Seattle Children's Research Institute

SCIENCE DISCOVERY LAB

Module: Investigations in Infectious Disease

Topics: Epidemiology, Infectious Diseases, DNA Fingerprinting, Gel Electrophoresis

Overview: This lesson is designed to take place in Seattle Children's *Science Discovery Lab*, a next-generation science classroom. In this module, students are presented with a real-world scenario involving a possible common source for an outbreak of infectious gastroenteritis. Students compare DNA fingerprints from simulated samples collected from the food vendors and an infected patient. They load gels and use electrophoresis to separate DNA fragments in the samples by size. By comparing the banding patterns (the DNA fingerprint) of the samples collected from the food vendor to the DNA from the infected patient, they identify the source of the outbreak.

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

Lab Equipment: Gel electrophoresis apparatus and power supplies, reagents for DNA analysis, micropipettes, min-centrifuges.

Health Issue: DNA contains the genetic instructions for the development and functioning of all known living organisms. Analysis of DNA from microorganisms such as bacteria can be used to study outbreaks of infection and determine whether patients are infected with the same strain. Studying the genes of bacteria can also be used to help understand how microorganisms can cause disease in humans and animals.

Objectives:

- Learn about the fields of epidemiology and infectious diseases.
- Use standard epidemiological techniques to investigate an outbreak of foodborne illness.
- Use gel electrophoresis to perform a DNA fingerprinting experiment.

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

Investigations in Infectious Disease 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**	
Crosscutting Concepts	**Structure and Function**	
Vocabulary	DNA Nucleotides DNA Fingerprint Gel	Gel Electrophoresis Micropipette Enzyme

Investigations in Infectious Disease 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