SCIENCE CAREER ADVENTURES

Clinical Dietician: Science and Sports

NGSS Standard: MS-PS1-1

Adventure Description:

In this adventure, you will think like a clinical dietician and help develop a new piece of technology that can analyze athletes' sugar intake.

Activity

Teacher Note: Students will need access to the color matching chart that is provided with your glucose testing strips. If your kit does not come with enough copies for all groups, you may need to make extras. Many companies have printable copies of their color matching scales on their website.

Step 1: Background Information (10 minutes)

- Show Video: Science and Sports.
- Explain to students that clinical dieticians study how the body breaks down food. Some dieticians specialize in working with athletes by providing advice on what types of foods to eat so they have the most amount of energy while playing sports.
- Show Handout: Simple and Complex Sugars. Discuss how foods contain sugars that provide our body with energy. Simple sugars can be broken down right away, and complex sugars take longer to break down.
- Ask students whether simple or complex sugars are better for providing athletes with long-lasting energy for practices or games.
  - Discuss how simple sugars are broken down quickly, meaning they go into the bloodstream quickly and provide a burst of energy. However, this burst of energy does not last long and will not provide athletes with enough energy for an entire game or practice! The sugar gets into your bloodstream after about 15 minutes and you get a sudden burst of energy, but it doesn't last very long.

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- On the other hand, complex sugars take longer to break down. As a result, they go into your blood stream more slowly. You don't get the same burst of energy, but the energy lasts much longer. It takes your body longer to digest complex sugars, so the energy you get can last for hours. Athletes who are practicing or playing in a game for an extended period of time will benefit from eating complex sugars because they will have energy for longer.

- Next, explain that dieticians have been working with engineers to design devices that could test the type of sugar found in common foods. Show Handout: Trends in Nutritional Technology. Explain that these are actual devices that can test sugar in peoples's blood, but not in food.
  - Discuss how technology can help give people information about about their health and how much sugar they have been consuming.
  - Explain to students that there is a problem with current technology. It cannot test for sugar until after it is eaten and it cannot tell the difference between simple and complex sugars. This is a problem because people need to know which foods are comprised of simple or complex sugars so they can make better food decisions.

Step 2: Building Device (15 minutes)

- Explain to students that they will be building their own device that can determine whether foods contain simple or complex sugars. That way, athletes can understand whether the foods they are eating will give them a short burst of energy or long-lasting energy.
- Provide students with Handout: Steps to Build Your Device. Explain to students that they first complete Step 1, building the prototype.
- Divide students into pairs or small groups. Provide groups with the following materials:
  - 2 Cotton swabs (groups only need 1 cotton swab; however, we suggest providing 2 to each group in case one breaks in the building process)
  - 2 Glucose test strips (groups only need 1 glucose strip; however, we suggest providing 2 to each group in case one breaks in the building process)
  - Art supplies and building materials (ex: recycled materials, construction paper, paperclips, tape)
- Teacher Note: Remind students that they should build their device in a way that they can swap out testing strips and cotton swabs. This is important, as groups will swap out strips and swabs in the next step when they test different food items.

Step 3: Testing Device (15 minutes)

- Explain to students that they will now test whether their device can detect simple and complex sugars.
- Provide groups with Handout: Steps to Test Your Device. As a class, review the steps.
- Provide groups with the following materials:
  - Gloves
  - 4 small cups
  - 2 glucose testing strips (students can reuse the strips from the building process if still in good shape)
  - 2 cotton swabs
  - Water
  - Iodine
  - 1 Pipette
  - 2 types of food- one made of simple sugar and one made of complex sugar (see Handout: Foods For Testing for ideas)
  - Copy of the glucose color matching chart that goes with the brand of glucose strips you are using
- Have students test two or more foods by following Step 1: Testing for Simple Sugar. Remind students to place the end of the testing strip into the item they want to test for at least ten seconds. Students should also make sure that the testing portion of the strip is fully submerged in liquid.
- When students are done submerging the strips, they should compare the color of the strips to the glucose test strip chart that came with their specific brand of strips.
- When students are finished testing the foods to see if they contain glucose, they should fill out Handout: Data Table. Then, they should test the same foods by following Step 1: Testing for Simple Sugar.
- When students are finished testing the foods to see if they contain complex sugars, they should fill out the Data Table.
- Remind students that in order to test for complex sugars, they are using iodine. Iodine turns blue or black when exposed to complex sugars, but does not change colors when exposed to simple sugars. A dark blue or blackish color indicates complex sugar. No color change represents no complex sugar.

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Step 4: Discussion (5 minutes)

- Have a class discussion about whether groups thought each food item contained simple or complex sugars. Was anyone surprised by the results?
- Which of the foods tested would be best for an athlete trying to fuel up for a long day of competition? Which would be the worst?

Materials List

Provided online:

- Video: Science and Sports
- Handout: Simple and Complex Sugars
- Handout: Trends in Nutritional Technology
- Handout: Steps to Build Your Device
- Handout: Foods For Testing
- Handout: Data Table

Not Provided online (each student or group needs):

- Art supplies and building materials (ex: recycled materials, construction paper, paperclips, tape)
- Gloves
- 6 small cups
- 2 - 4 glucose testing strips
- 2 - 4 cotton swabs
- Water
- Iodine
- Pipette
- At least 2 types of food- one made of simple sugar and one made of complex sugar
- Copy of the glucose color matching chart that goes with the brand of glucose strips you are using

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