

# STUDENT GUIDE

## ENGAGE LESSON 25



### Part 1: Our Motivation

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

#### Questions

- Why are muscles sore after exercise?
- What happens to protein in milk in the body?
- How does protein help us recover from soreness?
- Why does chocolate milk help athletes' muscles recover from exercise?

#### Gaps in Our Explanations/Models

- We still haven't figured out what amino acids do in the body once they go through digestion.
- We still haven't figured out how protein helps the body recover from exercise.



### Part 2: Sharing Our Prior Experiences

Have you ever experienced muscle soreness after exercise? When? What did it feel like? What caused it?

#### Examples include:

- When I run cross country, my muscles feel sore afterward because it's an intense race.
- When I finish marching band practice, my leg muscles feel sore because I did a lot of marching and walking.



### Part 3: Observing the Module Phenomenon

Record your observations of what you notice in the video.

- He was working out doing squats.
- He did one workout without milk recovery, and he felt really sore afterwards.



- He did a second workout with squats and used milk for recovery for that one.
- After this workout, he said his muscles were feeling less sore than the first time.



#### Part 4: Creating and Sharing Initial Explanations

With your group, create an initial explanation to answer our Module Question, *How does milk help in muscle recovery from soreness and weakness induced by intense exercise?* In your explanation, be sure to describe:

- How you think muscles get sore from exercise.
- How you think the body uses a feedback mechanism to recover from muscle soreness.
- How you think milk could help muscles recover from soreness.

I think that muscles become sore due to the buildup of hydrogen ions, just like we learned in Module 3 about how muscles get fatigued and burn. Maybe there are too many of them, and they make the muscles hurt for longer. Just like we have seen in other parts of the body, the muscles probably have some response that makes the soreness go away. Milk can help this because the milk proteins get digested into amino acids, and those amino acids go from the bloodstream and probably go into the muscles to help them recover. There may be some other body system that helps them do so.

Share your explanation with your peers as instructed by your teacher. In the space below, reflect on the explanations of your peers and record what you agree with and what you disagree with.

Agree	Disagree
I agree that the proteins somehow get into the muscles to help them recover. One of my peers also mentioned that there has to be other nutrients or systems involved in muscle recovery, and I agree.	I disagree with one of my peers who said muscles just use glucose to repair themselves. Based on what I know, this doesn't make sense to me because I know bodybuilders prioritize protein in their diets. So, that must mean it is more important in the muscle recovery process than glucose.



#### Part 6: Asking New Questions

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

- Find additional information about why our muscles get sore after exercise and how milk can help them recover.
- “Fill in a gap” in your explanation or our class consensus explanation.
- Settle an area of disagreement that we’ve identified in our explanations.

- What happens to amino acids in the body?
- Do amino acids help in muscle cell recovery?
- Why does exercise make muscles sore?
- What happens in muscles that makes them sore and weak?
- What other body systems or cells play a role in muscle recovery?
- Is muscle recovery a form of homeostasis?