

**Project ID: 531****Junior Division****Biochemistry****Omar Aly****Bright Horizon Academy****Gr. 8**

### *Does Temperature Affect the Amount of Carbohydrates in Food?*

The aim of this project is to investigate the different types of effects that temperature can have on starchy foods, and help diabetics determine at what temperature their food should be eaten. To do so, Calrose short rice, Basmati long grain rice, and potatoes were cooked then tested using a plate reader that read the amount of carbohydrates at varying times after cooking. The results showed that temperature does indeed affect the carbohydrate concentration level in starchy foods. As time went on, the rate of carbohydrate concentration decreased. 30 minutes after cooling, the short rice had a decrease of -11.83% in carb concentration. An hour after cooking, it was -8.62% in carb concentration. The long rice showed a low decrease of -8.55% after 30 minutes, but a decline of -27.76% after an hour of cooling. The potato, however, showed the most decline with a significant decrease of -67.46% after 30 minutes, and -24.67% after an hour. In conclusion, different temperatures can have a significant impact on the concentration of carbohydrates in starchy foods. The russet potato was the most effective in showing the most decline in carb concentration. Then it was the basmati rice, followed by the calrose rice. These findings suggest that diabetics can use food temperature to their benefit; waiting for food to cool down will help reduce the carbohydrate levels in starchy foods. All to further optimize a safer and healthier way to enjoy the foods you love.



**Project ID: 532**

**Junior Division**

**Biochemistry**

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**Gr. 7**



### *Effect of Fructose Diets on Wild type and Parkinson's Strains of Caenorhabditis elegans*

People diagnosed with Parkinson's Disease often consume higher levels of processed sugars compared to those without the disease. This is because sugar, acting through insulin, may aid in elevating brain dopamine levels as a way to cope with the dopamine loss associated with the disease.

In this study, I investigated the effects of various fructose concentrations on the growth rate of wild N2 type and pdr-1 knockout *C. elegans*. This was tested by subjecting the worms to control, 0%, 5%, 10%, and 15% fructose concentrations in thirty separate petri dishes, with fructose concentration as the independent variable. The experiments spanned 10 days, during which worm counts were recorded daily.

The results indicated a statistically significant difference in the growth rate between all wild (N2) *C. elegans* and pdr-1 knockout *C. elegans*, with a p-value of 0.017. Significant differences were also observed within all wild (N2) *C. elegans* groups (p-value of 0.04) and across all pdr-1 knockout groups (p-value of 0.05). However, when comparing the two groups, no significant difference was identified between wild (N2) and pdr-1 knockout *C. elegans*. Upon subgroup analysis between wild (N2) and pdr-1 knockout *C. elegans* from Days 5-10, 5% fructose group demonstrated a significant p-value of 0.05.

In conclusion, high fructose concentrations were found to decrease the lifespan of *C. elegans*, while a lower concentration of 5% fructose supported their survival. Compared to the wild type *C. elegans*, the trend suggests that sugars impede the growth of Parkinson's-related worms at a higher rate.



**Project ID: 533**

**Junior Division**

**Biochemistry**

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**Gr. 8**



*Relation Between Oxidation and Temperature*

The purpose of this experiment was to look into if colder temperatures can decrease the oxidation of apples and bananas to prevent them from going brown. The experimental question was, do colder temperatures decrease the rate of oxidation for apples and bananas? The hypothesis was if bananas and apples are put in lower temperatures then the oxidation of the fruits will decrease because they will have less contact with oxygen making it not oxidize. To conduct this experiment, you will need to acquire 13 apples that are cut in half for oxidation purposes and 25 bananas. The result of the experiment showed that when the temperature was at 5°F the average was at 15%. However, the temperature at 72°F resulted in the average being 23% which was the highest percent out of the 3 groups. The hypothesis was supported because of lower temperatures having a decrease in overall oxidation levels. The contribution this experiment established was that lower temperatures are the most effective at storing fruits like apples and bananas.



**Project ID: 534**

**Junior Division**

**Biochemistry**

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**Gr. 8**



### *How Does Storage of Vegetables Affect Their Vitamin C Content?*

This project aims to find how different storage methods affect vitamin C preservation in vegetables and identify the most effective method. It is hypothesized that wrapping vegetables in a paper towel and storing them in a Ziploc bag will retain the most vitamin C content.

To conduct the experiment:

1. Gather fresh bell peppers, broccoli, cauliflower, spinach, and kale.
2. Prepare storage materials: a roll of paper towels and 60 Ziploc bags.
3. Cut vegetables into uniform pieces, weigh them for consistency, and prepare 18 samples per vegetable.
4. Implement various storage methods for each vegetable sample: no storing (control), paper towel wrapping, paper towel wrapping then placed in a Ziploc bag, paper towel wrapping then placed in a perforated Ziploc bag, Ziploc bag storage with and without perforations.
5. Store each sample set for 24, 48, and 72 hours in the refrigerator.
6. After each storage period, extract juice from each sample and measure vitamin C content using a spectrophotometer.
7. Label spectrophotometer cuvettes, add iodine at a 20% dissolution rate, set to 630 nm absorbance rate, and measure absorbance rate to determine vitamin C content.

Results show that storing red bell pepper for one day in a Ziploc bag is optimal for preserving vitamin C, while storing kale for three days outside is least effective.

To further expand on this project we could calculate the vitamin C content in milligrams of the vegetables and test the impact of fresh versus frozen vegetables, as well as different storage temperatures such as freezing.



**Project ID: 535**

**Junior Division**

**Biochemistry**

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**De Portola Middle School**

**Gr. 8**



### *How Does the Type of Flour Affect a Cookie?*

My project examined the effects of using different types of flour to make a chocolate chip cookie. The flours I used were all-purpose, almond, cake, whole wheat, and self rising. I used the same recipe for each cookie to keep it consistent. It was hypothesized that self rising flour would make the tallest cookie because it has baking soda in it, which acts as a leavening agent in the cookie. My results supported this, as the cookie rose to 2.6 cm tall. My next hypothesis was that cake flour would make the biggest or more spread out cookie because my research indicated that flours with lower protein contents won't hold their structure and cake flour had the lowest protein content. My hypothesis was supported because the cake flour cookie had the largest circumference of 30.1 cm. My last hypothesis was that almond flour would make the tastiest cookie because it has a sweet, nutty, flavor as a result of the Almonds. My hypothesis was once again supported because the almond flour cookie had an average rating of 8.76 out of ten. Which was a higher rating than any other of the cookies tasted. All of my predictions were supported in the end.



**Project ID: 536**

**Junior Division**

**Biochemistry**

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**Gr. 8**



### *UV Lights Influence on Bacteria at Different Heights*

The purpose of this study was to find the impact in bacteria growth after being exposed to UV light at different heights. This was done by creating a stand with holes 5 cm, 25 cm, and 50 cm away from the ground. A UV lamp was placed at one of those settings. Bacteria was collected, and swabbed into agar dish, then put under a UV light for 8 hours. The dish was taken out and swabbed again. It was then put into the incubator and taken out 16 hours later. The amount of bacterial colonies were counted and entered into a data table.

The results showed that after exposure to UV light the bacteria grew least when 5 cm away from the UV light decreasing the amount of bacteria from 121.06 to 34.70 or 71.4%. The bacteria stopped growing because of the exposure to UV light. When the lamp was set at 25 cm, the UV light decreased the amount of bacteria from 87.81 to 60.5 bacteria colonies which is 31.10% less. The UV lamp set at 50 cm decreased the 68.56 bacteria colonies to 51.31 colonies which is a 25.16% decrease.



**Project ID: 537**

**Junior Division**

**Biochemistry**

**Keira Sebalj**

**St. Peter the Apostle Catholic School**

**Gr. 6**



### *Gummy Bear Osmosis*

The goal of this project was to figure out whether a gummy bear grew bigger in a sugar water solution, a salt water solution, or tap water the best. My hypothesis was that the gummy bear would grow bigger in the salt water solution. The hypothesis was inaccurate on this educated guess. The real result was that the gummy bear actually grew bigger in the sugar water solution. The first step in this experiment was to select twenty five gummy bears. For this experiment I chose twenty five Red Gummy bears. Next, I used a weigher to weigh all of them to make sure they were the same size. Then, the gummy bear were placed into a separate containers. Each of the containers were filled with a different solution. They were then set aside to absorb the solution to grow. When they were done, they were placed on the weigher to see which one increased the most in size. The trial was repeated three times showing similar results. Overall, in this experiment the results concluded that the gummy bears grew the biggest in sugar water rather than in salt or filtered water.

**Project ID: 538****Junior Division****Biochemistry****Maleeha Siddique****De Portola Middle School****Gr. 8**

### *Gluten-Free vs. Gluten: Xanthan Gum Edition*

This experiment was conducted to find out which amount of xanthan gum made gluten-free baked goods taste most similar to those made with gluten. I used four different amounts of xanthan gum, 1.25 mL, 2.5 mL, 5 mL, and 7.5 mL per 237mL of gluten free flour and all-purpose flour as the control. I then baked multiple batches of brownies, cakes and bread. I hypothesized that using xanthan gum at 1.25 ml for brownies, 2.5 mL for cake, and 7.5 mL for bread would get each baked good to taste the most similar to the control. Participants ranked each baked good from 1-10, 10 being the closest in taste and texture to the control. I found that my hypothesis was incorrect. The amount of xanthan gum didn't affect the taste scores for brownies and cakes significantly, suggesting that xanthan gum amount did not affect these baked goods. The 1.25 mL of xanthan gum in the gluten-free bread had an average taste score of 7.39 which was greater than any of the other average scores. The averages varied in bread more than cakes and brownies with breads averages between 2.67 to 8 and cakes and brownie averages between approximately 5 and approximately 8. There was a greater change in the bread experiment because bread needs xanthan gum more than brownies or cake. Xanthan gum creates the structure in baked goods without gluten. Bread is affected by the xanthan gum more than the others which makes the amount of xanthan gum matter more.