SN EDUCATOR GUIDE

February 29, 2020

Concussion Leaves Clues in the Blood

Student Discussion Worksheet

Directions: After reading "Concussion leaves clues in the blood," discuss questions No. 1–3 as a class. Then, find a partner and answer the rest of the questions together.

Class discussion questions

1. Think about the last time you or someone you know was injured. What did people (parents, athletic trainers, nurses, doctors, for example) do to try to diagnose the problem or its extent? What questions did they ask? What types of tests and procedures, if any, were run and what kind of information did those tests provide?

2. Now broaden your thinking. What techniques or tools do doctors or other medical professionals have available to identify injuries more generally? What about diseases and other health problems? Be sure to consider low-tech approaches and more high-tech tools.

3. Why are some health problems harder to diagnose than others? What characteristics of the injury or disease might influence the ease of identifying the problem? How might differences among individuals affect the ability to make a diagnosis? Why do you think doctors often rely on multiple lines of evidence for a diagnosis?

Partner discussion questions

4. What are biomarkers? How might biomarkers be useful in diagnosing concussions? Can you think of other diseases or injuries where biomarkers might be useful? Do a quick search at www.sciencenews.org to find examples of potential biomarkers that researchers are currently exploring.

5. How do biomarkers compare with other types of tests? What are the benefits and limitations of biomarkers? For the concussion study described in the article, did the researchers show that a knock to the head *caused* an increase in the biomarkers? Did the increase in the biomarkers *cause* the loss of normal brain function? Explain. Are there other cases when biomarkers can play a *causative* role?

6. Neurologist Juliana VanderPluym says "it is important to consider [biomarkers] as an aide, and not necessarily as the final determinant" of a diagnosis, noting that there could be a case where an athlete reports symptoms that suggest a concussion but doesn't show elevated levels of the biomarkers. What would you do if you were a coach or trainer faced with that situation, and why? How could scientific research help to address such cases in the future? What additional research should be completed?