

## **Lesson Plan: Properties of DNA**

Key Concepts Covered<sup>1,2</sup>

### **PROCESS OF SCIENCE:**

- Demonstrate safe laboratory procedures and behavior
- Perform experiments using the scientific method

### **NATURE OF GENETIC MATERIAL; REPRODUCTION:**

- DNA is the genetic material for all living organisms.
- Genes are segments of DNA that encode information critical for development. DNA is organized into structures called chromosomes.
- Identify chromosomes, nucleotides, base pairs, sugar-phosphate backbone, double helix, centromere, nucleus, cell membrane, nuclear membrane.
- Humans receive half their genetic information from each parent through the processes of replication, meiosis and fertilization.

### **Overview:**

This 60 min lesson plan covers 6 components of DNA as well as a general protocol to extract DNA. Students use this knowledge to extract DNA from their own cheek cells. Learning is solidified by labeling a DNA diagram and writing down the reagents used in the DNA extraction in a handout. This handout is used for subsequent sections of the MSL Genomics Field Trip and is available as an adjoining PDF (MSL OUTREACH GENOMICS worksheet).

### **Learning Objectives:**

By the end of this lesson, students will be able to identify components of DNA and list properties of DNA as well as recognize a DNA precipitate in a simple genomic extraction.

### **Resources Needed:**

For each DNA extraction (one per student): 5 mL 0.9% Saline solution, 0.5 mL 10% SDS, 10mL 100% Ethanol, 1X Dixie Cup, 1X Microcentrifuge tube)  
Handout, 1 printout per student (see attached PDF, MSL OUTREACH GENOMICS worksheet)

### **Introduction/ Hook:**

- Why are we going to spend a day talking about DNA? Why do you think your teacher thought it was important to bring you here?
- Your lives will take you many places but I would like to convince you that DNA is important to many of your interest and will affect your lives in many ways.

Presentation explaining how DNA impacts various aspects of lives (Human behavior, health, law and justice, human history, biodiversity and the environment, energy production, arts)

**Pre-Assessment:** While displaying an image of DNA have students identify parts familiar to them (Double helix, sugar-phosphate backbone, nucleic acids, chromosomes, centromere, base pairs). Discuss the unfamiliar and if all familiar talk in more detail about each component.

- If we want to explore what DNA is we are going to have to look at it. Any thoughts on how we could extract DNA?

## Teacher Resources for DNA Isolation Activity:

<sup>1</sup>Cracking the Code of Life- Teacher's Guide: [http://www.pbs.org/wgbh/nova/teachers/activities/2809\\_genome.html](http://www.pbs.org/wgbh/nova/teachers/activities/2809_genome.html)

### Activity: DNA Isolation

Explain the steps of a DNA extraction. Handout supplies needed for DNA extraction. As a group go through the steps in DNA extraction.

1. **Cell collection:** Swish 5 mL saline solution in mouth for 30 seconds, spit into Dixie cup, pour spit back into saline container.
2. **Break up membranes:** Add 0.5 mL SDS and wait 5 minutes.
3. **Precipitate DNA out of solution:** Pour 10 mL 100% Ethanol slowly into container, so as not to mix up the two layers. Watch the interface between the two layers for the precipitate of DNA.
4. **Transfer DNA precipitate** into microcentrifuge tube.

**Post- test/ Summary** Have students fill out the handout, labeling the 6 components of DNA mentioned and the 3 reagents used in the DNA extraction. Have them double check their answers with their neighbors then go over answers as a class.

Key Concepts adapted from:

<sup>1</sup>B.C. Ministry of Education. Grade 9 Curriculum Package, online. [www.bced.gov.bc.ca/irp](http://www.bced.gov.bc.ca/irp) [April 11, 2012]

<sup>2</sup> Dougherty M, Pleasants C, Solow L, Wong A, et al. (2011) A Comprehensive analysis of High School Genetics Standards: Are States Keeping Pace with Modern Genetics? CBE- Life Sciences Education (10): 318-327.

*Credits: This lesson plan was developed by Jennifer McQueen, Jody Wright, and Joanne Fox as part of the science outreach efforts at the Michael Smith Laboratories at the University of British Columbia, <http://bioteach.ubc.ca>*