

SCIENCE DISCOVERY LAB

Module: Isolating White Blood Cells with Ficoll

Topics: Immunotherapy, CAR T Cell Therapy, Cancer, Cells

Overview: This lesson is designed to take place in Seattle Children's *Science Discovery Lab*, a next-generation science classroom. In this module, students learn about emerging cancer therapies, including CAR T cell immunotherapy. Immunotherapy uses the body's own immune system to fight cancer cells. Students will also use centrifugation to separate the components of blood. They will isolate white blood cells, visualize them using a microscope, and calculate white blood cell concentration for a simulated patient.

Grade Levels: This module is appropriate for students in grades 11-12.

Lab Equipment: Centrifuge, micropipettes, Ficoll-Paque, microscopes.

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 Ficoll separation to isolate white blood cells.
- Use a microscope to determine white blood cell 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.



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Next Generation Science Standards

Isolating White Blood Cells with Ficoll 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 Immunology	Immunotherapy Cancer Micropipette Centrifuge Compound microscope Hemocytometer

Isolating White Blood Cells with Ficoll supports the following Performance Expectation:

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

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

