

UDL Vignette: Muscles Unit, Lesson 7

Mr. Jackson is teaching the Muscles unit to his 8th grade class. He is preparing for lesson 7, in which students figure out how the myostatin protein works to cause the heavily muscled phenotype in cattle. He wants to be sure to support his students who struggle with reading.

Learner Profile: He considers one student in his class, Dylan. Dylan is a creative student who loves learning about science. He was very engaged during the anchoring phenomena and brought many interesting questions to the class. However, Dylan has a learning disability in reading. He has challenges decoding text and has a particularly hard time with longer academic texts.

Goals: Mr. Jackson knows he wants to focus on the science practice - *Obtain, evaluate and communicate information*. After evaluating the credibility of the text and determining the reading is a reliable source, he wants the class to critically read the text to find its central ideas focusing on the function of myostatin. He knows that he wants his students to come away from this text understanding three main science ideas: normal myostatin stops cells from becoming muscle cells, it does this by fitting into a particular receptor on the outside of cells, and abnormal myostatin can't fit, which is why it can't stop cells from turning into muscle.

Supports built into the lesson: The text includes clear headings and images for each section. Students first skim the article and discuss the credibility with a partner using some criteria projected on a slide. Students are also provided with a graphic organizer to guide their critical reading of each section of the reading.

Potential Strategies: Mr. Jackson thought that some students, like Dylan, might need additional support to achieve these goals and minimize any barriers. He is considering taking the following actions:

- Splitting the reading into three sections and asking students to do a jigsaw, so that students have more time to read one section and truly understand what it says.
- Previewing the three important ideas with his students before they read the text, so that students know to look out for those ideas and the evidence that the text provides to support them.
- Placing students into pairs or small groups to read, evaluate and make sense of the text together before the planned classwide building understandings discussion.
- Paring down the text so that it only includes the three main ideas Mr. Jackson wants students to take away from the reading, so that he can reduce the cognitive load required to understand those ideas.
- Doing a classwide read aloud of the text so that students have an opportunity to read, see, and hear the words.

Based on the UDL principles and the goals of this lesson, which strategy would you suggest for Mr. Jackson? How might this strategy help reduce barriers for Dylan? For the class as a whole?

The Function of the Myostatin Protein

Functional Myostatin

Myostatin is a protein found in the skeletal muscles of many animals. The normal job of this protein is to stop cells from turning into muscle cells. So, the myostatin protein limits how many cells are made in muscle tissue so they don't get too big!¹ The myostatin protein stops cells from turning into muscle cells like this: Cells have receptors on them. A receptor is a structure that sticks out of the outside of a cell membrane (see Figure A) and relays messages from outside the cell to inside the cell. The myostatin protein is shaped so that it fits into one specific kind of receptor like a key fits into a lock. When it does, it causes a message to be sent to the inside of the cell. The message tells the cell to stay the way it is. As a result, that cell does not turn into a muscle cell (see Figure B).² So the myostatin protein is specifically shaped to do this job of fitting into the receptor and sending a message, unlike the muscle proteins myosin and actin, which have structures that help them build and move muscles.

Nonfunctional Myostatin

Sometimes a myostatin protein is not the right shape. When this is the case, it cannot fit correctly into a cell's receptor. It might fit partially in, like how a wrong key might fit into a lock, but it cannot unlock the door (see Figure C). Since it doesn't fit correctly, the "stop" message does not get sent to the nucleus of that cell. When this happens, that cell does become a muscle cell (see Figure D). If the myostatin protein isn't working to stop them from doing this, more and more cells turn into muscle cells, and the muscle tissue continues to grow.³

History of Myostatin

Heavily muscled cattle were first discovered in Belgium in the late 1800s.⁴ Farmers had not seen this phenotype in cattle before then. By the 1970s, farmers in other countries, including the United States, were very interested in these heavily muscled cattle because of how much beef they produce.⁵ In 1997,

