
Food & Energy

Name: Joseph Puccio

Lab Partner: Lucy Dempsey

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INTRODUCTION:

In a recent lab we learned that chocolate chip cookies contain a lot of energy. More energy per gram, in fact, than TNT! Food energy comes from three primary sources: proteins, carbohydrates, and fats. In today's lab we are going to study foods and food labels in order to better understand where your body gets its energy. We will also begin to look at why some sources of energy are healthier than others and why a balanced diet is so important.

PURPOSE:

The purpose of this lab is to answer the following questions:

1. What are proteins and how does your body use them for energy?
2. What are carbohydrates and how does your body use them for energy?
3. What are fats and how does your body use them for energy?
4. How much energy do we get from each of the three sources above?
5. Why is salt important?

HYPOTHESIS:

What are proteins and how does your body use them for energy?

I hypothesize that proteins are energy which is used to create ATP and run the body.

What are carbohydrates and how does your body use them for energy?

I hypothesize that a carbohydrate is a type of energy that is broken down into proteins and cells use the proteins to create ATP and run the body.

What are fats and how does your body use them for energy?

I hypothesize that fats are a storage of carbohydrates and if you eat too many carbohydrates without burning them the extra carbohydrates are stored in your body as fat.

How much energy do we get from each of the three sources above?

I hypothesize that we get enough energy to survive in our daily lives.

Why is salt important?

I hypothesize that salt is important because your bloodstream contains salt. And your body needs salt to survive. And needs more salt because when you sweat you lose salt.

MATERIALS & EQUIPMENT:

- ☐ Various foods (with food labels)
- ☐ Scale
- ☐ Beakers
- ☐ Petri dishes
- ☐ Sugar
- ☐ Salt
- ☐ Oil
- ☐ Protein powder

PROCEDURE:

1. Pick two snack foods for your lab team to explore
2. Label them Sample 1 and 2
3. For each sample, determine how big a single serving is
4. Determine how much salt, total carbohydrate, protein, and fat is available in one serving (in grams or milligrams).
5. Weigh out the equivalent amount of salt, sugar, protein powder, and oil in separate beakers.
6. Determine the %DV of each of the above that one serving contains
7. Determine how many calories one serving provides
8. Record all your data in a data table

DATA TABLES AND OBSERVATIONS:

Energy Table For Sample 1 & 2

	Sample 1 (Apple Crisp)	Sample 2 (Dorritos)
Serving Size	1 Bag (14 Grams)	1 Bag (28.3 Grams)
Salt	75 Milligrams (3% DV)	180 Milligrams (7% DV)
Carbohydrates	13 Grams (4% DV)	17 Grams (6% DV)
Fat	0 Grams (0% DV)	8 Grams (12% DV)
Proteins	0 Grams (0% DV)	2 Grams (4% DV)
Calories	50 Calories	150 Calories

Based on a 2,000 Calorie Diet

Observations:

I was very surprised by the high amount of sugar was in both the Dorritos and Apple Crisp. I was also very surprised with the low amount of salt in both the Apple Crisp and the Dorritos. I also noticed that there was no protein or fat in the Apple Crisp.

CALCULATIONS:

Given that 1 Cal = 4.1868 joules, calculate the number of joules of energy in one serving of sample 1. Repeat the calculation for sample 2.

Sample 1:

1 Calories = 4.1868 joules

Sample 1 = 50 Calories

Amount of Joules in Sample 1 = $50 * 4.1868$

Amount of Joules in Sample 1 = 209.34 Joules

Sample 2:

1 Calories = 4.1868 joules

Sample 2 = 150 Calories

Amount of Joules in Sample 2 = $150 * 4.1868$

Amount of Joules in Sample 2 = 628.02 Joules

If an adult needs around 2250 Cal per day to maintain weight and function, how many joules does the average adult need per day?

Average Amount of Calories An Adult Needs per day = 2250 Calories

1 Calories = 4.1868 joules

Amount of Joules the Average Adult needs per day = $2250 * 4.1868$

Amount of Joules the Average Adult needs per day = 9,420.3 Joules per day

QUESTIONS TO CONSIDER:

How much of Sample 1 would you need to eat to get 100% DV of salt, total carbohydrate, protein, and fat?

How much of Sample 1 would you need to eat to get 2000 calories?

Answer questions 1 and 2 for Sample 2

Amount of bags needed to meet each requirement

Type	Sample 1	Sample 2
Salt	33 Bags	14 Bags
Carbohydrates	25 Bags	16 Bags
Protein	Undefined	8 Bags
Fat	Undefined	25 Bags
Calories	40 Bags	13 Bags

How are your two samples the same? How are they different?

In every aspect shown here the two samples we tested are different. The Apple Crisps had a considerably more amount of salt than the Dorritos. However the Dorritos had a considerably larger amount of protein and fat. But the numbers that stand out the most are the calories per bag, the Dorritos have three times as many calories as the Apple Crisp.

How many grams of protein are required to get your 100% DV of protein?

Based on a 2,000 Calorie Diet 50 Grams of protein.

How many grams of carbohydrates are required to get your 100%DV of carbohydrates?

Based on a 2,000 Calorie Diet 300 Grams of Carbohydrates

How many grams of fat are required to get your 100%DV of fat?

Based on a 2,000 Calorie Diet 65 Grams of Fat.

DATA ANALYSIS AND RESULTS:

In this lab I measured the amount of fat, carbohydrates, salt, and protein in one serving of two foods that my partner and I chose. We began our measurements by examining each sample of food and recording the amount of fat, carbohydrates, salt, and protein were in each serving. We recorded these results in grams or milligrams depending on the units the nutrition chart used (see energy table pg. 4). We later recorded the amount of calories each sample contained in one serving.

After recording these results we weighed the amount of fat, carbohydrates, salt, and protein using either oil, sugar, table salt or protein powder so that we could record observations. These measurements allowed me to understand how much or how little fat, carbohydrates, salt, or protein each of the foods we chose contained. And in measuring each elements of the food out, it allowed me to understand what I'm actually eating when I eat it.

I was able to calculate the amount of Joules which is a unit of energy one serving of each sample contained. I did this by multiplying the amount of calories in each serving by the number of Joules one calorie equals.

I was surprised to discover the low amount of salt in sample one (apple crisp) compared to sample two (dorritos).

When you eat anything, it goes through six major areas of your body called the digestive system. Almost everything you eat contains starch which for example can be found in potatoes, corn, rice and wheat. Sugar, which is carbohydrates. Vitamins and Minerals, and of course water. And fat is also commonly found. The first major journey into the digestive system is the mouth, the teeth of course chop the food into small bits. Saliva is then produced which contains an enzyme which starts to break the starch particles in the food down.

Mucus in the saliva help lubricate the small pieces to slip down into the esophagus. Muscles in the esophagus force the food down into the stomach. In which the stomach's digestive juices (hydrochloric acid) are mixed with the food. Enzymes in the stomach break down some of the protein in the food. Once the food has been mixed a muscle located at the end of the stomach relaxes to allow the food through to the duodenum. In the duodenum different kinds of enzymes finish off the break down of the starch particles into sugar.

Next if the food contains fat bile, which is a digestive juice stored in the gallbladder breaks it down into smaller particles and fat enzymes break it down even further. The food then travels to the Ileum also known as the small intestine. The small intestine contains Villi, which are small extensions that snatch the sugar, protein and fat particles and are then absorbed into the blood stream.

What is left behind is only undigested waste, which is mostly made up of roughage (things that can not be digested in the human body) and water. This clump of roughage and water is then squeezed to the colon, also known as the large intestine. As it travels through the colon the remaining water is absorbed.

What remains of the food is purely indigestible waste, it is stored in the rectum. Which when enough of it is expelled through the anus which is feces.

After learning about the digestive system I found out why salt is so important, the elements that make up salt are sodium and chloride. The stomach breaks down food using hydrogen chloride. Hydrogen is found in every food, and any food containing salt has the chloride which the stomach requires. When the food travels through the small intestine the salt is absorbed. And is used to break down foods in the stomach.

My observational data indicates that I was very surprised at the low amount of salt in both the samples. I was also surprised with the difference of calories, the apple crisp had only 50 calories compared to the dorritos which had 150. Possible sources of error include weighing incorrectly, the difference of quantity between the two samples i.e. one has 14 Grams, and the other 28 Grams, and making observations and calculations based on those numbers.

CONCLUSION:

My hypothesis was partially correct, the real reason that salt is important is because it contains chloride. Chloride is used in your stomach along with hydrogen to break down foods. The reason why salt can be harmful if you have too much of it is because if more of it is absorbed into your blood stream than your body needs, it creates clots. Which make it harder for your heart to pump blood around your body giving you higher blood pressure and more risk of a heart attack.

I learned why salt is important and why if you have too much of it, it's bad for you. I learned the process of digestion and how your body extracts and uses the nutrition in food. Finally, I learned why your body needs different types of nutrition.

WEB LINKS:

<http://www.mypyramid.gov/>

http://www.kidshealth.org/kid/body/digest_noSW.html