Seattle Children's Research Institute

SCIENCE DISCOVERY LAB

Module: Protein Analysis in Immunotherapy

Topics: Immunotherapy, CAR T Cell Therapy, Cancer, Bradford Assay, Protein Concentration, Spectrophotometer

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Overview: This lesson is designed to take place in Seattle Children's *Science Discovery Lab*, a next-generation science classroom. Students will learn about emerging cancer therapies, including CAR T cell immunotherapy. They will calculate the protein concentration of simulated patient samples using a spectrophotometer.

Grade Levels: This module is appropriate for students in grades 9-12.

Lab Equipment: Spectrophotometer, micropipettes, Bradford Reagent, vortex mixer.

Health Issue: Researchers are constantly trying to find more efficient, less harmful treatment options for patients with cancer. Immunotherapy has received a great deal of attention since it uses the body's own immune system to fight off tumors. CAR T-Cell Therapy is just one type of immunotherapy that utilizes modified T cells to identify and eliminate tumor cells.

Objectives:

- Learn about CAR T cell immunotherapy and emerging cancer therapies.
- Use a spectrophotometer and Bradford assay to calculate protein concentration.

General Information: All activities done in the *Science Discovery Lab* are for educational purposes only. No personal or health-related information is collected from students and Seattle Children's does not retain materials.

Next Generation Science Standards

Protein Analysis in Immunotherapy supports the following Next Generation Science Standards:

Disciplinary Core Ideas	**LS1.A: Structure and Function** All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.	
Science Engineering Practices	**Planning and Carrying Out Investigations** **Analyzing and Interpreting Data** **Using Mathematics and Computational Thinking**	
Crosscutting Concepts	**Structure and Function**	
Vocabulary	Immune System T Cells B Cells Antibody Antigen Spectrophotometer	Immunology Immunotherapy Cancer Chimeric antigen receptor Micropipette

Protein Analysis in Immunotherapy supports the following Performance Expectation:
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Understandings about the Nature of Science	
Scientific and Engineering Practices Categories	**Crosscutting Concepts Categories**
Scientific Investigations Use a Variety of Methods	Science is a Way of Knowing
Scientific Knowledge is Based on Empirical Evidence	Scientific Knowledge Assumes an Order and Consistency in Natural Systems
Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	Science is a Human Endeavor