasons of what affects memory. My research can be used to help people be more aware of there sleep and brain activity.

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# Abstract: Science and Engineering Fair of Houston

**1284**

## EEG Proxy Focus and Heart Rate Variability Study

Leyla Ozkilic

Charter/School of Science and Technology Advancement -MS

Category:

Medicine and Health

Title: EEG Proxy Focus Tasks and HRV Study This project investigated how heart activity changes during stress and relaxation by measuring heart rate and heart rate variability (HRV). A heart monitoring device was built using an Arduino UNO R3, a fingertip pulse sensor, and it showed the results on the computer screen. The sensor detected heartbeats, and the Arduino calculated beats per minute (BPM). The device displayed real-time results on the screen. Three test conditions were performed on the same subject: resting quietly, completing mental math problems to create stress, and practicing slow breathing for relaxation. Each condition lasted two minutes, and BPM and HRV data were recorded. The results showed that during mental math, heart rate increased while HRV decreased. During slow breathing, heart rate decreased while HRV increased. These patterns indicate that HRV changes more noticeably than heart rate when the body responds to stress or relaxation. The experiment supported the hypothesis that stress lowers HRV and relaxation raises HRV. This project demonstrates how engineering and biology can be combined to safely measure real physiological responses.

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 Vertebrate animals       microorganisms       rDNA       tissue

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- yes       no

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- yes       no

4. This project is a continuation of previous research.

- yes       no

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- yes       no



# Abstract: Science and Engineering Fair of Houston

**1285**

## **HIV/AIDS AIDS Acquired Immunodeficiency Syndrome - HIVPR - HIV protease - 1XL2**

Inaaya Jiwani, Msgana Tekle

Harmony Public Schools - South District/Harmony School of Excellence - MS Sugar Land

Category:

Medicine and Health

This study focuses on the computational screening of 200 natural organic compounds obtained from Selleck Chemical LLC against the catalytic (active) site of the target receptor. The hypothesis proposes that this focused in-silico approach will identify one or more novel inhibitors with stronger binding affinity, higher specificity, and lower predicted toxicity compared to existing therapeutic agents. By targeting the receptor's catalytic pocket, the research aims to uncover new, effective, and safer candidate molecules that could serve as promising leads for future drug development. The outcomes of this work may contribute to advancing therapeutic options and improving disease treatment strategies.

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# Abstract: Science and Engineering Fair of Houston

**1286**

## **DOES THE TYPE OF CONTAINER AFFECT QUALITY OF MILK AT ROOM TEMPERATURE?**

DHANVI KAMMA

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Medicine and Health

Milk is an important source of protein and essential nutrients. It is normally stored in a refrigerator at 37°F because dairy products spoil quickly at room temperature. My experiment investigates whether the type of container affects the quality of milk when stored at room temperature. I poured 400 mL of almond milk into four different types of containers—metal, glass, plastic, and paper—and stored them for 6 days. During storage, lactose in the milk converts into lactic acid, which can be measured using pH paper. The results showed that the milk stored in metal and glass containers maintained a pH of about 6, while the samples in paper and plastic containers became more acidic. These findings support the use of glass and metal containers, which are non-toxic, more stable, and fully recyclable. They may be especially useful for storing liquids in remote areas without refrigeration.

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# Abstract: Science and Engineering Fair of Houston

**1287**

## **Modeling pH-Responsive Drug Release Using Bromothymol Blue and a Hydroxyethyl Cellulose Matrix**

Ava Zheng

Conroe ISD /McCullough Junior High

**Category:**

Medicine and Health

Drug delivery, the method and process of administering a medical compound to achieve a therapeutic effect, is a significant part of the medical field, as it focuses on the precision of the timing and location where drugs are delivered. When drugs are released in the wrong places, there can be serious unintended side effects. This project focuses on the use of one material, hydroxyethyl cellulose (HEC), to explore potential advances in drug delivery using bromothymol blue, a pH indicator, to substitute as the drug. To represent parts of the body, solutions of pH 2.0, 7.0, 7.8, and 8.5 were used to test the release of bromothymol blue from a hydroxyethyl cellulose matrix and the color of the solutions were recorded over a five hour period using a colorimeter. The results revealed that while the “b” value of the color of the pH 2.0 solution only made up about 27.36% of its control solution, the pH 8.5 solution was almost the same color as its control solution and made up 94.99% of its “b” value. In this experiment, the “b” value represented how blue or yellow the solution was, with positive values indicating more yellow and negative values indicating more blue. This study successfully established the correlation between the pH of body parts and the amount of drug released using a hydroxyethyl cellulose matrix, exploring the potential use of HEC in further medical advances.

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# Abstract: Science and Engineering Fair of Houston

**1288**

## Heart of a Swimmer

Ari Alcantar

Clear Creek ISD /Seabrook Intermediate School

Category:

Medicine and Health

The strokes of swim take up different amounts of energy an example would be if someone was good at long course or has lots of stamina, they would be good at fifty-meter butterfly because it takes up lots of stamina. Or another example is someone with high speed, but low stamina freestyle or backstroke would be good for them. This experiment was designed to test the hypothesis that If there is one stroke that would have the lowest heartrate it would be backstroke because the subject would constantly be able to breathe not having to be underwater. The difference of the highest average beats per minute was butterfly, with a heartrate difference between pre-heartrate and post-heartrate was 47.4. The difference between pre-swim and post swim heartrate for freestyle was 44.12, having the second highest difference. The difference for backstroke was 23 beats per minute, and the lowest difference was breaststroke with a difference of 18.44. The data showed that breaststroke used the least amount of energy and butterfly used the most amount of energy. Although my prediction was close, only having a difference of 6.88 between the one I predicted and the stroke that had the lowest BPM. There are multiple errors that may have occurred in this experiment, one of them being consistency. Perhaps having a longer recovery period prior to starting the next swim set or trial. In future experiments I would include a higher diversity of subjects, bringing in more consistency.

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# Abstract: Science and Engineering Fair of Houston

**1289**

## **The Price of Pain: The Difference in Bioaccessibility of Branded vs Generic Pharmaceutical Painkillers**

Himesh Mallula

Pasadena ISD/PEARLAND JUNIOR HIGH SCHOOL, WEST - MS

Category:

Medicine and Health

Analgesics represent a cornerstone of modern medicine and a dominant sector within the global pharmaceutical industry. Despite the pharmacological equivalence of branded and generic formulations, market dynamics are heavily skewed by consumer psychology, brand loyalty, and marketing strategies. This paper examines the disparity in purchasing behaviors, highlighting a University of Chicago study which reveals that while average consumers opt for branded painkillers 71% of the time, informed medical professionals do so only 10% of the time. Although generic drugs account for the majority of prescription volume due to significant price reductions (80–85%), branded products continue to command nearly 80% of market revenue through premiums ranging from 500% to 1000%. The study concludes that this asymmetry results in a collective consumer overpayment of approximately \$8–10 billion annually, characterizing this expenditure as a substantial "ignorance tax" on the unspecialized public.

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# Abstract: Science and Engineering Fair of Houston

**1290**

## Impact of Stress on Recurrence of Cancer

Janan Atakova

Charter/SST - Champions College Prep - MS

Category:

Medicine and Health

This research will focus on the impact that stress has on breast cancer recurrence. This research is important to understand if there is a relationship between emotional and physical stresses, or both, and the risk of having a recurrence of breast cancer. The information for this study has been obtained from reputable sources including peer-reviewed journals and cancer databases and has been organized in charts, graphs, and tables to be able to easily identify relationships and differences between the different types of stress and breast cancer. The findings indicate that women aged between 25 and 69 years were at a significantly higher risk of being diagnosed with breast cancer, while the overall mortality rate was significantly lower due to increased medical advances, improved diagnostic techniques, and increased access to quality medical care. Additionally, there is evidence to suggest that alcohol consumption and stress could contribute to breast cancer development and/or recurrence.

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# Abstract: Science and Engineering Fair of Houston

**1291**

## **HYPERTENTION ACE - Angiotensin-converting enzyme-1086**

Demilade Adebisi, Chikosi Nnabuife

Harmony Public Schools - South District/Harmony School of Excellence - MS Sugar Land

**Category:**

Medicine and Health

Hypertension affects approximately 1.4 billion people worldwide and is a major risk factor for cardiovascular and renal diseases. Dysregulation of the renin–angiotensin–aldosterone system (RAAS), particularly overactivation of angiotensin II type 1 (AT1) receptors and angiotensin-converting enzyme (ACE), contributes significantly to resistant hypertension. Although current antihypertensive therapies are effective, many patients experience limited efficacy or adverse effects, highlighting the need for safer and more effective alternatives. This project aims to identify novel natural inhibitors targeting the catalytic site of a hypertension-related receptor using computational molecular docking. A library of 2,504 natural organic compounds from plants, animals, and bacteria was obtained from Selleck Chemicals LLC, from which 200 compounds were selected for virtual screening. Docking simulations were performed using AutoDock Vina with receptor structures obtained from the RCSB Protein Data Bank and prepared using MGL Tools. Binding affinities were analyzed and ranked using custom Python scripts. The central hypothesis is that computational screening will identify inhibitors with stronger binding affinity, higher specificity, and lower predicted toxicity than existing drugs. Several compound classes, including bioactive peptides, flavonoids, and phenolic acids, showed promising interactions. Top candidates included dioscin, enoxolone, glycyrrhizic acid, hesperidin, and gypenoside-containing compounds. These findings support natural compounds as promising antihypertensive leads.

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- yes       no



# Abstract: Science and Engineering Fair of Houston

**1292**

## The Effect of Sunscreen Type on the Survival of Bacterial Colonies

Madeline Mark

Clear Creek ISD /League City Intermediate School

Category:

Medicine and Health

The purpose of this experiment is to determine which type of sunscreen is the most effective at protecting bacterial colonies against UV light. My hypothesis is that if bacterial colonies are treated with sensitive skin sunscreen, they will have a greater chance of survival after exposure to UV light. *S. Marcescens* bacterial colonies were plated on nutrient agar plates. Using plastic wrap to cover the top of the plates, five different types of sunscreens were tested: reef-safe, sport, mineral, budget, and sensitive skin sunscreens. Each type of sunscreen was applied evenly to agar plates, and aluminum foil was used to cover half of the plate, serving as the control. Each bacterial plate was exposed to a UV lamp for 3 minutes and then placed in an incubator. Colonies were counted after 24 hours, and percent survival was calculated. Overall, the sensitive skin sunscreen had the highest percent survival, at 90.62%, and the budget sunscreen had the lowest percent survival, at 86.81%. The reef-safe sunscreen had the highest number of colonies grown; however, it did not have the highest survival rate compared to the control and UV-exposed side. The results supported my hypothesis because the sensitive skin sunscreen had the highest percent survival when exposed to UV light. Since the results of this experiment indicate that the sensitive skin sunscreen was the most protective, it would be beneficial to examine other types of sensitive skin sunscreens to determine if the pattern is consistent across the category or varies by sunscreen brand.

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# Abstract: Science and Engineering Fair of Houston

**1293**

## Designing a Trispecific Antibody to Combat Acute Myeloid Leukemia

Rebecca Yu, Ximin Zhang

Sartartia Middle School /Fort Bend ISD

Category:

Medicine and Health

Our plan for this project is to create a protein that could potentially fight off a specific type of cancer cells known as Acute Myeloid Leukemia, as efficiently or possibly more efficient than most known methods of fighting the disease, such as chemotherapy and radiation therapy. Since these listed methods often include fatal or life-threatening side effects, our proposed protein will eliminate all of those potential risks when fighting the cancer. We will build beta versions of this said protein in an computer program named AlphaFold that will model all of our protein's functions and properties in fighting the lethal cancer cells. After this, we will use another computer simulation to demonstrate and effectively test the beta protein's usefulness and collect data on how well its unique functions preform. We will then compare all data collected on the models of our protein before we finalize one design that utilizes all the properties that prove to be the most efficient and that we will ultimately present. Our goal for this project stems from our hope that this project will bring awareness to topics of cancer and further pave the way towards a viable solution or cure to said cancer.

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# Abstract: Science and Engineering Fair of Houston

**1294**

## Blood Spatter Experiment

Arwa Ateia, May Nguyen, Cana Curley

Harmony Public Schools - North District/Harmony School of Excellence-Houston

Category:

Medicine and Health

Our blood spatter experiment investigates how height impacts a blood spatter's size/diameter. Simulated blood was released from a dropper at different heights for our experiment. Measurements of the blood diameter were recorded and analyzed. These results demonstrate that increased height produces larger stain diameters. These findings support established principles of bloodstain pattern analysis and illustrate how physical variables influence spatter information. This experiment provides insight into the scientific methods used in forensic investigations and highlights the importance of controlled experimentation in interpreting bloodstain evidence.

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# Abstract: Science and Engineering Fair of Houston

**1295**

## Does color matter? Origin of Rainbow Medicine

Riyanna Varghese

Conroe ISD /McCullough Junior High

Category:

Medicine and Health

The purpose of this project was to find out whether the color of light affects how deeply it can penetrate a skin-like material and to determine which color penetrates the deepest to explore their potential use in the field of "Rainbow Medicine." It was predicted that red light would penetrate the deepest because it has a longer wavelength and is absorbed and scattered less than colors with shorter wavelengths. To test this idea, a white LED flashlight(sr12 5000k) was used along with colored filter papers including red, orange, yellow, green, blue, and violet. Agar gel was used as a model for human skin . A light meter measured light intensity in foot candles. Measurements were taken first without the agar gel in place and then with the agar gel placed in the path of the light. The percentage of light that passed through the agar gel was calculated for each color by comparing the two measurements. The results showed that red light had the highest percentage of light passing through the agar gel at about 71.3%, followed closely by orange and yellow light. Green, blue, and violet light had lower percentages, with violet passing through the least at about 66.1%. These results supported the prediction that longer-wavelength light, such as red, penetrates deeper into skin-like materials than shorter-wavelength light. This experiment helps us understand how different colors of light interact with skin like materials, which could be useful in fields like "rainbow medicine," where light is used to treat or diagnose health problems depending on how deep they can reach into tissues.

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# Abstract: Science and Engineering Fair of Houston

**1296**

## Determinants of Mortality after Seizures

Ayurveda Samskrita, Atma Vedanti

Private/THE HONOR ROLL SCHOOL - MS

Category:

Medicine and Health

Background: Seizures are among the commonest neurological conditions that prompt calls to emergency responders. Seizures are associated with a significant risk of mortality. It is important to know which factors predict or contribute to mortality after a seizure, so that patients at higher risk of death can be identified and treated appropriately to reduce the mortality rate. Methods: All calls coming into the centralized dispatch center of the Emergency Medical System of the state of Andhra Pradesh, India, for seizures over 14 days were followed up. Data related to the patient, medical history and emergency care given were obtained from the first responders. A follow-up call was made a week later to determine the patient's condition. Using Excel, summary statistics were calculated for this data. Logistic regression (online tool at [www.statscalculators.com](http://www.statscalculators.com)) was used to identify the variables associated with mortality separately in the adult and pediatric subsets of this data. Results: The mortality at follow-up was relatively high, and higher in adults (12.74%) than in children (6.37%). Regression analysis showed that a longer time taken by the ambulance to reach the scene and unresponsiveness of the patient were predictive of higher mortality among adults ( $p < 0.0005$ ). In children, older age and unresponsiveness were strongly predictive of higher mortality ( $p \ll 0.0005$ ). Conclusions: Emergency calls for seizures represent a high-risk situation with a significant mortality rate. This mortality may be improved by prioritizing care for unresponsive patients, older patients and shortening the time taken by EMS to reach the scene.

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# Abstract: Science and Engineering Fair of Houston

**1297**

## How Does Color Affect Memory

Reethi Aswinn

Conroe ISD /McCullough Junior High

Category:

Medicine and Health

Color plays a major role in our lives, after all, hues and shades are always there, no matter where you look. My project, 'How Color Affects Memory Recall Over Time', studies how the use of pigmentation can be used to study efficiently and effectively. I experimented on which colors can improve memorization of simple vocabulary by sending a quiz to 100 participants with consent. The participants, aged from 10-14 years old, all had similar IQ and grades to maximize accuracy. When taking the quiz, they would have 90 seconds to memorize an easy 20-word list in their designated color (either red, yellow, green, blue, or black), then take a quick, 5-question pre-algebra quiz. Afterwards, they would have another 90 seconds to type as many words as they could remember. The data was then inputted manually (by me) into a Google spreadsheet and multiple graphs, and was pasted on my triboard.

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# Abstract: Science and Engineering Fair of Houston

**1298**

## How Does Different Types of Music During Meals Affect Heart Rate?

Naifah Habib

Conroe ISD /McCullough Junior High

Category:

Medicine and Health

The heart is functioned by the autonomic nervous system which slows or speeds up heart rate. It can be affected by music and other aspects such as eating. My project tested about different types of music being played while eating and their effect on heart rate. Three participants went through three trials each. Per trial, each person ate three Ritz crackers in silence, with calm music, and with fast music. Heart rate was measured using a pulse recorder and was recorded before and after each test. The results revealed that eating in silence kept the heart rate steady/barely change, eating with calm music gradually lowered the heart rate, and eating with fast music gradually raised the heart rate, showing me that different music suggestions while eating can significantly affect cardiovascular health.

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# Abstract: Science and Engineering Fair of Houston

**1299**

## **Sugar Content Reasearch**

Mariam Agunbiade

Harmony Public Schools - South District/Harmony School of Innovation Katy

**Category:**

**Medicine and Health**

N/A

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# Abstract: Science and Engineering Fair of Houston

**1300**

## **On the Effects of Shape Metal Alloys/Polymers and Its Effects on Relieving the Pain and Reducing the Risk from Percutaneous Endoscopic Gastrostomy**

Joshua Ghattas, Nelson Tang, Kevin Liu

Spring Branch ISD/Spring Branch Academic Institute

Category:

Medicine and Health

The percutaneous endoscopic gastrostomy (PEG) procedure is highly prevalent, with an estimated 160,000 to 200,000 procedures performed annually in the United States. Globally, this figure likely exceeds one million cases each year, especially in developing nations where less painful alternatives might be unavailable. The widespread application of this procedure underscores a significant opportunity to improve the quality of life for millions of patients by mitigating associated pain. The goal is to reduce the peak sensation of pain, even if the total energy expended is equivalent, using Shape-Memory Alloys (SMAs). In an experimental evaluation designed to optimize this approach, it was determined that a tube fabricated from the Nickel-Titanium Alloy (Nitinol) exposed to a temperature of 40° Celsius was most effective in achieving the desired pain reduction. This finding presents a promising avenue for enhancing patient comfort during a common and essential medical procedure.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- Human participants       potentially hazardous biological agents  
 Vertebrate animals       microorganisms       rDNA       tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

- yes       no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

- yes       no

4. This project is a continuation of previous research.

- yes       no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

- yes       no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

- yes       no



# Abstract: Science and Engineering Fair of Houston

**1301**

## **Chronotherapeutic Realignment: Optimizing Medication Efficacy in Response to Orbital Circadian Disruption**

Sri Magathala

Cypress-Fairbanks ISD/Smith - MS

**Category:**

**Medicine and Health**

This research investigates the physiological challenges of administering medication in Low Earth orbit, specifically on the International Space Station (ISS). On Earth, the human body operates on a 24-hour circadian rhythm, specifically an internal biological clock that regulates hormone release and hepatic drug metabolism. Chronotherapy relies on this rhythm to maximize drug efficacy and minimize toxicity. However, astronauts experience 16 sunrise/sunset cycles daily, leading to significant circadian misalignment. This study utilized existing NASA NSLP health databases and pharmacokinetic models to analyze how rapid light and dark cycles affect the timing of metabolic enzymes. The data suggests that when the biological clock is disrupted, the therapeutic window for specific medications shifts or narrows. My results indicate that current terrestrial dosing schedules may be suboptimal for spaceflight, potentially leading to decreased drug performance or increased side effects. These findings emphasize the need for personalized chronotherapeutic protocols to ensure astronaut health during long-duration space missions.

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# Abstract: Science and Engineering Fair of Houston

**1302**

## Uncovering the effects of blue light

Arely Gutierrez

Alief ISD/Houston Academy

Category:

Medicine and Health

This project was done to test the effects in blue light. The purpose of this project is to see if it helps or hurts the human eyes due to the fact that many people use screens for long periods of time on a daily basis and I think blue light is a quick but useful thing to change in your technology settings to avoid as much damage to the eye. I did an experiment in which I had people read off of two screens, one that ejects blue light and one that doesn't. I noticed the decrease of blinking when the blue light was on which over time can cause dry eyes unlike the normal non blue light screen and that has led me to the conclusion that blue light is indeed harmful to the human eye and it's better not to use it.

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- yes       no



# Abstract: Science and Engineering Fair of Houston

**1303**

## Delta Protein Atlas

Adel Sisy

Home School/Homeschool

Category:

Medicine and Health

Delta Protein Atlas (DPA) is a computational framework and interactive web atlas that translates human proteome variation into mutation-level structural and functional hypotheses for therapeutic discovery. DPA integrates public variation data, deep learning protein structure prediction, ortholog-based conservation analysis, and protein binding site level characterization to connect genetic disease associations to specific proteins and to interpretable mutation function descriptions. The framework begins with curation of the latest National Center for Biotechnology Information (NCBI) dbSNP database, which provide nearly 1.2 billion single nucleotide polymorphisms. After 4 novel stages of variant filtration, the resulting disease-focused dataset contains 223,450 variants linking 13,314 genetic diseases to 39,270 proteins and 2,104,391 amino acid mutations, enabling bidirectional mapping from disease to protein and protein to disease with evidence drawn from 23,604 research papers. To establish protein structural context, structures are generated at proteome scale using state-of-the-art protein models, with model quality assessed by evaluation across global similarity and quality metrics. This identifies ESM3-7B as the strongest overall performer, and it is used to construct the final structure set for the atlas. Mutation function is inferred by integrating evolutionary conservation, protein binding site, and physicochemical data. DPA provides novel mutation-level function descriptions that unify conservation, binding site proximity, druggability, and impact scoring, and it provides candidate binding molecules for predicted binding sites to aid downstream medicinal chemistry. By combining large-scale variant evidence with deep learning structure modeling and mutation function hypotheses, DPA enables systematic prioritization of proteins, mutations, and binding sites for mutation targeted protein-ligand intervention design.

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# Abstract: Science and Engineering Fair of Houston

**1304**

## Evaluating Enzymatic Gluten Breakdown

Adriana Reeves

Clear Creek ISD /Seabrook Intermediate School

Category:

Medicine and Health

Celiac disease is a severe autoimmune disease in which when gluten is consumed the immune system damages the villi in the small intestine. The only clinically accepted treatment is to eat strict gluten-free. If gluten and enzymes are incubated together, bromelain will have the greatest gluten breakdown. Water soluble gluten and enzyme particles were incubated together for 2 hours at 37 degrees Celsius. The concentrations of both the gluten and the enzyme were used to create equal molarity in the samples. This process was repeated in alcohol. Pepsin broke down 76.6 percent of the gluten soluble in water, papain broke down 37.1% of the gluten soluble in water, and bromelain broke down 36.5% of the gluten soluble in water. All samples in which alcohol soluble gluten particles were used, resulted in 5% or less breakdown indicating the enzymes got denatured. The hypothesis was not supported because pepsin broke down more gluten than bromelain. Pepsin should be taken instead of AN-PEP an individual with celiac disease or gluten intolerance is accidentally exposed to gluten. However, until an enzyme that can break down 100 percent of gluten is discovered, celiac disease can only be treated with a life-long strict gluten free diet.

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