Abstract: Science and Engineering Fair of Houston

1066

Turmeric: The DNA Shield

Tanvi Bussu

Category:

Biochemistry and Microbiology

Oxidative stress on human cells is the cause for cellular damage like mutations and dysfunction while also being a cause for multiple diseases. This happens when the reactive oxygen species (ROS) outnumbers the body's defenses; however, antioxidants can neutralize the ROS by donating electrons, which is what this experiment is about. The hypothesis is if human DNA is exposed to oxidative stress from hydrogen peroxide, then adding a natural antioxidant like turmeric will reduce visible and measurable DNA degradation compared to DNA exposed to hydrogen peroxide alone, because antioxidants can neutralize reactive molecules that damage DNA strands. In this experiment, human DNA was extracted from saliva by using a solution that breaks down cell membranes and releases DNA. The sample was divided into 3 conditions: a control, hydrogen peroxide, and hydrogen peroxide plus a turmeric extract. Isopropyl alcohol was added to precipitate the DNA. The DNA was compared qualitatively by using a scale of 1-5, with 1 being the most intact and 5 being the most damaged. It was also analyzed quantitatively by using the mL markings on the test tubes to determine the height of the precipitated DNA layer. This process was repeated two more times to get reliable results. While analyzing results between the trials, minor variability was noticed because of the saliva samples. However, there was still a reoccurring pattern in the data. Results showed that DNA exposed to hydrogen peroxide alone exhibited more damage than the control test tubes. The DNA samples with hydrogen peroxide and the turmeric extract improved the DNA's integrity when compared to the hydrogen peroxide alone. Overall, the hypothesis was partially correct because the turmeric protected the DNA but still had small amounts of fragmented DNA. Future improvements could be made to this experiment by using more advanced technology in a lab, working with different amounts of turmeric, or extracting DNA from multiple people.

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Abstract: Science and Engineering Fair of Houston

1067

Alzheimer's disease -ACHE - Acetylcholine esterase -4EY7

Category:

Biochemistry and Microbiology

Sarah Saif, Saina Burney

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

This study used in silico molecular docking to screen 200 natural organic compounds against the catalytic site of Acetylcholinesterase (AChE; PDB ID: 4EY7) in order to identify potential inhibitors for Alzheimer's disease treatment. The receptor structure was prepared using MGL Tools, and all docking simulations were performed with AutoDock Vina. The compound library—sourced from Selleck Chemicals—was processed and screened through automated batch scripts, and the resulting binding affinities were analyzed using custom Python tools. Several compounds demonstrated strong predicted inhibition, with multiple ligands showing binding affinities lower than –8 kcal/mol, placing them in the "more promising" category for AChE inhibition. Top candidates included Dioscin, Enoxolone, Glycyrrhizic Acid, Limonin, Ursolic Acid, and Naringin Dihydrochalcone. These findings suggest that naturally derived molecules may offer safer, more effective AChE inhibitors and represent viable leads for future experimental validation. Planned future work includes acquiring the top 15 candidates and testing them with an AChE enzyme activity assay to confirm their inhibitory potential.

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Abstract: Science and Engineering Fair of Houston

1068

The Effects of Amylase on Glycemic Control

Category:

Biochemistry and Microbiology

Zoa Arsiwala

Conroe ISD /Knox Junior High

The purpose of this experiment is to determine whether the enzyme, amylase, can be used to test how plant extracts slow starch digestion and if it is effective. The hypothesis states that 'If amylase could be used to test how plant extracts—cinnamon, fenugreek, and green tea—slow starch digestion, then diabetes management would become easier, because we could use natural resources to control sugar levels and help diabetics.' Managing post-meal blood glucose levels is a major challenge for many individuals with diabetes, especially type two, and slowing starch digestion may help reduce surges in blood sugar. In this experiment, starch digestion was observed using an amylase solution mixed with starch and three different plant extracts. A control sample without plant extract was compared to samples containing cinnamon, fenugreek, and green tea. Iodine was used at regular time intervals, every two minutes, to indicate the presence or absence of starch through color changes. The reaction mixtures were monitored over time, and the amount of starch digested after round five, the ten minute mark, was recorded and compared among all treatments. The results revealed differences in starch digestion times among the plant extract treatments compared to the control. The hypothesis was supported, as the presence of plant extracts reduced amylase activity. These findings suggest that natural plant-based amylase inhibitors may help naturally regulate glucose absorption. Such information could benefit diabetes prevention and management strategies by providing safer, alternatives to synthetic and expensive medications, like insulin.

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Abstract: Science and Engineering Fair of Houston

1069

Natural fruit preservation comparison

Category:

Biochemistry and Microbiology

Jesus Palacios, Jenni Palma

Alief ISD/Houston Academy

This experiment tested which natural ingredient works best to prevent apples from spoiling at room temperature. We tested this using three natural ingredients: garlic, vinegar, and honey. We prepared four apple slices: one control (untreated), one with garlic, one with vinegar, and one with honey. After one week, the slices were evaluated for mold, color, and texture. Garlic was the most effective ingredient because it left the apple slice with little discoloration and no mold. Vinegar was the least effective ingredient because it only made the apple slice more acidic and did not provide more protection against spoilage. Our results showed that garlic is the most effective natural preservative and helps us know which substances can help keep food from spoiling the longest.

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Abstract: Science and Engineering Fair of Houston

1070

The Effects of Seasonings on the Growth of E. coli

Annika Balaji

Clear Creek ISD /Westbrook Intermediate School

Category:

Biochemistry and Microbiology

Food spoilage is common around the world, and there are many problems that come from it. Including contributing to climate change, economic loss, and wastage of natural resources. Learning to sustain and preserve food against bacteria (a major cause of food spoilage) in a natural way is a small step in the right direction to decreasing food wastage. Thus, the current study will focus on testing household seasonings against the growth of Escherichia coli (E. coli). We will culture E. coli (Escherichia coli) on an LB plate, wait ten minutes and then add paper chads to the four quadrants of the plate. To the paper chads different concentrations of the spices will be added to test if the colonies form close to the chads or if the chads keep the bacteria from growing close to it. The plates will be incubated overnight (24 hours) at 37 degrees Celsius. Then the amount of growth will be measured according to the closeness to the chad. The expected results of this study are that turmeric will result in the least amount of growth in the bacteria because the active compound curcumin functions as an antibacterial agent which breaks down the cell membrane. And the expected result of the lemon juice is that it will do the worst out of the materials because it is a liquid and bacteria thrive in moist environments.

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Abstract: Science and Engineering Fair of Houston

1071

The Wonders of Protein Folding: Investigating How Gelatin Stability Is Affected by Titanium Dioxide Nanoparticles and Marine Polyphenols

Lauryn Wallace

Conroe ISD /Peet Junior High

Category:

Biochemistry and Microbiology

Introduction: Protein folding is vital for healthy cell function. When proteins misfold, they can form harmful clumps linked to diseases such as Alzheimer's, Parkinson's, cystic fibrosis, and diabetes. Metal nanoparticles—used in foods, cosmetics, medicines, and electronics—can contribute to misfolding because their small size allows them to interact with and destabilize proteins. Marine polyphenols from seaweed have antioxidant properties and may help protect protein structure. This project tested whether Wakame extract, a source of these polyphenols, could reduce protein aggregation and improve clarity in gelatin mixed with titanium dioxide (TiO_2), a common nanoparticle additive. Problem: Does Wakame seaweed extract reduce turbidity in gelatin containing TiO_2? The hypothesis predicted that Wakame would lower turbidity compared to TiO_2 alone. Procedure: Three samples were prepared: gelatin only, gelatin + TiO_2, and gelatin + TiO_2 + Wakame extract. Each was tested in six trials. Fiji (ImageJ) was used to measure mean intensity, standard deviation, and mode, which were then converted into turbidity values (NTU). Results: Gelatin alone had the lowest turbidity (9.68 NTU) and the highest mean intensity (~234–242), showing clear solutions. Gelatin + TiO_2 had extremely high turbidity (175.99 NTU) and very low mean intensity (~2–4), showing strong opacity. Gelatin + TiO_2 + Wakame extract remained highly turbid (172.17 NTU) with only a slight improvement over TiO_2 alone and showed more variability. Conclusion: The experimental data only slightly supports the hypothesis. Gelatin with TiO_2 and Wakame extract remained highly turbid (average ~172.17), only slightly lower than TiO_2 alone. Future work should test a wider range of Wakame concentrations, explore other natural additives, and use molecular‑level techniques (e.g., spectroscopy or light scattering) to better understand how nanoparticles affect protein structure.

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Abstract: Science and Engineering Fair of Houston

1072

How do Different Types of Sugar Affect the Fermentation Process?

Carmen Garcia Nguyen, Victoria Han, Emily Cheng

Fort Bend ISD /Sartartia Middle School

Category:

Biochemistry and Microbiology

The purpose of this experiment was to determine if healthier sugar alternatives, specifically monk fruit, honey, and cane sugar, affect the fermentation rate of sourdough. This project was chosen to investigate if alternatives to refined sugar, which is linked to long-term health issues like heart and liver damage, can still support effective fermentation. Sourdough starters were created using 100 grams of water and flour, 1/2 teaspoon of yeast, and the designated sugar type (monk fruit for glucose, honey for fructose, and cane sugar for sucrose). Each batch fermented for five days in ambient conditions, and progress was measured by carbon dioxide (CO_2) production in parts per million (ppm). Results showed that cane sugar produced the highest average CO_2 at 4,468 ppm, showing the most active fermentation. Honey followed with 4,076 ppm, while monk fruit produced the lowest average at 3,764 ppm. The presence of CO_2 also suggests dough acidification, which improves digestibility and gut health. In conclusion, this experiment proved that sucrose (cane sugar) has the most significant effect on fermentation speed compared to the other sugars tested. While alternatives like honey and monk fruit do support fermentation, they do so at a slower rate than traditional refined sugar.

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Abstract: Science and Engineering Fair of Houston

1073

Do Simulated Germs Stay On A Toothbrush When Rinsed With Water, Saltwater, or Mouthwash?

Chi Li, Aiden kurian

Stafford SMSD/Stafford STEM Magnet Academy

Category:

Biochemistry and Microbiology

Our project explores which liquid—water, saltwater, or mouthwash—is best at rinsing simulated germs off a toothbrush. We used yellow dyed water to represent germs and applied it to toothbrushes, then rinsed each one with a different liquid. After drying them on a towel, we looked at how much dye was left behind to see which rinse worked best. We repeated the process five times for each liquid to make sure the results were consistent. Our hypothesis was that water would be the most effective since it's commonly used to rinse off microbes. The results helped us figure out which everyday rinse does the best job at cleaning toothbrushes.

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Abstract: Science and Engineering Fair of Houston

1074

Designing a biodegradable plastic using home based products

Akshara Malepati

Fort Bend ISD /First Colony Middle School

Category:

Biochemistry and Microbiology

This project investigates the home-based design and development of biodegradable plastic using corn flour and starch as natural biopolymers. With global plastic production now exceeding 430 million tons per year and roughly 83 % of plastics produced in 2020 ending up as waste — approximately 360 million tons — plastic pollution has become a major environmental crisis. An estimated 8–11 million tons of plastic enter the world's oceans annually, choking marine life and persisting for centuries. This study prepared multiple formulations by varying concentrations of starch, corn flour, glycerin, acetic acid, and water. Each mixture was heated to trigger gelatinization and polymerization, then molded and dried. Resulting samples were tested for tensile strength, elasticity, durability, and early biodegradation. Higher starch increased structural strength, while glycerin enhanced flexibility. The optimized bioplastic displayed a balanced combination of durability and degradability — offering a tangible, small-scale step toward a global shift from persistent plastics to sustainable, biodegradable materials.

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Abstract: Science and Engineering Fair of Houston

1075

Why Does the Human Body Age?

Keidas Budhathoki

Conroe ISD /McCullough Junior High

Category:

Biochemistry and Microbiology

As humans age, our cells gradually lose efficiency due to processes such as telomere shortening, oxidative damage, and cellular senescence. This experiment focuses on oxidative damage, which occurs when reactive oxygen molecules stress and weaken cells. To model this process in a simple and observable way, I used apple slices and their natural tendency to turn brown when exposed to oxygen. During the investigation, I noticed that the apples browned much more slowly than I expected. Even the slices exposed to air took longer to show visible browning. This suggests that oxidation can happen at different speeds depending on environmental conditions such as temperature, humidity and how fresh the apple is. Despite the slower browning, the overall pattern remained consistent. The untreated apple browned the fastest, while the zip-lock bag was a bit slower to brown and the lemon juice covered stayed fresh the longest. These results support my hypothesis that certain substances can slow oxidation. The liquid that reduced browning acted like protective barriers, similar to how the body helps protect the cells. Although apples and humans are very different, this experiment demonstrates an important idea: oxidation affects all living tissues. By observing browning in apples, we can better understand how oxidation contributes to aging in the human body and how certain substances (medications) can slow down oxidation.

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Abstract: Science and Engineering Fair of Houston

1076

Home Sweet Bacteria!

Category:

Biochemistry and Microbiology

Omar Sorathia

Conroe ISD /Knox Junior High

Every day, humans touch countless surfaces without knowing when to wash their hands. This frequent contact, and the lack of cleanliness of the surface can turn surfaces into 'hotspots' where bacteria grow and collect over time. The purpose of this experiment was to determine which household surface would grow the most bacteria in an agar petri dish. The hypothesis states that if the phone screen is swabbed, then it will grow the most bacteria because phone screens are touched the most, and they are rarely cleaned. In this experiment, the researcher swabbed different surfaces (phone screen, freezer handle, doorknob, and TV remote) with a sterile cotton swab and transferred the bacteria to an agar petri dish. The petri dishes were kept in a fume hood for 4 days for proper bacterial growth. The control group involved swabbing a cotton swab directly onto a petri dish to ensure no contamination. The phone screen grew the most bacteria (4 colonies), supporting the hypothesis and being the dirtiest surface. The freezer handle, though it only grew one colony, was the second dirtiest because its colony was significantly larger than the TV remote & doorknob. The TV remote and doorknob grew 2, smaller colonies. The control group showed contamination, confirming that the only unsterile swab was the one used for the control group. This experiment can help people understand which surfaces need more frequent cleaning and encourage better hand hygiene practices to limit the transfer of bacteria from surfaces.

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Abstract: Science and Engineering Fair of Houston

1077

Category: Biochemistry and Microbiology

Millions to Molecules: Dual-Mechanism Small-Molecule Discovery via HTVS and Machine Learning-Guided Molecular Dynamics for Frontotemporal Dementia

Myreen Ahsan

Friendswood ISD /Friendswood Junior High

Frontotemporal dementia, affecting more than 100,000 patients annually, is characterized by pathologically modified tau protein, which normally stabilizes microtubules but in this disease is released and excessively modified by kinases. Notably, prior therapies target either tau aggregation or kinase-mediated phosphorylation, but not both. This study hypothesized that small-molecules could "dual lock" on tau, simultaneously stabilizing its physiological complex and inhibiting tau-relevant kinase activity. Using an AI-augmented in silico pipeline, over 10 million drug-like molecules were screened and multi-target docking was performed against physiological tau (PDB 6CVN), pathological tau (5O3T/7P6C), and GSK-3beta kinase (1J1C). A Random Forest model (300 trees, r=0.77) trained on RDKit 1024-bit Morgan fingerprints generated a rank-stability consensus, reducing scoring-function bias. CNS-11 emerged as the lead candidate and underwent 100-ns molecular dynamics simulations. MM-GBSA binding free energies (deltaG = −45.2 kcal/mol for tau; −88.7 kcal/mol for kinase) and principal component analysis revealed target-specific dynamical effects: a constrained conformational ensemble for tau (PC1 = 31.88% variance) that disfavored aggregation, and an expanded ensemble for kinase (PC1 = 25.67%) that disrupted catalysis-opposite signatures supporting the dual-lock hypothesis. Docking to CDK2 and CDK5 showed atleast-5-fold selectivity for GSK-3beta. In silico ADMET profiling predicted favorable blood–brain barrier permeability (LogP = 4.41, TPSA = 63.99square-angstroms) and low toxicity. These findings validate CNS-11 as a first-in-class dual-mechanism inhibitor that stabilizes physiological tau while disrupting GSK-3beta-mediated hyperphosphorylation, addressing the biochemical cascade of FTD pathology. This AI-augmented discovery pipeline (code on Kaggle/HuggingFace) provides a reproducible framework for identifying multi-target therapeutics in neurodegeneration.

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Abstract: Science and Engineering Fair of Houston

1078

Herbs Vs. Germs!

Nora Mathews

Clear Creek ISD /Brookside Intermediate School

Category:

Biochemistry and Microbiology

Bacterial diseases are a persistent problem, affecting organisms worldwide. While doctors and scientists have worked to find a plausible solution, such as vaccines and antibiotics, there are still many people against them and places without access to them. This project explores natural, herbal methods for eliminating bacteria in the household and determines the most effective essential oils for killing bacteria. Finding traditional ways to kill bacteria can also reduce modern healthcare costs and make them more available. Many people and places around the world have little to no access to high-end antibiotics Yet antibacterial oils can be a solution. In this project, essential oils were tested for their antibacterial properties. The hypothesis that tea tree oil was the most antibacterial oil was proven correct. Five oils were swabbed and then transferred to an agar plate. The oils used were tea tree oil, eucalyptus oil, lavender oil, peppermint oil, and lemongrass oil. Some variables must have been kept constant for the experiment to have accurate results, such as the amount of each oil used, sterility, temperature, and more. The result of the experiment was that tea tree oil was the most antibacterial oil, with only an average of 4 colonies grown, in contrast to other oils, such as eucalyptus oil, which grew an average of 30 colonies. The objectives of this project were met, and it contributes to the field of biology by recommending natural methods for killing bacteria that could be incorporated into antibiotics or cleaning products.

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Abstract: Science and Engineering Fair of Houston

1079

Lights On, or Off? Part 2.

Reed Glisson

Clear Creek ISD /Brookside Intermediate School

Category:

Biochemistry and Microbiology

Skin infections are a common and potentially deadly disease; caused by an infection of bacteria in an open wound. While most are mild and easily treatable, for the immune compromised they can be the exact opposite. The purpose of the experiment was to assess the effect of different wavelengths of blue LEDs from the range of 425nm-490nm, on the growth of Micrococcus luteus. If the data were to show inhibition in growth, the blue-LEDs could treat skin infections The hypothesis for this experiment was that if LED lights from the range of 490nm-425nm are tested on Micrococcus luteus, then it will reduce growth of colony sizes. This hypothesis builds on last year's experiment with genus Staphylococcus, which showed complete inhibition of growth in the blue spectrum (465nm). This experiment was tested by buying a slant of Micrococcus luteus, then performing a 1:10 serial-dilution on a colony 2-4mm in diameter. The 10^-1 diluted-culture was then plated onto two plates per wavelength (including the control) using 100µL and then incubated at 30-35C for approximately 72-hours. After incubation, five colonies were measured for their diameter using a caliper, then averaged. The averaged data for every wavelength is as follows, Control: 0.884mm, 490nm: 0.29, 465nm and 440nm: No Growth, and 425nm: 0.462mm. Based off the data, the hypothesis was correct, showing a decrease in growth of lighted-colonies compared to the control (dark). This substantiates the claim that these wavelengths could be used to treat skin infections, with the greatest inhibition being 440nm and 465nm.

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Abstract: Science and Engineering Fair of Houston

1080

Category: Biochemistry and Microbiology

Experimental design and analysis of copper based antimicrobial sprays for enhanced efficacy and longevity compared to commercial formulations.

Manha Shaik, Saanvi Gopal, Navika Agarwal

Fort Bend ISD /Fort Settlement Middle School

Copper has been long recognized for its antimicrobial properties primarily due to its ability to disrupt bacterial cell membranes and interfere with essential cellular processes. This is strongly supported by the Ayurvedic practice of Tamra Patra, using copper vessels in surgical procedures. Based on the evidence, we investigated copper as a potential safer alternative to commonly used commercial disinfectants. Currently, society widely uses commercially sold products such as Lysol sprays and Clorox wipes that are known to include harsh synthetic ingredients which cause eczema, dryness, and irritation. Our team decided to design an effective alternative with no negative effects and comparable efficiency. As a part of the experiment we have designed two copper sulfate solutions with increasing copper sulfate concentrations. In our experiment we have monitored both commercially available solutions and our formulations when tested on metal surfaces. We used our meticulously recorded results to determine the copper ion release and longevity of our solution, thus proving its efficacy. Our results demonstrated that our copper based formulation significantly reduced bacterial growth and maintained its antimicrobial activity over a long period compared to commercial products. By integrating our traditional knowledge of copper's antimicrobial property in this project; we highlight copper as a safe antimicrobial agent and efficient alternative to antimicrobial applications.

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[ ] Human participants [X] potentially hazardous biological agents

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Abstract: Science and Engineering Fair of Houston

1081

How the concentration of acid in white vinegar affects the yield of cheese

Isabelle Su

Private/ST. JOHN'S SCHOOL

Category:

Biochemistry and Microbiology

My scientific question was how does the concentration of acidity in white vinegar affect the yield of cheese in terms of weight? Overall, the higher the concentration of acidity in white vinegar, the less yield of cheese there will be. When pouring in the white vinegar with 5%, 4%, and 3% acidity the cheese curds formed immediately and there was a significant amount of them while there were few cheese curds and they formed really slowly when pouring in the white vinegar with 2% and 1% acidity. When carrying out my experiment, I noticed that there was a good amount of cheese curds stuck to the sides and bottom of the pot when pouring the cheese curd and whey mixture into the cheese cloth lined colander. In addition, for every trial, the cheese and whey mixture was not poured on the identical spot of the cheesecloth so it drained a little differently each time. In addition, the higher the concentration of acidity in white vinegar, the more yellow the whey was. The experiment results matter in real life because it is crucial for the efficiency of the cheese making process and commercial cheese production. It is important for the efficiency of the cheese making process that the concentration of acid in white vinegar triggers syneresis, the expulsion of moisture from the cheese curds, impacting the yield of cheese because it determines the moisture content of the final cheese product. The correct acid concentration is important for maximizing calcium, fat, and other proteins, directly affecting the yield of cheese. Moreover, my experiment is also important for commercial cheese production because this demands for a consistent, uniform product. By studying how the different concentrations of acidity affect the yield of cheese, it allows cheesemakers to standardize the process, ensuring that every batch has the same quality.

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Abstract: Science and Engineering Fair of Houston

1082

How do different foods change the microbiome? Exploration via a model system

Rithika Kakarla

Home School/Homeschool

Category:

Biochemistry and Microbiology

The gut microbiome is closely related to the immune system, yet the impact of ultra processed foods to the public is still unclear. The core purpose of this project is to create a simple model using active yeast as a gut micro bacteria. Eight foods were tested, including high sugar liquids, artificial sweeteners, fiber rich oat solution, and yogurt. Each sample was put in an oven at 95 to 98°F to simulate regular human body temperature, with growth measured by recording cloudiness and height at thirty minutes, one hour, two hours, eight hours, twelve hours, and twenty four hour time stamps. The results showed that nutrient solutions, such as yogurt and fiber rich solutions, had the most stable and robust growth. On the other hand, artificial sweeteners and high fat solutions resulted in the lowest growth levels. These findings show that certain foods help the microbiome grow more, while others may fail to provide the necessary environment for a balanced microbiome. This project helps communities understand how different dietary choices can support long term immune health and reduce the risk of inflammatory conditions.

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Abstract: Science and Engineering Fair of Houston

1083

Stiff or Soft: Exploring How Physical Environment Affects Yeast Survival After Mechanical Stress

Kalki Sundar

Conroe ISD /McCullough Junior High

Category:

Biochemistry and Microbiology

Cells are affected not only by chemical factors but also by physical conditions, such as how soft or stiff their environment is. In the human body, tissue stiffness is important and is often discussed in cancer research because tumor tissue is usually stiffer than normal tissue. In this project, baker's yeast was used as a safe model organism to investigate how environmental stiffness affects cell survival after mechanical stress. The yeast were grown on soft and stiff agar surfaces and then pressed with the same amount of force. Methylene blue staining was used to identify which cells were alive and which were dead. This project does not study cancer directly, but it helps explain why stiffness is an important physical factor in biology and why it is also relevant in cancer research.

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Abstract: Science and Engineering Fair of Houston

1084

Evaluating Ozone's Antimicrobial Abilities

Category:

Biochemistry and Microbiology

Ethan Theis

Houston ISD/BCM Academy at James D Ryan - MS

Water pollution remains a major public health concern in the United States, and thus the development of effective, efficient methods of water disinfection is crucial. Because ozone has an extraordinarily high oxidation potential and can generally inactivate microorganisms with fewer harmful by-products than chlorine, it is in common use at treatment facilities. Many plants, however, rely on the natural degradation of ozone rather than its immediate neutralization; this suggests that exposure times to ozone could be longer than necessary. The objective of this experiment was to answer the following question: "How does the duration of ozone exposure affect the amount of surviving colony-forming units of microorganisms in tap water?" Tap water was treated for 5, 15, 30, or 60 min with 2 mg/L ozone, at which time sodium thiosulfate was added to stop further action of ozone. Samples were plated on agar and grew for three days to enumerate surviving colonies. Results indicated a general decline in microbial colonies with increased exposure to ozone, showing their greatest reduction within the 30-minute mark. Colony features, like large diameters and filamentous forms, implied that most survivors could have been fungi, more ozone-resistant than bacteria. Contrary to my original hypothesis, colony counts continued to noticeably be reduced in exposure times greater than five minutes. Limitations include non-specific identification of microorganisms and variation within the 60-minute group. Overall, findings suggest that microbial populations were most reduced by ozone up to 30 minutes and provide insight into optimizing disinfection time in water treatment systems.

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Abstract: Science and Engineering Fair of Houston

1085

Plants & Pineapple: The Enzyme Inhibition Experiment

Likitha Pavuluri, Anika Vijay

Fort Bend ISD /Quail Valley Middle School

Category:

Biochemistry and Microbiology

The aim of our project is to investigate how different plant extracts affect the activity of the enzyme bromelain. This enzyme breaks down proteins, so it can liquefy gelatin. In our experiment, we will test gelatin and how long it takes to break down with different spices. Gelatin is made from proteins and bromelain is a specific enzyme thats breaks these protein chains down. By using control groups and time, we can compare the results and the amount of time it takes to melt. The second goal is to find out different herbs and spices affect bromelain's ability to break down gelatin. The spices and herbs we will be using include cinnamon, cloves, ginger, garlic, rosemary, green tea, and neem. The third goal is to measure and compare the reaction rates for each treatment by recording how long it takes for the flat in to liquefy in each cup. Some might slow down the enzyme while others may speed it up. With this information, we will be able to complete the last goal of the experiment, making a natural, eco-friendly enzyme cleaner that uses bromelain from pineapple juice combined with plant extracts that prove to be efficient. This type of product would be biodegradable, non-toxic, and safe to use around children and pets. This product would provide a solution for cleaning while also demonstrating the practical applications of enzymes in our daily life.

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Abstract: Science and Engineering Fair of Houston

1086

Acute promyelocytic leukemia-RXRa - Retinoic X receptor alpha-1mv9

Joseph Phan, Mehtab Mohammad

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

Category:

Biochemistry and Microbiology

The purpose of this experiment is to test new treatments for acute promyelocytic leukemia. Our fascination on the topic of APL began when we realized lots of people were affected by APL. Our fascination led us through the rabbit hole of the toxicity in current therapies like chemotherapy. In turn, this led us to create this experiment. This experiment can be useful to identify alternative treatments to cure APL. Our hypothesis was, "If we put 200 natural active organic compounds into a computer to be computationally screened against the target receptor, new potential inhibitors will show stronger binding affinity and higher specificity, and these compounds could serve as novel, effective, and safer drugs for treating the disease." Our results support our hypothesis due to six molecules being found with the highest binding affinity. We conclude that if we use one of the six molecules for treating APL, APL will be inhibited.

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Abstract: Science and Engineering Fair of Houston

1087

Ibuprofen Uncovered: Blood Levels Don't Lie

Ilhum Maredia, Divyasha Harsh

Clear Creek ISD /League City Intermediate School

Category:

Biochemistry and Microbiology

Most medicines are given a "one-size-fits-all" dose, even thought peoples bodies absorb and break down drugs differently. Different ages, weights, and metabolism levels can change how much medicine is in the blood at any time. Even brands of the same drug, such as Motrin and Advil, which are both ibuprofen, may show small differences in how the drug enters the bloodstream due to inactive ingredients or the pill coatings. This project simulates how ibuprofen behaves in different people by creating virtual patients of varying ages, wights and metabolism rates. By using both simple pharmacokinetic calculation and AI generated predictions, we can estimate blood concentrations of ibuprofen in the body after a standard dose of Motrin and Advil. By comparing results between brands and across patient types, this projects shows that the same drug can behave differently in the body of different people. Advil was the better drug, it reached peak blood concentration absorption quicker compared to Motrin. Our findings have highlighted why personalized medicines and dosing are important for safety and effectiveness.

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