<h1 align="center">Logbook</h1>

August 12, 2023

I have noticed that my dad will eat carrots before most of his meals. I asked him why he does that. He then explained to me that he has been worried about his blood sugar levels for the past few years. He says that his HbA1c is at 6.0 and is worried it will increase. HbA1c is the amount of glucose attached to hemoglobin in the bloodstream. In healthy people, this number is less than 5.7%. If you are between 5.7% and 6.4%, then you are prediabetic and over 6.5% indicates you have diabetes. My dad is 6.0 (prediabetic) and has been trying to eat very healthy, so this number won't increase. He has been listening to a podcast that says if you eat fibre before a meal, that your blood sugar won't spike as much. This is where I got my idea for science fair. I wondered if eating fibre before a meal can help control your blood sugar level. And I wondered how does it do this? I also wondered if exercise would help manage his blood sugar level as well. My question is: Will consuming fiber before meals minimize the intensity of the glucose spike?

August 13, 2023

Today I started my background research. Here are the topics I researched today. I wrote them in point form in a separate Word Document.

1) What is Type 2 Diabetes?
2) Why is Diabetes Significant?

August 14, 2023

I continued my background research today. Here are the topics I researched:

1) How can Diabetes be prevented?
   Diabetes can be prevented by eating fibre and exercising. Fiber is part of a healthy diet and can provide a range of health benefits. It can be especially important in preventing or managing diabetes. Another way diabetes can be prevented is by being active. If you want to minimize the chance of developing diabetes, you should start slow and build up.

2) How can Fibre affect blood glucose?
   We all need fiber to keep our internal plumbing humming like a fine-tuned engine. But most US adults only get about half the fiber they need each day. Fiber is a type of carbohydrate found mainly in fruits, vegetables, whole grains, and legumes. It helps keep you regular, but it offers many other health benefits as well, especially for people with diabetes or prediabetes. There are many health benefits of fiber. If you have diabetes or prediabetes, fiber is your friend because it helps with blood sugar control and weight management. It can also lower your risk of heart disease and some cancers. Specifically, fiber can help control your blood sugar. Because the body is unable to absorb and break down fiber, it doesn't cause a spike in blood sugar the way other carbohydrates can. This can help keep your blood sugar in your target range. It can also protect your heart. Fiber prevents your body from taking in some fat and cholesterol, lowering your triglyceride and cholesterol levels to help reduce your risk of heart disease. Furthermore, it can maintain your digestive health. Fiber acts like a

scrub brush, cleaning your digestive tract. It helps clean out bacteria and other buildup to improve gut health and help reduce your risk of colon cancer. Finally, it can keep you feeling full and help with weight management. Since fiber can't be digested, it moves slowly through the stomach, making you feel fuller for longer. And many foods high in fiber tend to be low in calories, which can help with weight loss. In conclusion, to have a fiber-friendly breakfast, you should choose whole grains, focus on non-starchy vegetables, add beans or other legumes, and finally snack on fruit, vegetables, nuts, and seeds.

3) How can Exercise affect blood glucose?
You need to keep it positive, and instead of focusing on how tired you are, focus on the progress you are making. To do this, you need to make physical activity more fun, and try new things. Second, you should encourage kids to join a sports team. Finally, limit screen time to 2 hours a day. Instead of watching tv, do biking, or take walks.

August 15, 2023

I began writing my background information today. I began a list of Bibliography and added my sources as I went along.

August 16, 2023

I continued writing my background information.

August 18, 2023

I finished writing my background information today. I then used my background information to form a hypothesis. Through research, I found that fibre before a meal can decrease blood sugar levels after a meal. I also found that exercise can potentially decrease blood sugar levels after a meal. With this information, my hypothesis is:

If one ingests fiber before a meal and exercises after a meal, then the intensity of the postprandial blood glucose spike should be lessened.

The significance of my research is that short term control of blood glucose levels can help long term. This could potentially reduce the risk for the onset of Type 2 Diabetes.

I thought about my experimental design. I thought it would be fun to do this experiment as a family, because the results would be very helpful for my dad. I also thought it would be easier to do it as a family because we all would be eating the exact same thing that my cooks. Here are my variables:

1. Manipulated Variables:
   - Fibre intake before a meal
   - Exercise after a meal
2. Responding Variable:
   - The blood glucose spike. A glucose spike is the postprandial blood glucose subtracted by blood glucose before a meal
3. Controlled Variables:

- Type & Quantity of Meal consumed,
- The Type & Quantity of Fiber consumed prior to the meal
- Type & Length of Exercise done after the meal
- The Continuous Glucose Monitor used
- Blood Glucose Levels prior to the meal by restricting food/drink intake 2 hours before the meal
- The time you wait to exercise after a meal (15min)

August 19, 2023

Today I created a rough plan for my procedure. I decided I will have 4 subjects: My dad, my mom, my sister, and myself.

Group 1: Days 1-3: I will measure our blood glucose before and after each meal. For these three days, I will not be doing fibre and exercise. Every group will have 3 sets of data or trials to increase reliability. These measurements in Group 1 act as the control for the experiment.

Group 2: Days 4-6: I will measure our blood glucose before and after each meal. However, here I eat fibre before each meal. These measurements in Group 2 include the fibre variable only.

Group 3: For 7-9 Days, I will measure my blood glucose before and after each meal. However, here I have no fibre and only exercise after each meal. These measurements in three days include the exercise variable only.

Group 4: For 10-12 Days, I will measure our blood glucose before and after each meal. However, here I have fibre before each meal and exercise after each meal. These measurements in three days include both the fibre and exercise variable.

Altogether, each subject will have 12 data points, giving me a total of 48 data points in the experiment.

I decided on our meal plan. We would have to eat the exact same dinner for 12 days straight to keep the experiment controlled. I also chose a meal that we normally eat. I don't want to alter our meals because I wanted to keep it as practical and realistic as possible. All I am testing is to see if adding fiber and exercise can help in reducing the post-prandrial glucose spike.

I would also use the Accu-chek finger poke glucose monitor that my family already owns to do the measurements. After research, I found that most post-prandrial spikes occur around 75min after a meal. That is when I will take the final measurement.

August 20, 2023

The type of fibre to consume?

I did research to find that blood sugar levels are best controlled by soluble fibre (as opposed to insoluble fibre). I added information to my background information regarding this. I also did research to figure out which source of fiber I will use for my experiment. I ultimately decided to use Metamucil powder. This is a good source of fibre but also contains no carbohydrates and is

sugar-free. All of the other sources of soluble fiber I researched (black beans, oats, vegetables, etc.) contain carbohydrates or sugars that will prevent my experiment from being controlled.

What type of exercise to do?

After doing research, I found that if we do intense exercise, that could release a hormone called cortisol. Cortisol is a stress hormone that can prevent insulin from being secreted by the pancreas. This could then prevent blood sugar levels from decreasing after a meal. Therefore, I decided that "exercise" in this experiment will consist of a brisk 20 min walk outdoors which is still considered low-intensity.

November 21, 2023

Submitted my Ethics Safety Form to CYSF.

November 23-27, 2023

Received an email from CYSF saying that I could not use the finger poke method for measuring blood sugar levels because using human blood is against the rules of CYSF. I emailed asking if a continuous glucose monitor would be okay since it does not use blood, but uses interstitial fluid to measure the glucose levels in the body. I received an okay to go ahead and my project was approved by the Ethics Committee.

I decided to use a CGM that my family already owns – the Dexcom G6.

November 28, 2023

My mom connected the CGM into her belly and begun measurement today.

Today, she tested:

- No Fibre, No Exercise.

November 29, 2023

Today, my mom tested:

- No Fibre, Yes Exercise.

November 30, 2023

Today, my mom tested:

- No Fibre, Yes Exercise.

December 1, 2023

Today, my mom tested:

- Yes Fibre, No Exercise.

December 2, 2023

Today, my mom tested:

- Yes Fibre, No Exercise.

December 3, 2023

Today, my mom tested:

- Yes Fibre, No Exercise.

December 4, 2023

Today, my mom tested:

- No Fibre, No Exercise.

December 5, 2023

Today, my mom tested:

- No Fibre, Yes Exercise.

December 6, 2023

Today, my mom tested:

- No Fibre, No Exercise.

December 7, 2023

Today, my mom tested:

- Yes Fibre, Yes Exercise.

After dinner tonight, she had to replace the insert of her CGM since it only lasts 10 days.

December 8, 2023

Today, my mom tested:

- Yes Fibre, Yes Exercise.

December 9, 2023

Today, my mom tested:

- Yes Fibre, Yes Exercise.

She is officially done the experiment.

January 7, 2024

Today was my dad's turn to do the experiment.

Today, my dad tested:

- Yes Fibre, Yes Exercise.

January 8, 2024

Today, my dad tested:

- Yes Fibre, Yes Exercise.

January 9, 2024

Today, my dad tested:

- Yes Fibre, Yes Exercise.

January 10, 2024

Today, my dad tested:

- No Fibre, No Exercise.

January 11, 2024

Today, my dad tested:

- No Fibre, No Exercise.

January 12, 2024

Today, my dad tested:

- No Fibre, No Exercise.

January 13, 2024

Today, my dad tested:

- No Fibre, Yes Exercise.

January 14, 2024

Today, my dad tested:

- No Fibre, Yes Exercise.

I also started my experiment today too. My mom helped me put the sensor into me. For children, the sensor is put in the lower back/upper buttocks.

Today, I tested:

- No Fibre, No Exercise.

January 15, 2024

Today, my dad tested:

- No Fibre, Yes Exercise.

Today, I tested:

- No Fibre, Yes Exercise.

January 16, 2024

Dad recorded Day 10 of results. He placed a new sensor on today.

Today, my dad tested:

- Yes Fibre, No Exercise.

Today, I tested:

- No Fibre, Yes Exercise.

January 17, 2024

Today, my dad tested:

- Yes Fibre, No Exercise.

Today, I tested:

- No Fibre, Yes Exercise.

January 18, 2024

Today, my dad tested:

- Yes Fibre, No Exercise.

He is officially done the experiment.

Today, I tested:

- Yes Fibre, Yes Exercise.

January 19, 2024

Today, I tested:

- No Fibre, No Exercise.

January 20, 2024

Today, I tested:

- No Fibre, No Exercise.

I also finished proofreading and completed the Background Information section for my project.

January 21, 2024

Today, I tested:

- Yes Fibre, Yes Exercise.

I also began creating a spreadsheet for my results and started thinking about the graphs I would create to display my results.

January 22, 2024

Today, I tested:

- Yes Fibre, Yes Exercise.

January 23, 2024

Today, I tested:

- Yes Fibre, No Exercise.

I also placed a new insert into my CGM today.

I also started a list of Sources of Error, Further Experimentation and Real Life Applications.

January 24, 2024

Today, I tested:

- Yes Fibre, No Exercise.

My sister also started her experiment today. My mom inserted a CGM into her lower back/upper buttocks.

Today, she tested:

- No Fibre, No Exercise.

January 25, 2024

Today, I tested:

- Yes Fibre, Yes Exercise.

I'm officially done the experiment.

Today, my sister tested:

- Yes Fibre, No Exercise.

January 26, 2024

Today, my sister tested:

- No Fibre, No Exercise.

January 27, 2024

Today, my sister tested:

- Yes Fibre, No Exercise.

January 28, 2024

Today, my sister tested:

- No Fibre, Yes Exercise.

January 29, 2024

Today, my sister tested:

- Yes Fibre, Yes Exercise.

January 30, 2024

Today, my sister tested:

- Yes Fibre, Yes Exercise.

January 31, 2024

Today, my sister tested:

- Yes Fibre, Yes Exercise.

February 1, 2024

Today, my sister tested:

- No Fibre, Yes Exercise.

February 2, 2024

Today, my sister tested:

- No Fibre, Yes Exercise.

She inserted a new sensor.

February 3, 2024

Today, my sister tested:

- No Fibre, No Exercise.

February 4, 2024

Today, my sister tested:

- Yes Fibre, No Exercise.

I have now obtained all of my results for the Science Fair!

February 5, 2024

Today I finished the spreadsheet for my results and began constructing my graphs for my results section.

February 6, 2024

Today I analyzed my data and completed by conclusions.

February 7, 2024

Today I completed my Sources of Error, Further Experimentation and Real Life Applications Section.

February 8 -19 , 2024

These days I worked on my Trifold and Oral Presentation.