

Title: Protein Synthesis in the Cell (*This is already an excellent lab and is taken **directly** from the Teacher Domain website. See website address below.)

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Subject Area(s): Life Sciences, Biology

Grade(s): 9-12

Description of Lesson: This activity is broken down into five sections (videos/interactive activities) that allow for them to work in short “burst” modes, instead of a long-drawn out video covering just one area. This allows for them to refocus on a slightly different subject area still well within the realm of protein synthesis in the cell. The students will view the following multimedia resources:

- [Journey into DNA](#) Flash Interactive
- [Organelles in the Cytoplasm](#) QuickTime Video
- [From DNA to Protein](#) QuickTime Video
- [DNA Workshop](#) Shockwave Interactive
- [A Mutation Story](#) QuickTime Video

This activity ties together different components in the process called protein synthesis. The initial process teaches students about what DNA is, what it looks like, and where it can be found in the body. The “Organelles in the Cytoplasm” video shows them about the various cell organelles that play a role in protein synthesis.

Next, they explore the process of protein synthesis, first by doing a Web activity, then by writing a description of the process, and finally by comparing their description with their partner's and working together to diagram the process. The activity concludes with “A Mutation Story” video, followed by a discussion about how mutations can affect protein synthesis and change the structure and function of cells.

Length of Lesson: 1-2 class periods (45 minutes each)

Student Objectives: The students will:

- explore the structure of DNA and its role in the cell and in the human body.
- understand the role of cell organelles in protein synthesis.
- describe the molecular process of protein synthesis.
- understand how mutations can affect protein synthesis and cell structure and function.

Materials: Access to computer lab

Procedure: The students should log into the website: http://www.teachersdomain.org/resource/tdc02.sci.life.cell.lp_prosyn/. The procedure directs the students to each of the resources as shown below.

1. Ask students:

- What is DNA? Where is it found in the human body?

Then have students do the Journey into DNA Web activity. Ask:

- What is the role of DNA in the cell? In the human body?

2. Show the Organelles in the Cytoplasm video. Ask:

- Which organelles are involved in protein synthesis?
- Why do you think cells that produce large numbers of proteins have more rough endoplasmic reticulum (ER) than cells that produce fewer proteins?
- Identify the kinds of human cells in which you would expect to find the most ribosomes. Explain your answers.

3. Show the From DNA to Protein video and then have students explore the protein synthesis part of the DNA Workshop Web activity. Discuss the following:

- How is the information about making different kinds of proteins passed on from parents to children?
- What building block molecules make up proteins?

4. Have students write a brief paragraph that describes the steps of the protein synthesis process, from DNA to polypeptide chain. Tell them to incorporate the following terms into their description: DNA, bases, transcription, mRNA, translation, codons, anticodons, ribosomes, polypeptides, amino acids.

5. Have students share their descriptions with a partner and then draw a diagram of the process together.

6. Show the A Mutation Story video. Discuss the following:

- How does a mutation change the DNA structure?
- How does the sickle cell mutation affect the function of red blood cells?
- How can a mutation be harmful in one environment and helpful in another?

Scientific Explanation: Protein synthesis is the making of proteins using the information found in DNA. As shown in the videos, proteins are long chains of amino acids. The sequencing of the amino acids is a determining factor in many of the genetic traits that we see today.

Assessment: The assessment can be found within the procedure section.

Kansas Science Standards:

Standard 1, Benchmark 1: The student will demonstrate abilities necessary to do the processes of scientific inquiry.

Standard 3, Benchmark 1: The student will demonstrate an understanding of the structure and function of the cell.

Missouri Science Standards (GLE's):

Strand 3.1, There is a fundamental unity underlying the diversity of all living organisms.

Strand 3.2, Living organisms carry out life processes in order to survive.

Strand 3.3, There is a genetic basis for the transfer of biological characteristics from one generation to the next through productive processes

Strand 7.1, Concept A. Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation.
