

Activity 3.2.1: Protein Synthesis

Introduction

In the last lesson, you learned that Anna Garcia suffered from a disease called sickle cell anemia. You learned that sickle cell anemia is a disease in which red blood cells form an abnormal crescent shape. The disease is a genetic disorder caused by inheriting a mutated gene that codes for the protein hemoglobin. In Unit 1 you learned about the basics structure and function of DNA. You learned that DNA carries the instructions to produce proteins and is responsible for passing traits from one generation to the next. Proteins are worker molecules that are necessary for virtually every activity in your body. They circulate in your blood, seep from your tissues, and form the hairs that cover your head. Proteins are the key to essential bodily functions and complete a large variety of jobs.

As you observed in Activity 1.2.1, DNA is made of four different nucleotides (A, T, C, and G). It is estimated that the human body may contain over two million proteins. Considering this fact, it is hard to believe that a molecule made from only four subunits is capable of carrying all the instructions necessary to code for all of the proteins that make life possible. The complexity of DNA is not in the number of subunits, but in the arrangement or sequence of those subunits. Just as English words are created by the specific arrangement of letters, the instructions in the DNA molecule are determined by the sequence of the nucleotides. In this activity you will explore how the body uses DNA to produce proteins, a process called *protein synthesis*.

Equipment

* Computer with Internet access and Inspiration® Software
* Laboratory journal
* Activity 3.2.1 Student Response Sheet

Procedure

1. Think back to everything you learned about proteins in Unit 2. In your laboratory journal, write down what you know about proteins including their chemical make-up. Share your responses with a classmate.
2. Use the Internet or books to research the following proteins: collagen, amylase, hemoglobin, and insulin. For each of the proteins, record the function of each protein in the body in your laboratory journal. Note the large variety of functions proteins play in the body.
3. Obtain an Activity 3.2.1 Student Response Sheet.
4. View the animations of protein synthesis listed below and complete any associated tasks. Take notes in your laboratory journal. Make sure to include a detailed description of the entire process including the steps for transcription and translation.
* How Do Cells Make Proteins? – Teachers’ Domain <http://www.teachersdomain.org/asset/lsps07_int_cellprotein/>
* Cell Transcription and Translation – Teachers’ Domain <http://www.teachersdomain.org/asset/lsps07_int_celltrans/>
* A Science Odyssey: You Try It! DNA Workshop Activity – PBS Choose protein synthesis from the main page. <http://www.pbs.org/wgbh/aso/tryit/dna/shockwave.html>
1. Use your notes to complete the concept map on the Student Response Sheet.
2. Answer the Conclusion questions.

Conclusion

1. Describe how the DNA code is translated into messenger RNA.
2. How is the RNA molecule a “script” for the protein production process?
3. What is the function of hemoglobin in the body?