Background
- Blood glucose level can be measured with a small amount of blood and a blood glucose meter.
- Individuals who are affected by hypoglycemia and diabetes tend to frequently use blood glucose meters.
- The blood glucose meter uses test strips in which blood is absorbed and the meter analyzes the glucose in the individual’s system.
- The pH is the scale in which solutions are termed acidic or basic.

Purpose / Objective(s):
- To practice taking blood sugar levels and blood pH.
- To better understand how sugar (sucrose) is digested and metabolized within our bodies.
- To learn about the different excretes of the human body through urine.
- To observe and compare the correlations and differences between ourselves and other subjects.
- To assist us in learning about more medical tools and measure blood sugar, pH, and urinalysis.

Hypothesis (ese):
- A normal and healthy individual will begin the morning with a lower blood sugar level and it will spike after ingestion of sucrose.
- A normal and healthy subject will have a peak level of blood glucose level at 20 minutes after sucrose ingestion, and will drop back down after 40 minutes.
- A subject that is affected by diabetes will have varying levels of blood glucose, inconsistent with that of the other subjects.
Subject(s) / Specimen(s):

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Preexisting Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew</td>
<td>19</td>
<td>N/a</td>
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<tr>
<td>Andrea</td>
<td>20</td>
<td>N/a</td>
</tr>
<tr>
<td>Aileen</td>
<td>29</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Jillian</td>
<td>26</td>
<td>Epileptic</td>
</tr>
<tr>
<td>Victoria</td>
<td>18</td>
<td>N/a</td>
</tr>
</tbody>
</table>

Materials:
- Alcohol Prep Pads
- Blood Glucose Test Strips (Figure 1)
- Digital Blood Glucose Meter (Figure 2)
- Food Scale (Figure 3)
- Lancet/Lancet Device (Figure 4)
- Paper Cups
- pH Test Strips (Figure 5)
- Pure Cane Sugar (sucrose)
- Sharps Container
- Test Tube
- Urinalysis Test Strips (Figure 6)
- Water (H2O)

Figure 1: [Image of Blood Glucose Test Strips]

Figure 2: [Image of Digital Blood Glucose Meter]

Figure 3: [Image of Food Scale]

Figure 4: [Image of Lancet/Lancet Device]
### Blood Sugar

1. Disinfect spring loaded lancet device.
2. Place blood glucose test strip into the blood glucose meter.
3. Disinfect area on finger in which the lancet will puncture the skin.
4. Puncture skin with the lancet.
5. Squeeze blood from small opening in the finger.
6. Place the small pool of blood on the end of the blood glucose test strip.
7. Wipe off excess blood from finger.
8. Read the blood glucose meter and record results.
9. Repeat this process at 20 minutes and 40 minutes after ingesting sucrose.

### pH

Urine:

1. Cut off a strip of the pH test strip.
2. Collect a urine sample in paper cup.
3. Transfer urine sample to test tube.
4. Place end of pH strip into the sample.
5. Wait for the pH strip to change color.
6. Match the pH strip color to the color key on the pH strip container.
7. Record observed results.

Blood:

1. Cut off a strip of the pH test strip.
2. Use excess blood from puncturing finger with the lancet.
3. Place the blood on one end of the pH strip.
4. Wait for the pH strip to change color.
5. Match the pH strip color to the color key on the pH strip container.
6. Record observed results.
7. Repeat this process at 20 minutes and 40 minutes after ingesting sucrose.

### Urine

1. Take the paper cup, test tube, pH strip, and urinalysis strip into the bathroom.
2. Collect a urine sample in the paper cup.
3. Transfer the urine sample into the test tube (this is important, because the test strip indicators can fall off if bent to place in the cup).
4. Place the urinalysis strip into the urine sample.
5. Hold the strip in the urine sample covering all indicators, for 30 seconds.
6. Remove the strip and discard the waste appropriately.
7. Take the urinalysis strip back to the classroom.
8. Match all indicators with the color key on the urinalysis strip container.
9. Record observed results.
10. Repeat this process at 20 minutes and 40 minutes after ingesting sucrose.
Results / Data (See Attachments):
- Chart 1 shows the blood glucose level for myself versus the blood glucose level average of the sample population.
- Chart 2 shows the blood glucose levels for all subjects.
- Chart 3 shows the urine panel for myself.
- Chart 4 shows the urine panel averages for all subjects at base line, 40 minutes, and overall average.
- Chart 5 shows the urine panel means for all subjects.
- Chart 6 shows the urine and saliva pH at the base line.

Analysis / Discussion (See Attachments):
- Chart 1 suggests that there is a similar pattern for the averages of the sample population and myself. However, my blood glucose levels were lower than the averages except for at the peak. My blood glucose levels suggest a very quick digestion and absorption of the glucose. This quick digestion and absorption is within normal range for adults. As well, all of my blood glucose levels are in the normal range for adults.
- Chart 2 shows that I am fairly in the middle range of all of the subjects. My pattern shows a similar pattern to that of every other subject except for Jillian who flatlined. It is possible that Jillian is borderline hypoglycemic. She could possibly have reactive hypoglycemia. As well, Jillian is epileptic and hypoglycemia can lead to seizures. Victoria and I are the only two subjects that had a rapid growth at the peak. This could be due to our age, the amount of sucrose intake, and metabolism.
- Chart 3 shows that I have a steady level of leukocytes within my system and my pH had stayed very stable. What I think is interesting is that there was zero traces of glucose in the my urine sample. I had expected there to be traces of glucose, due to the ingestion of sucrose. However, higher levels of glucose in urine is an indicator of diabetes.
- Chart 4 shows that the pH levels are stable for all subjects. This is due to the fact that the kidneys create urine and are very strict, resulting in a similar and stable pH for all subjects. The only things that had varied during the different times was leukocytes, and ascorbic acid. Ascorbic acid is also typically known as vitamin C.
- Chart 5 once again similar to chart 4, shows variance in leukocytes and ascorbic acid. Victoria especially had high levels of leukocytes in her urine. This could because she was sick at the time and fighting an illness. As well, the ascorbic acid varies, this is most likely caused by what the individual had eaten.
- Chart 6 shows that pH for all subjects is very stable for both urine and saliva. I had a higher pH level for my saliva than every other subject. This can be caused, by illness or other means such as what I had eaten. My pH level of my saliva still falls within the normal range. pH levels vary among adults.
Conclusions / Further Considerations:

- The hypothesis that a normal and healthy individual will begin the morning with a lower blood sugar level and it will spike after ingestion of sucrose, had proved to be true except for one subject—Jillian. This could very well be caused by hypoglycemia. Otherwise, all other team members fall within the average range for that of adults.

- The hypothesis that a normal and healthy subject will have a peak level of blood glucose level at 20 minutes after sucrose ingestion, and will drop back down after 40 minutes, also was proven to be true for all subjects except for Jillian. Some individuals did have much more of a peak than others.

- The hypothesis that a subject that is affected by diabetes will have varying levels of blood glucose, inconsistent with that of the other subjects, was surprisingly inconclusive. It was interesting to see that Aileen had a fairly stable blood glucose levels compared to all subjects. In order to accurately assess this hypothesis it would require many more subjects affected by diabetes. Aileen could have had stable blood glucose, because she is very active about keeping her levels consistent. As well, it depends on the severity of her diabetes and the type of diabetes.

- It is interesting to see how much of a peak I have with blood glucose, after ingestion of sucrose and the quick decline as well. All of my levels fall within the normal levels of blood glucose for adults. The quick digestion and absorption of sucrose could have an effect on what is know as a “sugar rush” and then the “crash” shortly after. I had expected to see higher levels of glucose in my urine, but that would be a sign of diabetes. I had expected it to be the other way around and that lower levels of glucose would be a sign of diabetes.

- I had thought that a high level of leukocytes in urine would just be indicative of illness of some kind. However it could be because of a Urinary Tract Infection (UTI) or a kidney infection. Pregnancy can also causes these levels to rise and so can holding the bladder for too long.
Research:

Blood Glucose Levels:
- There are many people who can benefit from testing blood glucose levels, including:
  - People to take insulin
  - Pregnant women
  - Individuals that have a difficult time controlling blood glucose levels
  - People who have low blood sugar levels
  - People who have ketones from high blood glucose levels
- The amount of glucose (measured in mg/dL) in your system varies throughout the day. These levels change in accordance to how much, what, and when an individual eats. As well, exercise plays a role in blood glucose levels.
- Normal blood sugar levels after not eating for eight hours is between 70 and 99 mg/dL.
- A normal blood sugar level two hours after eating is less and 140 mg/dL.

Sucrose Digestion and Absorption:
- Sucrose consists of one glucose molecule and one fructose molecule. Sugars such as sucrose that contain more than one molecule are referred to as polysaccharides.
- Glucose and fructose are digested, absorbed, and metabolized separately.
- Digestion of sucrose begins in the small intestine, where polysaccharides are broken down during a processes known as hydrolysis. The polysaccharides are broken down into monosaccharides.
- The monosaccharides are then ready to be absorbed. The nutrients are carried into the hepatic portal veins for further processing.
- The glucose then travels to almost every cell in the body. Glycolysis is the metabolic breakdown of glucose.

Hypoglycemia:
- Hypoglycemia occurs when the blood sugar/glucose level drops below normal.
- Glycogen is stored within the body to be released when hypoglycemia occurs. The release of glycogen can be impaired resulting in lower than normal levels of blood glucose.
- Hypoglycemia can worsen if not treated, leading to confusion, dizziness, and fainting. Severe hypoglycemia can lead to seizures, coma, and possibly death.
- Hypoglycemia usually occurs with diabetes, however there are two kinds of hypoglycemia that can occur in people without diabetes:
  - Reactive hypoglycemia (postprandial hypoglycemia) happens within four hours after eating.
  - Fasting hypoglycemia (postabsorptive hypoglycemia) is usually related to an underlying disease.
ATTACHMENTS

Chart 1:

Blood Glucose for Myself vs. Average of the Population

Chart 2

Blood Glucose For all Subjects
Chart 3:

Urinalysis for Myself

Chart 4:

Urine Panel Averages for All Subjects
Chart 5:

Chart 6:
References / Literature Cited: Medical Practice uses APA Standards for Citations.