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Lesson Plan: Hemoglobin

**Title:** Sickle Cell Anemia Brochure/ Web Page

**Audience:** 11<sup>th</sup> and 12<sup>th</sup> grade Human Biology (some previous chemistry; all have had biology)

**Goals:** To have students relate protein structure with protein function or malfunction

**Student Objectives:**

At the end of the lesson, students will be able to:

1. Explain the structure of Hb
2. Explain the role of Hb in oxygen transport
3. Explain the role of Hb in sickle cell anemia

**Purpose:** Hemoglobin is the main oxygen transport molecule in mammals, including humans. The structure of the molecule is quite important; a small mutation can result in non-functional Hb molecules, or those that work in an abnormal fashion, as is the case with sickle cell anemia. Students need to constantly identify the relationship of structure to function, and can do so using this important molecule.

**Materials/ Resources:**

Computer with Internet access; handout

Web links:

- <http://www.nlm.nih.gov/medlineplus/ency/article/000527.htm>
- <http://sickle.bwh.harvard.edu/hemoglobin.html>
- <http://web.indstate.edu/thcme/mwking/hemoglobin-myoglobin.html>
- <http://www.cties.niu.edu/Practice%20Problems/Protein%20structure/hemoglobin.htm>
- <http://tutor.lscf.ucsb.edu/instdev/sears/biochemistry/tw-hbn/hemoglobin-properties.htm>
- <http://www.people.virginia.edu/~rjh9u/oxytrans.html>

**Prior preparation:** verification of web addresses; copies for students of handout

**Time required:** Two class periods (48 minutes each), plus time at home/ with partner(s).

**Procedure:** See attached handout.

**Assessment:** Assignment is the assessment, as well as quiz

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Partner(s): \_\_\_\_\_

## Hemoglobin and Sickle Cell Anemia: Patient Information

You are a physician who works with several families that have children with Sickle Cell Anemia (SCA). The families have been asking many questions about the disease, and you decide to set up a web site or pamphlet to answer the most common questions. You know that most families that you work with do not have a large biology background, so you need to be very thorough, but start from the most basic ideas about blood and what it does. These families need your help- and if you can't get all of the information needed across clearly, you know that they'll keep calling and asking more questions!

### Web resources:

- <http://www.nlm.nih.gov/medlineplus/ency/article/000527.htm>
- <http://sickle.bwh.harvard.edu/hemoglobin.html>
- <http://web.indstate.edu/thcme/mwking/hemoglobin-myoglobin.html>
- <http://www.cties.niu.edu/Practice%20Problems/Protein%20structure/hemoglobin.htm>
- <http://tutor.lscf.ucsb.edu/instddev/sears/biochemistry/tw-hbn/hemoglobin-properties.htm>
- <http://www.people.virginia.edu/~rjh9u/oxytrans.html>

(Links may also be found on the class webpage or in my hotlist in the "Teacher Hotlist" folder on the shared drive of the server.)

**Directions:** Use your textbook, the web sites above, as well as those you discover on your own, to answer the following questions in groups of 2 or 3 (only). Your final product must be in the form of either a webpage or a pamphlet. The points that you need to cover include:

- What is Sickle Cell Anemia? What are the symptoms, and the problems that present in cases of SCA?
- What causes SCA? Can anyone get it, or are you born with it? (be specific- you want to tell exactly what is mutated!)
- What is blood? (The types of cells present and their functions, in brief)
- What does Hb look like?(What is it made from – tell about it's structure)
- What role does Hb play in oxygen transport? (Be specific- tell how many oxygen are held, and what holds them)
- How does Hb differ from HbO structurally? What does SCA have to do with this?

Resources must be cited! Be sure to use two sources that you discover- this is a requirement! You probably would want to use a few pictures- be sure to note the source for these as well. It may be wise to break the assignment down- have each person cover a few points above, and assemble the final product together. All group members are responsible for the content. You will be quizzed on this information. If all group members score above an 85%, the whole group earns a 5% bonus on BOTH this assignment and the quiz!

**Assignment value:** 40 points

**Quiz value:** 16 points