CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Kevin E. Chung

Project Number

J0401

Project Title

What Drives Kimchi Fermentation?

Abstract

Objectives/Goals

My objective was to see how temperature, salt, and sugar affect the speed of fermentation in kimchi. I hypothesized that warmer temperatures and increased amounts of salt and sugar would speed up fermentation.

Methods/Materials

Thirty jars were filled with water and Napa cabbage. They were distributed evenly into six different groups of five jars each. The control group was stored at room temperature with no added salt or sugar. The other five groups were used to test my variables. One of them was stored in the fridge at about 4 degrees Celsius. Two sample groups contained 1mL and 5mL of salt and two sample groups contained 1mL and 5mL of sugar. Each sample was tested with litmus paper daily to measure pH levels.

Results

The two sugar groups fermented faster than the control group, while the fridge temperature group and the two salt groups fermented slower.

Conclusions/Discussion

My conclusion is that warmer temperatures and sugar speed up fermentation, while colder temperatures and salt slow down fermentation. By understanding how environment and ingredients affect fermentation, we can optimize our production of fermented food products. Also, we can find ways to preserve food by interfering with the bacteria that cause them to age.

Summary Statement

I investigated how environmental factors affect the rate of fermentation in kimchi by measuring lactic acid production.

Help Received

My mom and my brother gave me advice on how to set up the experimental procedure. Doctor Lisa Belluzzi from Santa Barbara City College helped me by giving me helpful background information for my project.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Krystal Y. Chung

Project Number

J0402

Project Title

Hot Potato! Cold Potato! Does Temperature Affect the Reaction Rate Between Catalase and H(2)O(2)?

Abstract

Objectives/Goals

In this experiment I wanted to test whether temperature causes any change in the overall rate of reaction between the enzyme, Catalase, and hydrogen peroxide. My hypothesis was that the enzyme will break down the hydrogen peroxide faster when it is hot.

Methods/Materials

To begin this experiment, I prepared a Catalase, enzyme mixture from potatoes and distilled water in a blender. After pouring 3% hydrogen peroxide into beakers; I placed an enzyme soaked, filter discs into the solution and recorded how long it took for the disk to rise to the surface. I completed the same series of 20 tests using hydrogen peroxide at 3 separate temperatures. I used a temperature of 0 degree Celsius to test a cold reaction, 22 degree C for room temperature, and 70 degree C for hot. In order to maintain a constant 70 degree temperature, the hydrogen peroxide was heated over a gas stove top on top of an upside down, cast iron pot with holes drilled in the sides for air circulation.

Results

It turned out that the heated hydrogen peroxide did in fact react the quickest with the enzyme, Catalase. The hottest temperature, which was 70 degrees Celsius, reacted at 4.7 seconds on average. The coldest, 0 degrees, reacted in 11 seconds on average. While the rate of the room temperature, 22 degree, hydrogen peroxide was in the middle at 7.5 seconds.

Conclusions/Discussion

The results of this experiment prove that my hypothesis was correct. The reason that the filter discs rose, is because when the enzyme solution reacts with the hydrogen peroxide then the byproduct, oxygen, escapes in the form of bubbles which get trapped in the filter disc holes causing it to rise to the surface. The activation energy in this experiment varied with the different temperatures of the hydrogen peroxide. The hotter temperatures had more energy because it came in the form of heat.

Summary Statement

My project is about reaction rates between Catalase and H(2)O(2) and how they change due to temperature.

Help Received

Borrowed equipment from Dr. Shevinsky; Dad helped with drilling and wiring.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Sara N. D'Souza

Project Number

J0403

Project Title

Antioxidants from Natural Sources

Abstract

Objectives/Goals

To extract antioxidants from natural sources and to compare their polyphenolic content by Folin Ciocalteau Assay, and activity by DPPH Assay, and also to determine their antibacterial properties

Methods/Materials

Pomegranate Fruit
Gallic Acid, Folin-Ciocalteau and DPPH Reagent, Ethanol, Water, Methanol and Acetonitrile
Round Bottom Flask, Reflux Condenser, Oil Bath, Stirrer, Falcon and Test Tubes
Rotary Evaporator, Water Heater, Analytical, Preparative HPLC, UV and Mass Spectrometry
96 Well Plates, Pipettes, Weighing Balance, Safety Goggles, Gloves and Lab Coat
LB Media, LB Agar Plate, Garlic, E.coli cultures, Glass Beads, Incubator

Results

The rind of the pomegranate showed higher polyphenol content than the seed and juice. Also, the DPPH Scavenging Activity in the rind was 5 times more than the seeds. The polyphenols from the rind showed excellent inhibition of the E.coli growth.

Conclusions/Discussion

I extracted active ingredients from the juice, rind and seeds from the Pomegranate. The extracts were analyzed and characterized by Analytical HPLC coupled with the Mass Spectrometry to determine the nature of polyphenols. The total polyphenolic content was determined by Folin-Ciocalteau Assay using Gallic Acid as a standard. The rind had more polyphenols than the seeds, which in turn had more than the juice. The antioxidant activity was determined by the DPPH assay. The DPPH scavenging activity in rind was 5 times more than that of seeds. The polyphenols from the juice and rind were purified using Preparative HPLC, and their structures were determined by comparing them with those reported in the scientific journals. 5 major components obtained from the juice extract belong to the Flavonoid family of polyphenols. The rind extract had many polyphenols that were difficult to separate into individual pure components, but were from the Ellagic acid family. All the samples were tested for their antibacterial property in E.coli. The rind and some of its components showed excellent inhibition of E.coli growth on the agar plates. The seeds and juice did not show a clear inhibition. Due to my time constriction I was unable to test many other fruits, which I had originally planned to test and so I would like to continue this project next year. Based on my results, I conclude that the rind of the pomegranate is rich in antioxidants, and has great medicinal value.

Summary Statement

I isolated antioxidants from the pomegranate's juice, rind, and seed and compared their polyphenolic content and activity.

Help Received

Dr. Lawrence D'Souza trained me in using the HPLC instruments and handled all the solvents. Used all lab equipments at Amylin Pharmaceuticals under the supervision of Dr. Lawrence D'Souza.

Name(s)

Ryan K. DeBiase

Project Number

J0404

Project Title

One "Sweet" Yeast Experiment

Abstract

Objectives/Goals

My objective was to determine which artificial sweetener or natural sugar caused the yeast to produce the most carbon dioxide.

Methods/Materials

I set-up a large bowl of water with a graduated cylinder placed upside down inside the bowl. I then ran a tube from the graduated cylinder into a bottle containing the type of artificial sugar or natural sugar I was using. There was also yeast and water in the bottle that was connected to the tube. Bubbles went down through the tube and into the graduated cylinder where I could determine how much carbon dioxide the yeast produced.

Results

My results were that the normal granulated sugar caused yeast to produce the most carbon dioxide, on average, at 330ml. Normal yeast and water produced the least carbon dioxide, on average, at 7ml.

Conclusions/Discussion

My conclusion is that normal granulated sugar caused yeast to produce the most carbon dioxide, on average(330ml), but brown sugar was close behind it at 325ml, on average.

Summary Statement

My project is about which artificial sweetener or natural sugar causes yeast to produce the most CO(2).

Help Received

Parents helped with set-up of experiments.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Nikki R. Fido

Project Number

J0405

Project Title

The Yeast Beast

Abstract

Objectives/Goals

Q: Will yeast mixed with sugar substitutes produce the same amount of carbon dioxide gas as yeast mixed with table sugar?

H: I think the yeast mixed with sugar substitutes will produce the same amount of carbon dioxide gas as the yeast mixed with table sugar.

Methods/Materials

Dry Yeast (2t), Table Sugar (1T), Sugar substitutes(1T), Warm Water (1C), Water Thermometer, 6 empty 16 oz plastic water bottle, 1 cap that fits all bottles, Plastic Tubing, Epoxy, Graduated cylinder, Plastic tub, Packing tape, Water

.

I made a gas chamber by filling a 24 oz water bottle with water, turning it upside down in a tub of water to allow all of the oxygen to escape. My father drilled a hole in the cap of a 16 oz plastic bottle, stuck clear tubing through the hole and put epoxy glue around the tubing to prevent the air from escaping. I made a solution of water and yeast as a control and placed it in the 16 ounce bottle. I put the cap with the tubing on the bottle and stuck the end of the tubing underneath the gas chamber in the tub. I watched to see if there were any bubbles in the tubing and whether any of the water in the gas chamber was pushed out into the tub. I allowed the mixture to work for 50 minutes. I did the experiment twice for each solution.

Results

Unlike sugar, Aspartame and Saccharin which produced alot of gas, the solutions with stevia and sucralose produced no bubbles and did not move the water out of the gas chamber.

Conclusions/Discussion

I concluded that my hypothesis was right for two of the sugar substitutes, but that it was wrong for the other two sugar substitutes. Based on my experiment, if you baked bread with Sucralose or Stevia, the bread would not rise.

Suggestions For Further Study:

I would want to do further research to find out why the two sugar substitutes (Sucralose and Stevia) did not produce gas. I would also study what could be added to the sugar substitutes to see if it would change the results. Another way to do the experiment would be to bake different breads - - one with regular sugar

Summary Statement

My project explores whether sugar substitutes produce the same amount of carbon dioxide as table sugar when mixed with yeast.

Help Received

Dad helped drill hole in bottle and expoxy; mom helped me get articles off of internet; my sister Jami helped with printing the title on her computer; mom helped guide me with with organization of written report and tables; Mrs. Harvey supervised.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Nishanth P. Jayram

Project Number

J0406

Project Title

A Comparison of Vitamin C in Modern and Older Rose Varieties

Abstract

Objectives/Goals

Through hundreds of years, various hybridization methods have been developed for producing rose varieties, mainly for cosmetic reasons. Since rose hips are used for their Vitamin C content, these methods could affect the amount of Vitamin C concentration. My hypothesis is that modern roses have less concentration than their ancestors.

Methods/Materials

11 samples of rose hips were collected from different species. Ascorbic acid (Vitamin C) tablets were used for positive control, distilled water for negative control. Rose hips were mashed, boiled and finally strained to produce the rose extract. Starch and iodine were used to detect Vitamin C concentrations. The data was analyzed both using the age and the available heritage of each of the roses to determine the change, if any, in the Vitamin C concentration.

Results

Shining Ruby, a modern rose variety (1992), had the most Vitamin C concentration, while Climbing Old Blush (1752) had the least. But in general, the Vitamin C concentration was neither increasing nor decreasing by age.

Conclusions/Discussion

My hypothesis was not true since there is no correlation between the age of rose and Vitamin C concentration. For future research, I would study the relationship between Vitamin C concentration in other families where the heritage data is fully known. Another direction is to study the concentration where non-natural methods such as fertilizers have been used.

Summary Statement

I studied whether modern roses have less Vitamin C concentration than older roses.

Help Received

Selected rose samples from Guadalupe Rose Gardens. Mrs. Sarah Thaler supervised my experiments.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Saumya R. Keremane

Project Number

J0407

Project Title

Understanding Color Development in Citrus

Abstract

Objectives/Goals

Fruits with carotenoid pigments are excellent sources of antioxidants and provide several health benefits including prevention of cancer. My project was to understand the molecular basis of fruit color development in citrus. The first goal was to characterize the presence or absence of selected few genes involved in the pigment synthesis pathway. The second goal was to understand the differences in sequences of expressed proteins in plants with different colored fruits. The third goal was to characterize mRNAs in fruits. A better understanding of the molecular mechanisms of color development would help us develop/engineer better fruit crops.

Methods/Materials

I collected four citrus varieties with different colored fruits: yellowish white, pink, orange and blood red. Since no genomic sequences were available, primers were designed based on EST library for two genes in pigment synthesis pathway; phytoene desaturase (PDS) and lycopene epsilon cyclase (LEC). PCR amplifications were done using both external and internal primers using both DNA and cDNA from leaves and fruit flesh as templates. Selected products were cloned, sequenced and analyzed.

Results

Phytoene desaturase and Lycopene epsilon cyclase genes were present in all four varieties. Comparison of amplicons from cDNA and DNA templates revealed the presence of large introns. The exons of four different varieties were of identical lengths, but showed differences in sequence. cDNA sequences from fruit tissue showed evidence of alternate splicing in certain varieties.

Conclusions/Discussion

Color development in citrus fruits is controlled by several genes. I have selected two genes for my study: Phytoene desaturase that mediates conversion of Phytoene to zeta carotene and Lycopene epsilon cyclase that helps in the conversion of Lycopene to beta carotene. A full complement of both the genes was present in all four varieties. The sequence of the two genes showed a few aminoacid differences between the varieties which might be important for pigment synthesis. In addition, the fruit tissue showed alternate splicing that might have contributed to the differences in the length of the active protein and in turn this might affect the color development in the fruit. Understanding the basis of color development in citrus may lead to development of healthier varieties of citrus by breeding and genetic engineering in future.

Summary Statement

Study of sequence and expression of two genes involved in pigment biosynthetic pathway in citrus fruits.

Help Received

Used lab facilities at the USDA Citrus Germplasm Repository under the supervision of Dr. Richard Lee.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

C. Jared Lampson

Project Number

J0408

Project Title

Milk Made? II

Abstract

Objectives/Goals

The purpose of my project was to determine what form of milk, when mixed with vinegar and microwave heated, will form the heaviest solid. My hypothesis was that the skim milk would form the heaviest solid.

Methods/Materials

Three types of milk (skim, low fat, and whole) were mixed with vinegar and heated in a microwave. The result of each test was the formation of a solid and liquid. The solid was strained from the liquid and weighed, while the liquid remaining was measured. Each type of milk was tested three separate times and the appropriate data was recorded.

Results

The chemical reaction of whole and low fat milk, mixed with vinegar and heated, consistently and equally formed the heaviest solid and liquid volume, whereas the skim milk solid was not as substantial.

Conclusions/Discussion

Last year I discovered that vinegar formed a heavier substance than both lemon juice and apple juice when mixed with skim milk and heated in the microwave. In continuation of last year#s project I used three forms of milk and one acidic(vinegar) instead of three acidics and one form of milk. I decided to test vinegar with three forms of milk to see which milk would make the heaviest solid. The solid formed by a heated mixture of milk and an acidic was how many of the beginning forms of plastics were made.

Summary Statement

The goal of my project was to discover what form of milk, when mixed with vinegar and heated, forms the heaviest solid.

Help Received

Father helped type report; Mother helped with laying out board

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Cody L. Lim

Project Number

J0409

Project Title

Jello-Oh-No! The Effects of Fruits on the Denaturing of Peptide Bonds in Gelatin

Abstract

Objectives/Goals

The objective is to determine what kinds of fruits, those with protease enzymes or those with only citric acid, can denature the most gelatin in 5 days.

Methods/Materials

Five-gram samples of kiwis, pineapples, papayas, oranges, strawberries, and lemons were placed in graduated cylinders with twenty milliliters of gelatin. There were four samples for each fruit. The effects of the fruit were recorded for five days.

Results

The fruits with protease enzymes and citric acid dissolved more gelatin than the fruits with only citric acid. Kiwi fruit, which has the protease actinidain and relatively high amounts of citric acid, consistently dissolved the most gelatin out of all six fruits, while the lemons, which have even higher amounts of citric acid but no protease, consistently denatured the lowest amount, actually making the gelatin expand.

Conclusions/Discussion

My conclusion is that protease enzymes are more effective than citric acid in breaking down peptide bonds. In the stomach, the enzyme pepsin works along with very strong gastric acid to digest food. But in my experiment, the citric acid (and ascorbic acid) had little effect. The protease fruit kiwi dissolved peptide bonds the fastest. The data suggests that people who eat kiwis along with protein would be able to break down more protein and get more amino acids, which are essential to life.

Summary Statement

My project tests the ability of fruits containing enzymes and/or acids to break down the peptide bonds in gelatin.

Help Received

Science teacher Ms. Buck gave me advice; Mother bought the fruit and gelatin; Father bought and helped cut up the construction paper for my board.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Hailey C. Loehde-Woolard

Project Number

J0410

Project Title

Saccharification of Cellulose Using Acid and Cellulase Enzymes to Produce Cellulosic Ethanol, a Sustainable Fuel

Abstract

Objectives/Goals

The purpose of my investigation is to develop a method to convert cellulose to glucose utilizing chemical and enzymatic processes based on literature and experimental means. I will work through this process by iterating in successive experiments. Secondly, I want to confirm that the saccharide produced is glucose and fermentable by yeast.

Methods/Materials

Exp #1: Add H2O to the 1st jar. Add 6 mL conc. H2SO4 and H2O to the 2nd. Add 52 ml conc. H2SO4 to the 3rd. Hold temp. of 80-100 C for >12 hours. Record glucose levels. Adjust pH to 4.8 and temp to 50C . Add 0.7 g of cellulase to first two jars. Hold temp for 48 hours then record glucose. Adjust temp. to 25C and add yeast. Hold for 48 hours. Record Glucose levels. Exp #2: Add H2O to the 1st set of 3 jars. Add 5 mL conc. H2SO4 and H2O to the 2nd set . Add 14 ml conc. H2SO4 to a 3rd set . Repeat for hydrolysis in Exp #1 but use 1.4g of cellulase in all jars. Exp #3: Use paper and 5mL acid steps from Exp#2 for 2 Jars. Place jars in pressure cooker at 15 PSI for 45 minutes. Place in microwave. Record glucose levels. Adjust pH to 4.8 and temp to 50C . Add 2.8 g and 5.6g of cellulase to each jar. Hold temp for 24 hours then record glucose. Adjust temp. to 25C and add yeast. Hold for 48 hours. Record Glucose levels. Exp. #4: Use 5mL acid steps from Exp. #2 for 3 jars of paper and 3 of newsprint. Take pH and add acid until pH is below 2. Repeat steps for hydrolysis in Exp. #3 but use 7g of cellulase in all jars.

Materials: Copy and newsprint paper; Sulfuric acid; Cellulase enzymes; Potassium hydroxide; Sodium bicarbonate

Results

The highest concentration of acid from experiment #1 produced a high amount of total sugars, 5863mg. Due to side reactions, 35% of the sugar produced was not glucose. Using a moderate amount of acid in experiments 2,3 and 4 produced 100% glucose. The amount of glucose produced is correlated to the amount Cellulase used in a relationship of about 1.1:1.

Conclusions/Discussion

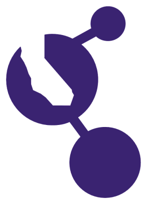
Enzymes are critical for the efficient hydrolysis of cellulose to produce glucose and thus the sustainable fuel, ethanol. The enzyme easily unzipped the cellulose after I spent weeks trying to break the strong alpha bonds in cellulose with heat, pressure, acid and microwaves. Enzymes are amazing. More work needs to be done in this field to produce enough ethanol from cellulose to help our fuel needs.

Summary Statement

Hydrolysis of cellulose by acid and cellulase enzymes to produce glucose/ethanol: Its good for the planet.

Help Received

My father supported me during lab work, answered my questions and helped me learn the chemistry I needed to understand my project. He taught me how to be safe. My dad handled all of the concentrated acid/base related tasks. My mother helped me type my report and board, and internet research



CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Abigail A. Maliyekkal

Project Number

J0411

Project Title

Extracting DNA

Abstract

Objectives/Goals

The objective of my experiment was to find whether the dehydration process of a strawberry affected the amount of nucleic acid it contained. To do so, I had extract the nucleic acid from both the dried and the fresh strawberry and compare the amount. I chose to find both the mass and the volume of the nucleic acid.

Methods/Materials

First, using nessary material, I extracted the nucleic acid from the fresh strawberries, The using hte same tools (which were cleaned), I extracted the nucleic acid from the dry fruit. Then, using a specific formula, I found the volume of the nucleic acid for the dry and fresh strawberry. Later, using an extremely sensitive weighing scale and a centrifuge machine, I found the mass of the nucleic acid. I then compared results for both the mass and the volume of the nucleic acid.

Results

My results repeatedly stated that the dried strawberry had less nucleic acid that the fresh strawberry.

Conclusions/Discussion

The conclusion I came to, due to the results, was that the dehydration process of a strawberry does affect the amount of nucleic acid inside the cells. The fresh strawberry did have more nucleic acid, but the dried strawberry did have a small amount.

Summary Statement

My project was about finding the difference in the nucleic acid level of a dried strawberry compared to that of a fresh strawberry.

Help Received

Mom helped with experiment: Dad helped get supplies: Was loaned lab equipment from Dr.Saldivar

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Madeline B. Matthys

Project Number

J0412

Project Title

Enzyme Stabilization in Calcified Marine Algae

Abstract

Objectives/Goals

The objective is to determine whether calcareous algae protect their enzymes from heat denaturation more than non-calcified algae.

Methods/Materials

Four red algae were tested for vanadium bromoperoxidase activity, Chondracanthus exasperatus, Mazzella affinis, Corallina vancouveriensis, and Gelidium, by conducting an assay in which, if V-BrPO was present, the enzyme would catalyze the bromination of Phenol Red to Bromo-phenol Blue, as indicated by the color change. To test if the catalyst was a protein, the seaweeds were boiled for 5 minutes and tested for activity. The catalytic activity was destroyed in all the algae except the calcareous Corallina alga. This alga's V-BrPO was then extracted and boiled. The time-course of the reaction was followed spectrophotometrically at 590nm. Enzyme extracts were encapsulated in calcium alginate beads to investigate the effect of this matrix on the thermal stability of the V-BrPO enzyme.

Results

All algae were active for vanadium bromoperoxidase. When heated, all denatured except for the Corallina vancouveriensis. When this alga#s extract was boiled, it denatured. Because the V-BrPO activity could be destroyed by heating (or by extracting and heating) in all the seaweeds, it indicated that all the seaweeds# catalysts were enzymes. The assay in which the time-course of the reaction of Phenol Red to Bromo-phenol Blue was followed showed that the calcareous alga (Corallina vancouveriensis) had the most activity. Then, when the Corallina vancouveriensis# extract (which was denatured when boiled previously) was put in a calcium alginate gel bead and boiled, it retained the V-BrPO activity.

Conclusions/Discussion

The hypothesis was supported, in that calcareous algae do protect the V-BrPO enzyme better than non-calcareous algae against heat denaturation. This was shown because the enzyme in Corallina vancouveriensis (a calcareous alga) did not denature when boiled, whereas the V-BrPO in the other red algae did. Again the hypothesis supported when a calcareous shell (calcium alginate) was made to surround an enzyme extract that would normally denature when boiled for five minutes, and the catalyst in the calcium alginate beads remained active when it was boiled for five minutes.

Summary Statement

The calcium carbonate shell in calcareous marine algae is shown to protect vanadium bromoperoxidase against heat denaturation.

Help Received

Used lab equipment at UCSB under the supervision of Moriah Sandy, a graduate student at UCSB

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Ariel C. Mendelsohn

Project Number

J0413

Project Title

Which Food Group Is Best to Eat before Taking an NSAID?

Abstract

Objectives/Goals

The objective of this project is to find out which food group (protein, carbohydrates, dairy, fats) will best protect the lining of the stomach if eaten before taking a non steroidal anti inflammatory medication.

Methods/Materials

Artificial gastric juice was used to replicate the gastric juice in the stomach. Motrin, Aleve, Excedrin Back and Body and Aspirin were used as to represent the actual medication that would go into a persons body. Chicken baby food was used as protein, sweet potato baby food was used to represent carbohydrates, milk was used as a dairy product and butter represented fats. Food groups and gastric juice were measured in proportion with each other. A portion of gastric juice was placed into 5 cups and a portion of one of the types of food was placed into each cup leaving one cup with just gastric juice. After being measured with no medication, one of the medications was added and the pH was measured after certain times. The testing was then repeated with all four medications.

Results

The chicken was most successful with all NSAIDs in lowering the acidity of the gastric juices. Milk came a close second to chicken, and had a lower range of numbers than chicken did (chicken was from 6.08-6.38 and milk ranged from 6.15-6.24). Out of all the food groups, butter was the least successful in reducing the acidity of the gastric juice, but it is still better than eating nothing at all.

Conclusions/Discussion

Overall the chicken was the most successful out of all the food groups. Eating sweet potato before taking medication is least successful out of all the food groups but it is still significantly better than eating no food at all. The hypothesis was not proven. There is a possibility that the results would have varied slightly if there was a smaller margin of error, and a bigger sample size.

Summary Statement

This projects goal is to find out which food group is best to eat before taking a non-steroidal anti-inflamatory drug in order to prevent damage to the lining of the stomach.

Help Received

Mom helped conduct the experiment, Mr. Hartung provided material, Uncle provided equipment, Dad helped create the graphs and analyze the data.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Jiho Park

Project Number

J0414

Project Title

Effects of 3-Membered Heterocycle-Derived dTTP Analogs on the Inhibition of Nucleic Acid Polymerases Using Docking

Abstract

Objectives/Goals

The objective was to determine the inhibitory effects of novel three-membered heterocyclic compound-derived analogs on several nucleic acid polymerases in silico using molecular docking.

Methods/Materials

Protein files of HIV Reverse Transcriptase, HCV NS5B Polymerase, and DNA Polymerase Kappa were imported from the Protein Data Bank and modified for the docking procedure with ArgusLab and Maestro. Ligands were created and prepared for the docking procedure using ArgusLab and LigPrep. Glide performed grid generation and the docking process and a total of 327 docking calculations in Extra Precision (XP) Mode were made. Inhibition was measured by the binding energy of the best ligand pose, determined by EModel, and measured in kcal/mol. The following materials were used: Protein Data Bank (RSCB); Calculation of Molecular Properties and Drug-likeness (Molinspiration); Online SMILES Translator and Structure File Generator (NCI/CADD Group); ArgusLab (Planaria Software); Symyx Draw 3.2 (Symyx); Maestro (Schrödinger); LigPrep (Schrödinger); Protein Preparation Wizard (Schrödinger); Prime (Schrödinger); Glide (Schrödinger)

Results

Several potential inhibitors have been identified through this experiment: for DNA polymerase kappa, Ligand 102 with a binding energy of -6.09 kcal/mol; for HCV NS5B polymerase, Ligand 35 with a binding energy of -5.67 kcal/mol; and for HIV reverse transcriptase, Ligands 15 and 96 with a binding energy of -6.03 kcal/mol. The majority of ligands had a greater binding affinity than the control ligand, dTTP. Analysis of data found that three-membered rings increased binding affinity through both hydrophobic interactions and through an extensive network of hydrogen bonds. The decreased steric repulsion of three-membered rings relative to the five-membered rings of dTTP also contributed to increased binding affinity.

Conclusions/Discussion

The majority of ligands that were docked to their protein targets had higher binding affinities than dTTP, which also served as the controlled variable for the experiment; approximately half of the ligands had binding affinities that were one standard deviation above the average binding affinities. The objective was attained, and this discovery may lead to a new class of drugs that use a different ring structure to combat diseases linked to the targeted enzymes or drug resistance.

Summary Statement

The aim of this project is to determine the inhibitory effects of a new dTTP analog on enzymes that are targets for treating cancer, HIV, and HCV.

Help Received

Mrs. O'Brien and Debra Innis edited my report, and Mrs. Driscoll was my advisor. Schrödinger, LLC provided a free license to use their software.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Neil J. Patel

Project Number

J0415

Project Title

Cry Baby Cry

Abstract

Objectives/Goals

People all over the world use onions on a daily basis and get irritated eyes in the process. I wanted to discover a format in which your eyes would not be irritated while cutting onions.

Methods/Materials

I used the following materials for my experiment:4 red onions, a knife, a cutting board, a microwave, a refrigerator, running water, a stopwatch, a pencil, and scratch paper. The four onions were placed in different conditions and then cut by my test subject.

Results

The results of my experiment were surprising. My hypothesis was that if you cut an onion after heating it you will have less irritation to the eyes. This was proved wrong because the heated onion actually made my test subject have the most irritation to the eyes. Cutting an onion under running water resulted in the least irritation to the eyes.

Conclusions/Discussion

My hypothesis is that heating an onion before cutting it will result in less irritation to the eyes because the sulfuric acid in the onion cells would evaporate. this hypothesis was proved wrong by my experiment. The results show that cutting an onion after heating it will make you have more irritaion to th eyes. Cutting an under running water will result in less irritation to the eyes. My explanation for these results has come after reading more about the cellular diffusion of an onion. The heating of an onion before cutting will make the sulfur in the onion to start cirrculating the cell at a faster rate so when cellular diffusion occurs in the onion the sulfuric acid will erupt out into the area of incision. When you cut an onion nder running water the sulfuric acid will be absorbed by the water.

Summary Statement

My project is about discovering new formats to cut onions with having less irritation to the eyes.

Help Received

Mother helped cut onions; Sister helped with presentation board; Uncle helped with graphs and application process

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Nikash D. Shankar

Project Number

J0416

Project Title

Are You Getting Your Antioxidants?

Abstract

Objectives/Goals

The purpose of this project is to study the effect of different cooking methods on Vitamin C content, Lycopene content, and Antioxidant activity in vegetables. Based on my research my hypothesis was: 1) Vitamin C is destroyed in all cooking methods and that boiling vegetables will have a lower content of Vitamin C than steaming. 2) Lycopene levels will increase after cooking red vegetables. 3) Some vegetables will increase their antioxidant activity after certain cooking methods while other vegetables will lose their antioxidant activity.

Methods/Materials

Vegetable samples were boiled for 10 minutes, baked at 350-degree F for 15 minutes, microwaved for 10 minutes, steamed for 5 minutes, and fried for 10 minutes with oil. 1) Vitamin C level was calculated in 25 mL of liquid vegetable extract by the Redox Titration method using Iodine solution. The procedure was repeated for each of the 9 vegetables (carrots, tomatoes, broccoli, zucchini, potato, spinach, cabbage, red bell peppers, green beans) after the 5 cooking methods and in raw. 2) Lycopene levels were determined in the 3 red vegetables. 2 mL of vegetable extract was placed in a spectrophotometer to analyze the absorbance at 503 nm. 3) The Total Antioxidant activity was measured using the DPPH radical assay. 1.5 ml of 0.1 nM DPPH radical in methanol was added to 0.5 ml of the vegetable extract in methanol. Decrease in the absorbance of DPPH was measured at 517 nm and the percentage inhibition of DPPH radical was determined.

Results

In the cooked samples, Vitamin C content reduced between 7% (carrots after baking) and 81% (Spinach after microwaving). My data showed that Lycopene levels increased following certain cooking methods and the range of increase was between 38% (red bell peppers after frying) and 63 % (tomatoes after frying). In certain cooked vegetable samples, the Antioxidant activity increased between 4% (spinach after boiling) and 19 % (cabbage after frying).

Conclusions/Discussion

The data clearly proved my hypothesis that Vitamin C content was destroyed in all cooking methods, but boiling did not always lower the Vitamin C content than steaming. Also, the Lycopene levels did not increase in all methods of cooking red vegetables. My data showed that certain cooking methods increased the total Antioxidant activity compared to that of the raw.

Summary Statement

My project researched the effect of different cooking methods on the antioxidant levels in vegetables and found that the levels increased in certain methods and decreased in the other methods.

Help Received

Mother helped purchase of vegetables, used lab equipment from Schmahl Science Workshop

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Jeremy R. Stewart

Project Number
J0417

Project Title
Extracting DNA

Abstract

Objectives/Goals
I extracted DNA from three different foods. I weighted the DNA that I extracted from mushroom, onion and liver to see which one had the most DNA. My hypothesis was that the onion would have the most DNA because it has the most base pairs per cell.

Methods/Materials
First, I added dishwashing liquid, salt, and distilled water to the chopped foods. Next, I heated them up and cooled them down to extract the DNA. Then I placed the filtered solution in a test tube and added meat tenderizer and 95% ethanol. The DNA floated on top. In order to compare the DNA mass for each food, I filtered the content of the test tube and weighted the DNA.

Results
My hypothesis was wrong because I had predicted that the onion would have the most DNA and the mushroom would have the least DNA. However, the liver ended up having the most DNA with the mushroom having the second largest amount of DNA. The onion had the least amount of DNA.

Conclusions/Discussion
There are several possible explanations why I extracted the most DNA from the liver material. One possibility is that the liver has smaller cells. This would mean the liver has more cells per gram and, therefore, more DNA that can be extracted. In other words, a larger number of cells would produce a greater amount of DNA. Another possible explanation is that liver cells simply break down more easily. The cow liver cell, unlike the mushroom or onion cells, doesn#t have a cell wall, so it might be expected to be more easily broken. Therefore, my extraction procedure was more effective in breaking down liver cells (in comparison to onion and mushroom cells) and the cells produced more DNA.

Summary Statement
I extracted the DNA of three different foods to see which one had the most DNA.

Help Received
Mr. Nuttal, my science teacher, mentored me by teaching me about DNA. Mr. Michail, our biology teacher helped me take a picture of the DNA. I used Ribet Academy's lab. My mom taught me how to make graphs and tables.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)	Project Number
Brandon M.W. Stubbs	J0418

Project Title

Mummy Dogs

Abstract

Objectives/Goals

The objective was to find out if body fat is a factor in the mummification process.

Methods/Materials

Hot dogs of different fat content (four turkey and four beef hot dogs, and four polish sausages) were weighed and measured. One of each was put in sand heated by a reptile lamp and heat pad. Three were put in containers filled with baking soda. As a control, three were placed in unheated sand, and three were placed in empty containers. After five days the hot dogs were weighed and measured, then replaced. This process was repeated after three more days, and continued every three days until there was no further change in weight and measurement for all the hot dogs. This test was repeated three times, using the same method.

Results

On average, in the sand test, the hot dog with the least fat, the turkey dog, mummified first, the beef second, and the polish sausage, with the most fat, mummified third. The hot dogs placed in baking soda stopped shrinking at the same time on two of the three tests. On the first test the polish sausage took slightly longer to mummify than the other two hot dogs. The baking soda control hot dog's weights and measurements never changed. The sand control hot dogs did shrink slightly, but had not ceased shrinking by the end of the experiment.

Conclusions/Discussion

The fat content of the hot dogs did have an effect on the amount of time it took the sand hot dogs to mummify. The fat content did not have an effect on the baking soda hot dogs. Also, the sand hot dogs became shriveled and hard, while the baking soda hot dogs remained smooth and flexible. The information from this project shows that in ancient Egypt the Pharaohs and wealthy citizens did not need to be slim, because they used a similar method of mummification as the baking soda method. The poor people, however, needed to be lean, because they used the sand method of mummifying.

Summary Statement

Hot dogs with different fat content were placed in sand and baking soda to determine the time it would take for them to mummify.

Help Received

My science teacher, Mr. Kyle, guided me through the project, giving me the steps necessary to make a science fair project. He also gave me advice. My mom verified my weights and measurements for each hot dog. She also typed the information for my science project from my hand written papers.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Vikram Sundar

Project Number

J0419

Project Title

Seeking a Cure for Hay Fever: A Study of Inhibitors of the Histidine Decarboxylase Reaction

Abstract

Objectives/Goals

Human mast cells produce histidine decarboxylase, which catalyzes the histidine decarboxylation reaction, converting histidine to histamine. This reaction causes histamine to attach to receptors in the immune system, resulting in allergy symptoms. Current treatments for hay fever include antihistamines, a class of chemicals that prevent histamine from attaching to these receptors. However, the effectiveness of these treatments decreases over time. Alternative treatments that address the allergic response in a completely different manner could possibly be more effective. One such treatment could be devised by inhibiting the histidine decarboxylation reaction. The objective of this project was to determine the optimal inhibitors of the histidine decarboxylation reaction. It was hypothesized that the inhibitor epigallocatechin-3-gallate, a member of the catechin group, would be the most effective in inhibiting the histidine decarboxylation reaction. The catechins are a group of chemicals known to inhibit the histidine decarboxylation reaction, and epigallocatechin-3-gallate is known to be the strongest inhibitor of its group.

Methods/Materials

To carry out a simulation of the histidine decarboxylation reaction, the catalyst bacteria Escherichia coli was used to release histidine decarboxylase into a Petri dish. The decarboxylase reacted with the histidine to produce histamine. To measure the reaction rate, pH was used, since histidine is slightly more acidic than histamine. As a result, a strong inhibitor would result in a low pH, while a weak inhibitor would show a high pH.

Results

The control group consistently showed pH readings of 9.5. The epigallocatechin-3-gallate showed pH ranging from 8 to 8.5, a pH change from the control of 1 to 1.5. Epigallocatechin had pH of 8.5, a pH change from the control of 1. The other two inhibitors, epicatechin and epicatechin-3-gallate consistently showed pH readings of 9, a mere pH change from the control of 0.5.

Conclusions/Discussion

Epigallocatechin-3-gallate supported the hypothesis by being the most successful in inhibiting the reaction. Epigallocatechin was a close second, while the other inhibitors, epicatechin and epicatechin-3-gallate demonstrated a weaker inhibition of the reaction. The next step is to measure the effectiveness of a combination of epigallocatechin-3-gallate and epigallocatechin in inhibiting the histidine decarboxylation reaction.

Summary Statement

This project found a possible alternative treatment to hay fever by determining the optimal inhibitor to the histidine decarboxylation reaction.

Help Received

Used school's laboratory equipment; Mentor provided feedback on board and abstract

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Kenneth K. Suon

Project Number
J0420

Project Title
Orange's Rival

Abstract

Objectives/Goals
Background: Have you ever wondered if you're getting enough vitamin C? In this project I will be measuring the amount of vitamin C in certain fruits. In the world there are a variety of fruits and most have different Ascorbic Acid levels. Vitamin C is important in our daily lives. It can keep us healthy by preventing disease like scurvy or cancer. The purpose of my experiment is to find out which fruit is better to eat for the daily requirement of vitamin c.

Methods/Materials
My design for this experiment is to extract 20ml of juice from the selected fruits and titrate to measure the level of the iodine solution needed to react completely with the Ascorbic Acid in the sample. After all the acid has reacted with the iodine solution the sample starts to change color. The amount of iodine added to the sample is equated with the level of Ascorbic AcidI used four fruits: orange, tangerine, lime, and lychee. . I hypothesize that the tangerine has the most vitamin C. I believe this because it is a sourer fruit then a regular orange which is the mark of Ascorbic Acid.Materials/Methods: The materials are regular science experimental test tubes, vials, cylinders, burets, etc. the method I will use is called titration which will require iodine and soluble starch solutions. I am using distilled water and vitamin C tablets 250mg. The vitamin C tablet is the control. Each fruit is extracted for the juice and tested three times

Results
Orange (range = 0.94mg; average = 17.31). Lemon (range = 2.35; average = 13.48). Tangerine (range = 1.41; average = 9.88). Lychee (range = 1.17; average = 18.96).the equation used to determine the Absorbic Acid is the amount of control vitamin C multiplied by amount of Iodine needed for the testing juice divided by amount Iodine needed for control vitamin C.

Conclusions/Discussion
Conclusions/Significance: In conclusion my hypothesis was wrong. The lychee extract had more Ascorbic. Acid then all the other fruits I was using. This test is reliable because the numbers of the result were in a close range to each other. The level of absorb cid is based on amount of iodine used. The results show that 20ml of lychee extract had more vitamin C then the other fruits. This project could be further studied by testing other fruits. Support was provided from Pershing Middle School teacher Ms. McCormick and family members such as Sarak Suon, Emily Suon, Kanika Suon, Paul Schimelpfenig.

Summary Statement
Finding Vitamin C content in fruit.

Help Received
Teacher lending materials/ support; Parents and family helping do project and edit work.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Anna T. Thomas

Project Number

J0421

Project Title

Alzheimer's and Inflammation: Exploring Enzymatic Pathways Involved in Beta Amyloid Induced TNF alpha Production

Abstract

Objectives/Goals

A recent theory about the pathology of Alzheimer's disease (AD) is the inflammation hypothesis, which suggests that the inflammatory response in the brain is central to the disease. The objectives of this study were to determine 1) the effect of treatment with fibrillar beta amyloid 1-42 (BA 1-42) on tumor necrosis factor alpha production and proliferation in the J774.2 macrophage cell line and 2) the effect of inhibition of NADPH oxidase, calcineurin, protein kinase C, and NFkB (by treating with the effectors apocynin, fuijimycin, tamoxifen, and carnosol respectively) on production of TNF-a and macrophage proliferation. These pathways are responsible for functions such as ROS production, calcium regulation, cell growth, and immune response.

Methods/Materials

J774.2 macrophages were cultured in DMEM +10% FBS+ 1%Pen-strep , then plated into 24 well plates for treatment with 2.5 uM fibrillar BA alone or with apocynin, carnosol, fujimycin, or tamoxifen in concentrations from 100 nM-300 uM. A 0.03% DMSO vehicle control was also used. After 24 hours, TNF-a concentrations were detected by performing an ELISA assay. At 48 hours cells were stained and counted with Trypan blue, and cell concentration and viability percentages were calculated.

Results

Using ANOVA, it was determined that apocynin, fujimycin, and tamoxifen significantly decreased TNF-alpha concentration in a dose dependent manner. Carnosol had no significant effect on TNF-a production or cell number until the highest concentrations of 100 and 300 uM, where it appeared to induce significant apoptosis. The data for acetovanillone confirmed observations in existing literature. The IC50 values for apocynin, fujimycin, and tamoxifen were respectively: 9.6 uM, 2.5 uM, and 14.6 uM. Additionally, apocynin, fujimycin, and tamoxifen significantly reduced macrophage proliferation as determined by Trypan blue exclusion.

Conclusions/Discussion

This study has identified, for the first time, that fujimycin and tamoxifen citrate inhibit BA 1-42 induced TNF-a production and macrophage proliferation. These pathways, calcineurin and protein kinase C, are thus possible therapeutic targets for beta amyloid induced neuroinflammation, specifically Alzheimer's disease. The next step, currently being performed, in this ongoing study is analyzing the effects of beta amyloid treatment on inflammatory gene expression in macrophages and apoptosis in cocultured neurons.

Summary Statement

This study investigated the roles of several different proteins in inhibition of beta amyloid induced tumor necrosis alpha production and macrophage proliferation and identified fujimycin and tamoxifen as novel inhibitors of BA induced TNF.

Help Received

Funded by grant from Alzheimer's Research Foundation; used lab equipment at Schmahl Science Workshop under supervision of Sarah Thaler, and Stanford HTBC under supervision of Jason Wu; materials and reagents donated by many different companies, listed on board.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Tatiana C. Trejo

Project Number

J0422

Project Title

Investigating Vegetable Consumptions and Gas Level Emissions

Abstract

Objectives/Goals

In my project, I wanted to determine if different types of vegetables and their food preservations would affect the amount of gas released. I believe that the canned vegetables and the peas will release the most gas.

Methods/Materials

Eight test tubes were used and vegetables were put into the test tubes along with distilled white vinegar and a balloon was put on top of the test tube with no air inside the balloon. I would then put five liters of water into my heat source, which was a CrockPot. The test tubes would then be place into the water after the water had reached 37 degrees Celsius and would be left for 8 hours. After the eight hours had came, I would next take the test tubes out with tongs and measure the circumference of the balloon with a fabric centimeter measuring tape.

Results

The frozen peas had released the most gas on average after fifteen trials, while the canned peas produced the least amount of gas.

Conclusions/Discussion

Conclusions: My conclusion is that frozen peas produce a higher amount of gas than frozen corn, string beans,carrots, or canned corn, peas, string beans, or carrots.

Summary Statement

My project was about finding out what different types of food preservations and what types of vegetables would release the most gas in a human body.

Help Received

Mother and father helped glue papers onto board; Teachers helped with research and providing materials.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Avantika Vivek

Project Number

J0423

Project Title

Expan-Doh!

Abstract

Objectives/Goals

My objective was to see if the amount of yeast used had an effect on the rise height of bread dough. I believed that using 2x the Amount of Yeast in the Recipe would cause the bread dough to deflate or explode, and using the Full Amount of Yeast in the Recipe would result in perfect bread dough. Using 1/2 the Amount of Yeast in the Recipe would probably not cause the dough to rise much, and using No Yeast would not cause the dough to rise at all.

Methods/Materials

20 loaves of bread dough were made, then put into separate containers and stored in a cool and dark place. The recipe used was Julia Child's White Bread Recipe. The only difference in the dough was the amount of yeast added. There were 4 different amounts of yeast and 5 trials per amount of yeast. The amounts were: No Yeast, 1/2 the Amount of Yeast in the Recipe, Full Amount of Yeast in the Recipe, and 2x the Amount of Yeast in the Recipe.

Results

I found that the 2x Amount of Yeast trials did rise the highest, but when baked, tasted sour and horrible, due to the higher yeast concentration. The Full Amount of Yeast trials rose to a medium height and tasted perfect. The 1/2 Amount of Yeast trials rose to a small height and tasted bland. The No Yeast trials did not rise at all, and tasted bland as well.

Conclusions/Discussion

I found that yeast is essential to bread rising, and that the amount of yeast determines part of the flavor as well as the rise height. More yeast leads to higher rise height, but sour-tasting bread, while less yeast leads to small rise height and bland-tasting bread. Therefore, the full amount required by the recipe is the best since it leads to good rise height as well as great-tasting bread.

Summary Statement

My project was about whether the amount of yeast used in a bread recipe affected the rise height of bread dough.

Help Received

Mother helped with the bread dough baking; Father helped with backboard and photography.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Steven M. Wang

Project Number

J0424

Project Title

Male Pattern Baldness: The Hair Growth Cycle and Genetic Mutations

Abstract

Objectives/Goals

Male Pattern Baldness (MPB) is the most common form of hair loss in humans and affects more than 50% of men by age 50. No accurate method exists to predict who will get this condition and treatment options are limited. The goal of this project is to discover a method to better predict Male Pattern Baldness by performing a genetic study of potential risk alleles.

Methods/Materials

My hypothesis is that detecting mutations in the APCDD1, 20p11.22,and androgenic receptor (AR) genes will give a better indication for MPB than the AR gene alone. Human consent forms were obtained from all participants who were classified into control or variable groups based on the Norwood-Hamilton Scale for Male Pattern Baldness. Numerous genetic tests were performed on the buccal cells of each subject for DNA extraction, purification, and isolation, polymerase chain reaction (PCR) and gel electrophoresis. Data for the subjects in both the control (non-bald) and the variable (bald) groups were compared, analyzed, graphed, and recorded.

Results

My experiment found that mutations in both the 20p11.22 gene and AR gene served as an effective indicator of male pattern baldness. Subjects in the variable group with the phenotype for baldness were more likely than non-bald subjects of the control group to have the A allele of the 20p11.22 gene. Eight of the 10 subjects in the variable group had both A alleles and one subject had one A allele. The control group had six subjects with both GG alleles. Current testing is being performed on the APCDD1 gene discovered to be a novel inhibitor in the Wnt signaling pathway in human hair growth.

Conclusions/Discussion

Prior studies showed that AR gene mutation pointed to sensitivity to DHT which is believed to shorten the hair growth cycle. However, current treatments for blocking DHT production have not led to a permanent cure. My research supports that multi-genetic in addition to hormone approaches are needed to better understand Male Pattern Baldness. It also showed that MPB can be paternally or maternally inherited.

Summary Statement

This project is about genetic analysis of mutations in the APCDD1, 20p11.22 and AR genes for Male Pattern Baldness to better access risk for early detection and may someday lead to better treatment options.

Help Received

My advisor Sarah Perry gave me advice on how to operate the equipment and machines. Sarah Thaler offered encouragement. Belinda Schmahl offered suggestions on putting my board together.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Jnaneshwar T. Weibel

Project Number

J0425

Project Title

Comparison of Antigenic Drift and Shift in Influenza Virus Strains

Abstract

Objectives/Goals

The objectives are to determine whether the 2009 H1N1 swine flu evolved by antigenic shift or antigenic drift and to explore the data and tools provided by the National Center for Biotechnology Information (NCBI). The hypothesis is that the nucleotide base pair (bp) sequence of the hemagglutinin protein (HA) gene of the 2009 H1N1 swine flu virus will have significantly more differences than the HA gene of the H1N1 viruses used in the composition of flu vaccines over the past ten years.

Methods/Materials

The composition of the influenza vaccine recommended by the World Health Organization (WHO) over the past ten years was researched. The genetic sequence of the HA gene for the H1N1 subtypes were queried from the Influenza Virus Sequence database and BLAST from NCBI and compared using the Multiple Alignment tools. The number of nucleotide base pairs that differed from the consensus sequence were identified.

Results

The HA gene segment is 1782 nucleotide base pairs (bp) in length. The four H1N1 virus strains prior to 2009 ranged from 8 to 43 nucleotide bp differences from the consensus, while the 2009 H1N1 virus gene had 382 bp differences. The 2009 H1N1 virus HA gene had from 9 to 47 times more bp differences than the previous H1N1 viruses studied.

Conclusions/Discussion

These results support the hypothesis that the 2009 H1N1 swine flu virus evolved via antigenic shift due to the significantly higher number of bp differences in the genetic sequence. Antigenic shift occurs when a virus abruptly changes genetically when viruses from two different animal species infect the same host cell and the genes mix. Antigenic drift occurs when a virus slowly evolves over time and is represented by less change in the genetic sequence. NCBI provides access to a large database of information with tools useful for analyzing trends in virus evolution which can assist in determining vaccines and fighting influenza.

Summary Statement

The project is about comparing the genetic sequences of the 2009 H1N1 Swine Flu to historical H1N1 influenza vaccine strains.

Help Received

My parents criticized my writing. Dr. Jacob Varkey and Dr. Jianmin Zhong of Humboldt State University answered questions.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Robyn A. Young

Project Number

J0426

Project Title

Fermentation

Abstract

Objectives/Goals

The objective is to ferment a variety of fruit juices and determine their ability to produce potential alcohol. The hypothesis states: fruit juices with greater sugar content when fermented with yeast will yield greater potential alcohol than fruit juices with lower sugar content.

Methods/Materials

Eight types of fruit juices were put into 40 plastic containers (each juice had 5 containers). The eight fruit juices started with different sugar contents: purple grape juice (15%), white grape juice (15%), cherry juice (13%), pear juice (13%), peach juice (12%), apple juice (11.5 %), pomegranate juice (11.5%), and cranberry juice (7%). Yeast, Saccharomyces bayanus, was added to all the containers and each was sealed with a lid, and stored at room temperature. Using a triple-scale hydrometer, percent of sugar, specific gravity (control of water), and percent of potential alcohol was measured every three days for 30 days.

Results

Purple grape, white grape, and peach juice fermented to potential alcohol the fastest. Fermentation was complete in 6 days. Apple, pear and pomegranate juices also had high sugar content and fermented to potential alcohol in 9 days. However, cherry juice which had a beginning sugar content of 13% did not ferment completely even after 30 days. Cranberry juice had the lowest amount of sugar (7%) at the beginning of the trial period and fermented to the least amount of potential alcohol. It also fermented at the slowest rate. The juices with the most sugar, purple grape juice and white grape juice (15% sugar) each produced the greatest yield of potential alcohol (8%). Cranberry juice had the lowest sugar content (7%) and produced the least amount of potential alcohol (0.25%).

Conclusions/Discussion

The hypothesis is accepted as demonstrated by those fruit juices with the highest sugar content yielding the highest potential alcohol. These data suggest other juices can ferment to potential alcohol. This might benefit the agriculture industry economically by manufacturing additional products. Secondly, cherry and pomegranate juice have a red color similar to purple grape juice. Red wines made from purple grapes have some cardiovascular health benefits. Therefore, it may be possible that cherry and pomegranate juices fermented to wine would have the same health benefits as red wine.

Summary Statement

This project demonstrates the fermentation of a variety of fruit juices and their ability to convert to potential alcohol.

Help Received

My parents helped me obtain the supplies and monitored the experiment. The Enology Department at CSU Fresno allowed me to tour their facility.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Maria D. Zumkeller

Project Number

J0427

Project Title

Investigating the Degradation of Vitamin C in Broccoli Utilizing Various Cooking Methods

Abstract

Objectives/Goals

Determining which cooking method will retain the most Vitamin C in broccoli.

Methods/Materials

Dilute Lugols iodine 1:10 in distilled water for iodine titration solution. Make starch indicator solution by adding .5g starch to 50ml near boiling distilled water. Make vitamin C standard solution, dissolve Vitamin C tablet in 100ml distilled water. Pour into cylinder add distilled water. Titrate 25ml vitamin C standard solution. Use 25ml graduated cylinder to measure 20ml of vitamin C standard solution. Pour into 50ml flask

Add 10 drops starch indicator solution. Set up buret and fill with iodine titration solution. Write down initial volume of iodine titration in buret. Place flask (containing vitamin C and starch solutions) under buret. Add iodine solution drop by drop. Swirl flask and tally number of drops. Titration is complete when iodine creates a blue-back color in solution that lasts longer than 20 seconds. Record final volume of iodine solution in buret. Repeat 4 times.

Cook broccoli in desired method. Squeeze out broccoli juice and filter through cheesecloth. Put juice into clean 25ml graduated cylinder. Repeat the steps to titrating the vitamin C solution but substitute broccoli juice for vitamin C solution. Titration is complete when iodine creates distinct color change. Record the final volume of the iodine solution in the buret.

Repeat 4 times.

For each broccoli sample calculate the amount vitamin C using a proportion.

Materials:30oz fresh broccoli,pot w/lid,bowl,measuring cups,wok,vegetable oil,cheesecloth,distilled water,250mg vitamin C tablets,funnel,lugols iodine solution,soluble starch,buret,stand,buret clamp,glass jar,flask.

Results

Stove top steaming method preserved the highest amount of vitamin C. Microwave steaming method preserved average amount of vitamin C. Stir-frying method preserved least amount of vitamin C.

Conclusions/Discussion

I found that my hypotheses were correct. My hypotheses stated that the stove top steaming method would preserve the highest amount of vitamin C, the microwave steaming method would preserve an average amount, and the stir frying method would preserve the least.

Summary Statement

Investigating which method of cooking broccoli will retain the most vitamin C.

Help Received

None