Activity: Protein Structure and Function
DNA to Protein Overview
Participant Guide

Description and Estimated Time to Complete

This is one of two activities in the DNA to Protein Learning Module. This activity provides the processes and tasks for reviewing protein structure and function. This information is important is improving your understanding of how protein and MEMS work together in bioMEMS devices. If you have not reviewed the PK (reading unit), you should do so at this time.

Estimated Time to Complete
Allow approximately one hour

Introduction

Most of the properties of living organisms ultimately arise from a class of molecules known as proteins. Proteins are polymers composed of subunits known as amino acids. These linear polymers fold into specific three-dimensional structures with specific, unique functions. Amino acids dictate the structure of the protein. The linear sequence of information found within a gene in an organism's DNA dictates the order of amino acids.

The emerging field of proteomics is analyzing the complex range of protein expression within cells. Biologists use this information to create micro-sized protein arrays on chips. These arrays investigate both the interactions of the arrayed proteins with other proteins as well as their potential for chemical modification. These micro-sized protein arrays and their electronic interface are part of microsystems technology and a bioMEMS device.

This activity allows you to further your understanding of protein structure and its complexity.

Activity Objectives and Outcomes

Activity Objectives
* List the functions of proteins.
* Describe an application in which proteins are used in microsystems technology.

Activity Outcomes
Upon completion of this activity you will have gained an understanding of the information flow within a biological system as an aid to understanding bioMEMS applications.

Activity: Protein Structure and Function

Description
This activity provides more in-depth information on proteins, their function and structure.
Procedure:

1. Step through the lesson "What are Proteins?" from Learn Genetics, University of Utah. (http://learn.genetics.utah.edu/content/molecules/proteins/)

2. View the video "What is a Protein?" from the RCSB Protein DataBank. (https://youtu.be/qBRFIMcxZNM)

3. Review the series of YouTube videos at this link:
    https://youtu.be/Ml0OqAUzEXU?list=PL1AD35ADA1E93EB6F

4. Answer the Post-Activity Questions. (You may need to do additional research to correctly answer the questions.) Be sure to list your source(s) to support your answers.

Activity: Post-Activity Questions

1. Name at least five (5) proteins classification by biological function?

2. Why does each protein have a unique chemical composition and structure?

3. What are amino acids composed of?

4. What are the 4 types of R groups?

5. What two methods of protein separation separate proteins by hydrophobicity?

6. What is a bioMEMS application in which the hydrophobicity characteristics of a protein might be advantageous?

7. Create your own graphic that illustrates the Central Dogma of Biology and briefly describe each step.

Summary

Deciphering the genetic code has allowed scientists to translate the sequence of DNA into the sequence of amino acids that comprise the primary structure of a protein or polypeptide. Protein structure is related to function, and proteins fulfill a wide diversity of functions within cells. Proteins are also an integral part of many diagnostic aids and devices.

References
1. <u>Fundamentals of BioMEMs and Medical Microdevices.</u> Steven S. Saliterman. Wiley Interscience. 2006.
2. <u>Life: The Science of Biology</u>, 8th edition. Sadava et.al. Freeman. 2007.
3. <u>Bioinquiry</u>, 3rd edition. Pruitt and Underwood. Wiley. 2006.
4. <u>Genetics: From Genes to Genomes</u>, Hartwell et.al., McGraw Hill. 2008.
5. Learn Genetics, Genetic Science Learning Center. University of Utah. http://learn.genetics.utah.edu
6. The Biotechnology Project. Madison Area Technology College. <u>Proteins Unit 1: Why Proteins?</u>