Goal Time (10 – 15 mins)

Overview

1. Quick introductions. Ask the eiSci mentors and mentees to say their names.
2. Provide the background research on Sugars. Try to engage the other mentors and mentees by asking for examples of favorite drinks.
3. Carry out the experiment.
4. Have the students fill out the provided tables.

Background Info.

Fresh pineapple, chilled watermelon, and an icy cold soft drink on a hot summer's day. What do these things have in common? They all taste so good because of the sweetness the sugar in them provides. When you think of sugar, you probably picture the white granules you put in cookies, that your parents put in their coffee, or that you put on your cereal. Actually, this is just one kind of sugar, called **sucrose,** which is extracted from sugar cane or sugar beets. Technically, sugar is a **carbohydrate** that occurs naturally in every fruit and vegetable. It is the major product of photosynthesis, the process by which plants transform the Sun's energy into food. Simple carbohydrates or sugars are the different forms of sugar, which are easy for the body to process. These sugars are **fructose** and **glucose** (found in fruits and vegetables, **lactose** (found in milk), and **sucrose** (refined and purified to produce table sugar).

**Glucose** is a very important **biochemical.** For one thing, glucose is the only fuel used by brain cells. Glucose is also an important source of energy for muscles and other tissues in the body. All other sugars must be changed into glucose by the body before the cells can use them.

The glucose in your blood comes from the food you eat. **Complex carbohydrates,** found in pasta or cereal, for example, are long chains of sugar molecules that are broken down by **enzymes** to simple sugars, such as glucose. Sucrose, or table sugar, is also broken down to form glucose. Because carbohydrates and sucrose in food are broken down to form glucose, the level of glucose in your blood goes up after you eat.

Like most of the chemicals in your blood, the level of glucose must be tightly controlled. The level of glucose in your blood is controlled by **insulin,** a **hormone** made in the **pancreas.** Too little glucose, and your brain and other organs will not have the energy they need to function. Too much glucose in the blood can cause diabetes, which is a serious and growing health problem in the United States.

We are going to investigate the concentration of glucose in common fruits and juices. In order to measure the glucose concentration, you will use glucose strips. These strips were developed to help people with diabetes maintain a healthy level of blood glucose. When you dip the test strip into a liquid, such as orange juice, it changes color if glucose is present. The degree of color change depends on the concentration of glucose.

Materials:

* Pencils
* Food and juices to test: orange juice, coke, apple juice and peanut butter
* Background info pdfs.
* Glucose level tables
* Disposable cups, at least 8 oz.
* Permanent marker
* Glucose tablets with 4 g of glucose per tablet
* Water
* Graduated cylinder (10ml and 100 mL volume)
* Diastix® glucose test strips for urinalysis
* Timer

Experimental Procedure

Part I: **Making the Positive and Negative Controls**

1. First, make the positive controls using water and the glucose tablets. To do this, make a **dilution series** using sequential two fold dilutions to create the following concentrations: 4%, 2%, 1%, 0.5%, 0.25%, 0.125%, and 0.0625%.
   1. Label seven cups 1–7.
   2. Add 8 grams (g) of glucose to 200 milliliters (mL) water in cup #1 to make the 4% solution and stir until the glucose dissolves.
      1. *Tip:* The glucose tablets will dissolve faster if they are first cut into small pieces and then crushed (such as by using the back of a spoon).
   3. Add 100 mL of water to each of the six remaining cups (2–7).
   4. Add 100 mL of the 4% solution to cup #2 to make a 2% solution. Stir well.
   5. Then add 100 mL of the 2% solution to cup #3 to make a 1% solution. Stir well.
   6. Repeat for the remaining dilutions. Make sure to rinse the container you are using to transfer the 100 mL volumes between each dilution.
      1. When you are done, each cup should have 100 mL of liquid, except for the 0.0625% solution, which should have 200 mL.
2. Label an eighth cup #8 and add 100 mL water to it. Do not add any of the glucose solutions to it. This will be a 0% solution and will be your negative control.
3. Dip a test strip into each of the eight cups, one at a time. Watch the test strip for 30 seconds (which should be the time recommended in the test strip instructions) and match the color of the test strip to the color on the bottle. Do the colors match what you would expect? Write down your observations in your lab notebook.
4. *Note*: The colors on the bottle will not exactly correspond to the percent glucose solutions you made. On the bottle there will probably be colors for 0% ("Negative"), 0.1% ("1/10"), 0.25% ("1/4"), 0.5% ("1/2"), 1% ("1"), and 2% ("2") glucose solutions, as shown in Figure 2 below.
5. Some test strip colors may fall between two of the colors on the bottle, for example between "1/2" and "1." If this happens, write down the two numbers in your lab notebook and calculate their average.
6. If the color changes to the maximum range (2%) before 30 seconds, list it as greater than 2% (">2%").

### Part II: Testing the Foods for Glucose Concentration

1. Pour a small amount of liquid that you plan to test into a cup.
2. Get ready to start the stopwatch.
3. Dip the test strip into the liquid
   1. For the fresh fruits and vegetables, press the test strip against a freshly cut slice until the test strip is thoroughly wet.
   2. For very high-glucose liquids, such as honey or soft drinks (not diet), or viscous substances, such as peanut butter, molasses, or baby food, dilute the samples in water prior to testing.
4. Start the stopwatch as soon as the test strip has been dipped.
5. Wait for the amount of time specified on the test strip directions, usually 30 seconds.
6. Compare the color on the test strip with the color on the side of the container to determine the glucose concentration.
7. Repeat steps 1–6, of this section, for all of your foods and juices.
8. Record your observations on the table.