# Clean or Contaminated?

## HOW TO TEST

# Drug Purity

biogen idec COMMUNITY lab

**Endotoxin** – a toxic substance bound to the bacterial cell wall and released when the bacterium ruptures or disintegrates. Common endotoxins include botulinum, which causes food poisoning, and tetanus, which affects the brain and nervous system.

**Multiple Sclerosis** – or MS – a disease that affects the brain and spinal cord. Patients with MS can experience tingling, numbness, bladder problems, difficulty walking, dizziness, fatigue and muscle spasms.

**Chromatography** – a scientific technique that separates mixtures to identify the individual components.

**Spectrophotometer** – a scientific instrument used to determine the concentration of a given substance in a solution by measuring its absorption of light.

**Standard Operating Procedures** – or SOPs – detailed, step-by-step, written instructions to achieve uniformity in the performance of a specific function.

**From aspirin to antibiotics, the medicines we take are vital to our everyday health and well-being. But what if bacteria, viruses or toxic substances accidentally contaminate a drug during manufacturing?**

Scientists play a critical role in ensuring that our medicines are both pure and safe. In this lab, students will act as a quality control team in a manufacturing facility by testing whether a mock drug – GrapeX, for multiple sclerosis – is pure or contaminated with an 'endotoxin' that causes allergies and illness.

Students will analyze samples of GrapeX using reverse phase chromatography to separate out the drug colors and look for additional yellow molecules, which signal the presence of an endotoxin. They will verify their results using a spectrophotometer and then decide whether their batch is safe to be released to the market for public use.

This lab is designed for eighth grade students and will take approximately 2 to 2.5 hours in addition to pre and post labs at school.

# When a Band-Aid Won't Stop the Bleeding:

## A CASE STUDY OF

# Hemophilia

biogen idec COMMUNITY lab

DNA Restriction Digest – cutting DNA molecules into fragments with specialized enzymes to prepare the DNA for analysis.

Gel Electrophoresis – the process of separating DNA molecules based on their size and charge, by running through an agarose gel, to visualize and purify the molecules.

Punnett Square – a table used to determine the probability of an offspring having a particular genotype.

Pedigree – a diagram used to analyze the inheritance of genetic conditions through families.

Genotype – an organism's unique set of genes.

Phenotype – an organism's observable characteristics, such as eye color and height.

Small scrapes and cuts are the stuff of childhood. Falling off a bike, stubbing a toe or wrestling with siblings are all rites of passage for most youngsters. However, such minor injuries can be life-threatening for people with hemophilia, a rare disorder in which the blood fails to properly clot.

In this lab, students will learn about the symptoms of hemophilia, how it is inherited, and which proteins give rise to hemophilia A and B. Students will perform molecular biology techniques – DNA restriction digests, gel electrophoresis, pedigree analyses and Punnett Squares – to determine which members of a hypothetical family have the disease and how to predict their respective genotypes and phenotypes.

This lab is designed for high school students and will take approximately 3.5 hours in addition to pre and post labs at school.

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# Medicine Making Machines

## SHEDDING LIGHT ON

# Cell Growth

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Everyone knows that proper nutrition helps us grow and perform at peak levels. The same is true of the cells grown in a laboratory. By giving cells the proper nutrients and optimal growing conditions, they rapidly multiply and produce the specialized proteins needed to make life-saving medicines.

In this lab, students will work with yeast cells as a model for understanding how cells multiply and what they need to survive, thrive and produce therapeutic proteins. Acting as technical development scientists, students will observe and measure the quantity of yeast cells at each growth temperature using a hemocytometer and an automated cell counter. They will also use a centrifuge to determine cell mass. From this information, students will gain new appreciation for the complexity and importance of making medicines from cells.

This lab is designed for seventh grade students and will take approximately 2 to 2.5 hours in addition to pre and post labs at school.

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