STUDENT GUIDE
EXPLAIN 2 LESSON 22

Food and Agriculture Center for Science Education

Part 1: Our Motivation

Record what we were trying to figure out that led to this investigation.

We are updating our explanation of how milk helps with recovery from exercise.

Related Questions:

- What does milk do to help with recovery from fatigue?
- What does glucose do once it is in the bloodstream?
- How does the sugar and lactose in milk help with recovery?

Part 2: Developing an Explanation of How Milk Helps with Recovery From Changes to the Body During Exercise

Using all the evidence you have gathered so far in this module, construct an explanation to answer the second part of our Module Questions, *Why are there so many changes to my body during exercise? How does milk help with recovery from these changes?* In your explanations, be sure to:

- Describe how the components of milk can help recovery from exercise and provide additional energy for continued exercise.
- Cite evidence from the data sets analyzed.

Our bodies require a lot of energy to participate in intense exercise. Energy for our cells, ATP, is made from glucose molecules. Glucose from muscle glycogen and liver glycogen stores is used to generate ATP during aerobic and anaerobic respiration. After a long enough amount of intense exercise, muscle and liver glycogen can be depleted enough that they have little to no glucose to contribute. We saw in John L. Ivy et al. 2002 and in John A. Carrithers et al. 2000 that after intense cycling exercise, muscle glycogen was depleted to 0 mmol/L in each study group and to less than 100 mmol/L in each study group, respectively.

Drinking a recovery beverage with carbohydrates can recover muscle glycogen to help continue to produce ATP for exercise. We saw in John L. Ivy et al. 2002 and in John A. Carrithers et al. 2000 that after drinking the recovery beverage, which contains carbohydrates, muscle glycogen levels increased from 0 mmol/L to over 30 mmol/L in each study group, and from less than 100 mmol/L to over 200 mmol/L in each study group, respectively.

Milk contains sugar and lactose. In digestion, these are broken down to produce glucose, which enters the bloodstream. Glucose can then enter the muscles and liver, where it can be used in

anaerobic or aerobic respiration right away, or it can be stored in the form of glycogen. So it is likely that glucose from milk, just like the carbohydrates in the studies, helps the body recover from intense exercise because it provides more glucose for immediate use or later use as stored glycogen to make ATP to help move the body.

Part 3: Updating the Recovery Model

We will update the class Recovery Models. List 2-3 additions you would make to the class model in the space below. These may be:

- Organs and their function
- Specialized cells and their function
- Signals or molecules and where they move

Molecules:

- muscle glycogen
- liver glycogen
- glucose from milk replenishing muscle and liver glycogen levels

Part 4: Asking New Questions

Record any new questions that you have that might help you:

- Find additional information about the changes experienced in our bodies during/after exercise and how milk helps us recover from those changes.
- "Fill in a gap" in your explanation or our class explanation.
- Settle an area of disagreement that we've identified in our explanations.

- Is it possible to run out of glucose for cellular respiration?
- What happens when you keep exercising and you don't take in more glucose to recover glycogen?