

# Biomedical Diagnostics

TOPIC CATALOG

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**Designed for the Classroom**  
**SINCE 1987**



THE BIOTECHNOLOGY EDUCATION COMPANY®

# EDVOTEK®

*The Biotechnology Education Company®*

Edvotek® was the world's *first company* dedicated to demystifying biotechnology for young people. In 1987, we envisioned how the emerging area of biotechnology could *inspire* students to choose a career in science.

Since then, Edvotek® has *expanded* to become the world's *leading supplier* of safe, affordable and easy-to-use *biotechnology kits and equipment* designed specifically for education.

*Let us help you bring the exciting world of biotechnology into your classroom!*

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# About Biomedical Diagnostics

In recent years, there has been a revolution in how medical diagnostics are performed. The Human Genome Project has offered new ways of screening for diseases and increased our molecular understanding of diseases such as cancer, infectious diseases, and genetic disorders. For instance, although more needs to be done, there has been a dramatic rise in the survival rates for all cancers, and huge strides have been made in our understanding of how this disease develops. As we begin to understand, we can develop new treatments. With kits from Edvotek®, you can inspire the next generation of biomedical scientists.

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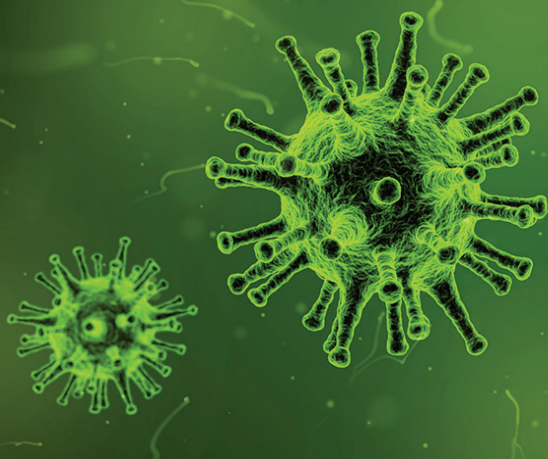
Every day, scientists are understanding more about diseases, developing new treatments, and inventing new detection methods. With the availability of genetic tests, we have a chance to screen out many diseases that have occurred for thousands of years. Some of these, such as Sickle Cell Anemia, may have given humanity an advantage in the past. But now they pose a problem themselves. We can screen for these diseases in children and adults, in the womb before birth, or even *in vitro* before embryo implantation. These tests offer great hope and promise but

raise huge ethical, social and moral questions.

In addition to genetic testing through agarose gel electrophoresis and PCR, scientists are using protein-based assays such as the ELISA, protein gels, and immunoelectrophoresis to detect and study diseases.

Bring all of these techniques, and more, directly into your classroom with medical diagnostic kits from Edvotek®. Edvotek® is your one-stop shop for biomedical science labs.





## Getting Started

Try one of these kits with your students as an introduction to biomedical science techniques.

### What is an Epidemic and How Does an Infection Spread?

Infectious agents such as bacteria and viruses can spread rapidly through a population and cause widespread disease and death. In this experiment, your students will use colored solutions to simulate the spreading of a disease in the classroom.

**Cat# S-68**

**For 10 groups**



### Detection of a Simulated Infectious Agent

An infectious outbreak requires prompt and accurate identification of the biological agent. Often, early clinical symptoms are first identified in exposed individuals and then infectious agents are identified by lab tests. In this kit, students will transmit a simulated infectious agent (chemical dye) between classmates. The simulated infectious agent is only visible under long UV light. The pattern of transmission and primary source will be documented.

**Cat# 166**

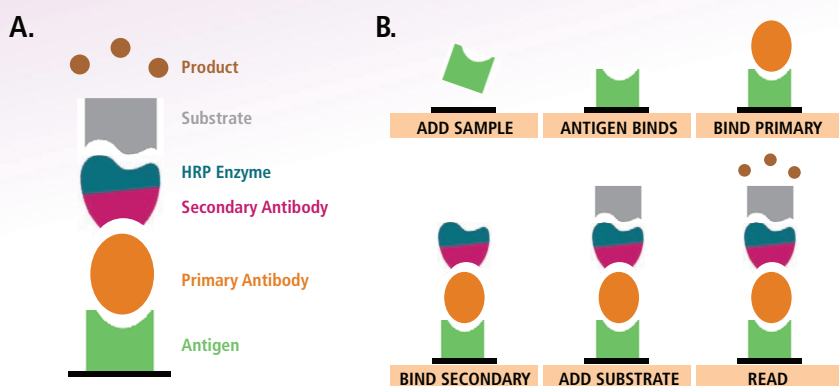
**For 25 students**





## Using ELISAs to Detect Disease

Antibodies (also called immunoglobulins, or Igs) are specialized proteins that allow the immune system to distinguish between “self” and “non-self” proteins or polysaccharides. These Y-shaped molecules comprise four linked polypeptide chains and allow each antibody to recognize a particular location within an antigen. Using these antibodies and antigens, doctors and scientists can test for a number of diseases using the enzyme-linked immunosorbent assay (ELISA). In an ELISA, when an antigen-antibody interaction occurs, a color change is visualized. This can be used to detect disease and quantify how much antigen is present during an infection.



## Introduction to ELISA Reactions

Your students will learn the basic principles of the enzyme-linked Immunosorbent Assay (ELISA) in this precise and sensitive antibody-based detection kit. Experiment components do not contain human serum. R

*Cat# 269*

*For 10 groups*



## Single Antibody ELISA Diagnostics


Teach your students the ELISA technique in less than half the time of traditional ELISAs! This experiment eliminates the need for the primary and secondary antibody normally needed for ELISAs because the detection antibody has an enzyme linked to it directly. Simply add substrate to discover which patient is infected. R

*Cat# 267*

*For 10 groups*



## Quantitative ELISA


Antibodies are highly specific in their recognition of antigens. This ELISA experiment demonstrates the quantitation of varying concentrations of viral antigens as detected by the intensity of the color reaction. 

*Cat# 278*

*For 6 groups*

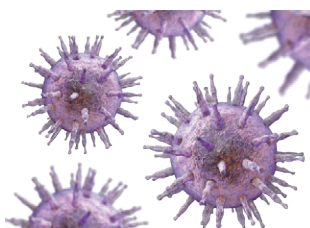


## In Search of the Kissing Disease

Infectious mononucleosis is commonly known as the "kissing disease". The causative agent is Epstein-Barr virus (EBV) which can be transmitted through saliva during kissing. In this experiment, students search for the presence of EBV using the ELISA reaction to detect specific viral proteins. 

*Cat# 274*

*For 10 groups*



## NEW! Researching Alzheimer's Disease by ELISA


Alzheimer's Disease is one of the most widespread and tragic neurodegenerative diseases. Alzheimer's Disease is characterized by memory loss and a decline of cognitive ability, but researchers are still trying to understand how it happens. In this kit, your students will become neuroscience researchers to identify the level of A $\beta$  peptides in patients' CSF as a potential biomarker.

*Cat# 1116*

*For 10 groups*



## What's in my Lunch? Quantitative Milk Allergy ELISA

Milk proteins are the most common food allergens in children. Accurate detection and labeling is vital to inform consumers about potentially dangerous foods. In this inquiry-based experiment, students will master the concepts behind the enzyme-linked immunosorbent assay (ELISA). Students will perform an ELISA to detect the presence and measure the concentration of whey protein in various food products. 

*Cat# 266*

*For 10 groups*

**STEM**



This icon indicates that Kit Replenishers are available for this experiment. See page 23 for details.

## Detecting the Silent Killer: Clinical Diagnosis of Diabetes

Over 380 million people worldwide are afflicted by diabetes mellitus, a chronic disease that leads to high blood sugar. Due to genetic predisposition and high-calorie, low-activity lifestyles, that number continues to grow.

Without early detection and treatment of diabetes, severe medical complications can occur. In this simulation, students will diagnose diabetes in three patients using the urine glucose test and Enzyme-linked Immunosorbent Assay (ELISA). **R**

**Cat# 280**

**For 10 groups**

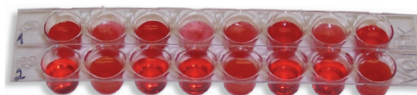


## Blood-based Cancer Diagnostics

Cancer cells differ from normal cells by the combinations of proteins that are present on their surfaces. Antibodies against these proteins will specifically bind to cancer cells and not to normal cells. This allows early detection of cancer and potentially a way of delivering cancer therapies. In this simulation experiment, the reaction of cancer cell markers and their corresponding antigens are demonstrated.

**Cat# 141**

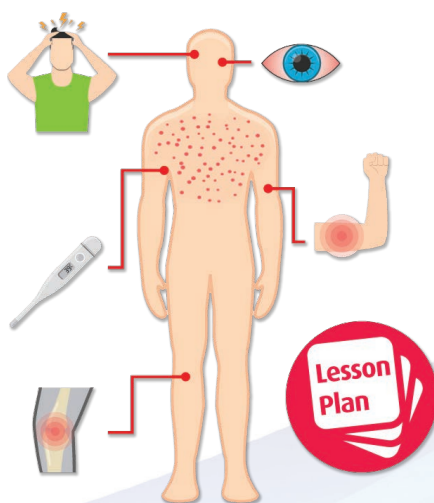
**For 10 groups**



### FREE LESSON PLAN:

## Outbreak! Learning About Zika Virus Transmission and Testing

Explore transmission and diagnosis of infectious diseases using a Zika outbreak as the model. First, use a simple model to simulate the spread of an infectious disease through a population. Next, use the Enzyme Linked Immunosorbent Assay (ELISA) to test patient samples for Zika. The results will be summarized in a laboratory report.



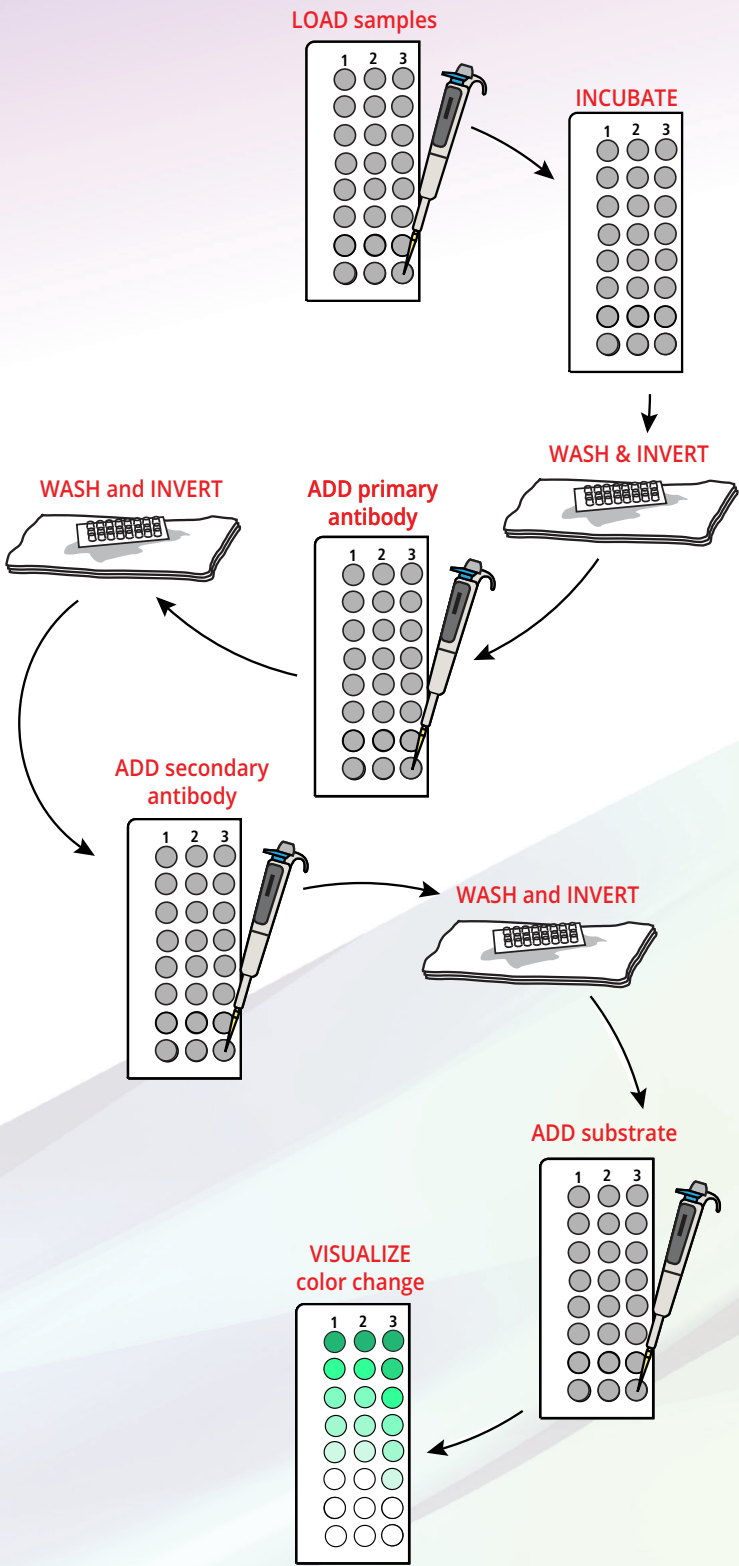
**Available as a free download on our website:**

**[www.edvotek.com/Lesson\\_Plan\\_Outbreak\\_Zika.pdf](http://www.edvotek.com/Lesson_Plan_Outbreak_Zika.pdf)**

*NOTE: This weblink is case sensitive.*

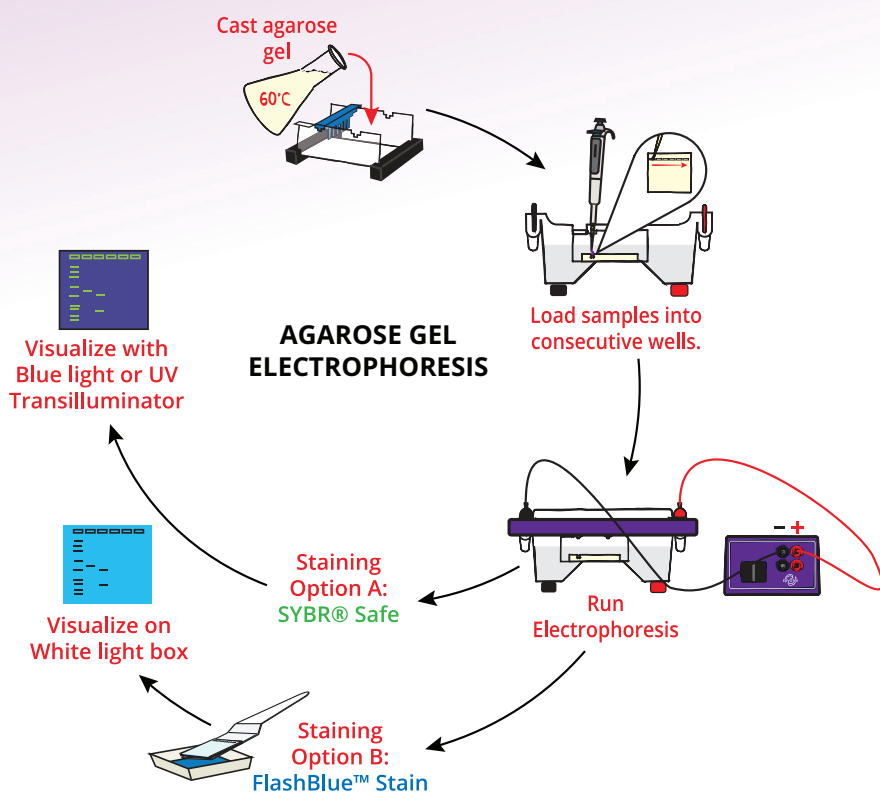


**PERFORMING AN ELISA**




# Detection of Genetic Diseases Using DNA Analysis

A single nucleotide change in the DNA sequence of an important gene can affect health and disease. A large number of genetic diseases have been identified where DNA changes are correlated to the disease. Explore a number of these scenarios with specially designed kits to bring DNA-based diagnostics directly into your classroom!



## Principles and Practice of Agarose Gel Electrophoresis

DNA analysis is performed through gel electrophoresis. Demonstrate to your class how electrophoresis separates molecules on the basis of size and charge. Students will separate dyes packaged in QuickStrips™ in a safe, colorful, fast and simple experiment to teach a technique that will engage your students. 

Cat# 101

For 8 gels

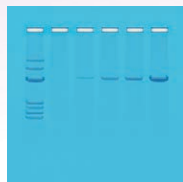


## Principles of PCR

DNA is microscopically small. In order for scientists and doctors to examine patients' DNA, they need to amplify it using the Polymerase Chain Reaction (PCR). This experiment includes amplified DNA in Ready-to-Load™ QuickStrips™ to introduce students to the principles and applications of PCR. This simulation experiment does not contain human DNA and does not require a thermal cycler. **R**

*Cat# 103*

*For 8 gels*

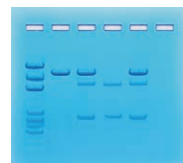


## Cancer Gene Detection

Immortality through uncontrolled cell division is a characteristic of cancer cells. The p53 gene is a tumor suppressor gene which prevents this. Mutations in this gene are present in more than 50% of cancers. Testing a person for p53 gene mutations can indicate an increased risk of developing cancer. These tests raise intriguing ethical questions for both the individual tested and the family of an individual who chooses to be tested. In this experiment, students determine a pedigree for a family suspected to be carriers of mutations in their p53 genes. A DNA test indicates their likelihood of developing cancer. **R**

*Cat# 115*

*For 8 gels*

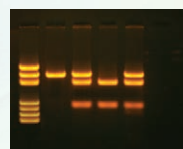


## In Search of the Cancer Gene

Suppressor genes such as p53 are essential for cell functions, but mutations in the p53 gene can be correlated to predisposition for certain cancers. Gene mutations can either be inherited or accumulated due to environmental factors. This experiment includes a family pedigree determination of several generations relating to cancer formation due to p53 gene mutations, autoradiographs of the family's DNA sequences, and Ready-to-Load™ QuickStrips™. **R**

*Cat# 314*

*For 6 groups*

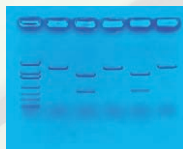


## NEW! Using CRISPR To Treat Cystic Fibrosis

In this experiment, students will simulate the use of CRISPR-Cas9 to target a genetic mutation found in a patient suffering from Cystic Fibrosis. Students will develop an understanding of guide RNA (gRNA) design, and use agarose gel electrophoresis to examine prepared DNA samples after CRISPR treatment.

*Cat# 135*


*For 8 gels*



This icon indicates that Kit Replenishers are available for this experiment. See page 23 for details.



## Cholesterol Diagnostics


Elevated blood cholesterol has been established as a serious risk factor for coronary heart disease and stroke which are leading causes of death in the United States. A disease known as familial hypercholesterolemia (FH) causes an increase in blood levels of the "bad" form of cholesterol, known as low density lipoprotein (LDL). In this experiment, a simulated genetic test for FH is demonstrated in which patients are tested for a DNA polymorphism linked to the FH gene. 

*Cat# 118*

*For 8 gels*



## Detection of Mad Cow Disease


Bovine spongiform encephalopathy (BSE), better known as mad cow disease, is a neurodegenerative, fatal condition in cattle. Consuming BSE-infected beef is believed to be the cause of a similar condition in humans, Creutzfeldt-Jakob disease. In this experiment, students examine simulated PCR products from several feed mills, to determine any possible violations of a 1997 ban which ended the practice of including animal parts in cattle feed. 

*Cat# 117*

*For 8 gels*

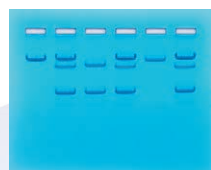


## Sickle Cell Gene Detection

Sickle Cell Anemia is a common genetic disease that causes long rods in red blood cells, giving them a "sickled" appearance. These cells get stuck in small capillaries of the blood stream leading to oxygen deprivation that causes pain and organ damage. Sickle Cell Anemia is caused by a single point mutation in the hemoglobin gene that results in a faulty protein. In this experiment, your students will investigate the restriction enzyme that discriminates between HbA (normal) and HbS (disease) genes and perform a simulated test on a patient. 


*Cat# 116*

*For 8 gels*



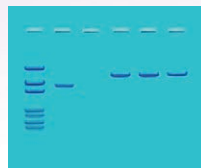
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## DNA Screening for Smallpox

The objective of this experiment is to develop an understanding of Smallpox and the causative agent of the disease. Students will analyze simulated PCR products to confirm or rule out the presence of the Smallpox virus. This experiment does NOT contain smallpox. 

Cat# 124

For 8 gels

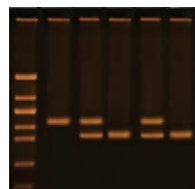


## NEW! Diagnosing Huntington's Disease Using PCR


Bring medical diagnostics directly into your classroom! In this experiment, students will conduct a DNA fingerprinting exercise on simulated patient samples to determine if family members are heterozygous for Huntington's Disease or homozygous for the normal HTT gene. Students will then analyze the amplified DNA segments by agarose gel electrophoresis.

Cat# 1125

For 5 complete sets of reactions (25 samples)

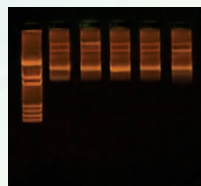


## DNA Damage and Repair


According to the World Health Organization, between 2 and 3 million cases of skin cancer occur globally every year. Many of these cancers are caused by preventable damage to DNA by UV light during sunbathing. In this experiment, your students will expose plasmid DNA to shortwave UV light to simulate the effect of sunbathing. The DNA is then analyzed by agarose gel electrophoresis to observe the damage. 

Cat# 957

For 10 groups

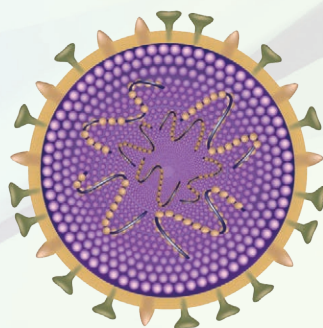


## Detection of the Influenza Virus

The influenza virus, or "the flu," is a common contagious disease that affects the respiratory system. In this simulation, students will perform two common tests (RIDT, RT-PCR) used to diagnose the flu in a clinical setting. 

Cat# 122

For 8 groups



# Southern Blot

Agarose gel electrophoresis exponentially accelerated biomedical diagnostics. In addition to simply identifying genes using PCR, specific DNA sequences can be identified and analyzed using Southern blot analysis. In Southern blot analysis, DNA samples are transferred onto a membrane and probed to find DNA sequences of interest.

## Southern Blot Analysis

This experiment introduces your students to Southern blotting as a tool for "DNA Fingerprinting" in a hypothetical paternity determination. DNA fragments are first separated by agarose gel electrophoresis, then transferred to a nylon membrane and finally visualized by staining. R

*Cat# 207*

*For 5 groups*

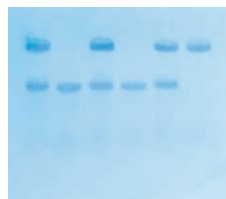


## In Search of the Sickle Cell Gene by Southern Blot

Southern blotting is an important technique used widely in clinical genetics and research. By transferring DNA from an agarose gel onto a membrane, the method allows you to analyze and identify the DNA bands on a gel precisely. Your students will use Southern blotting to find a point mutation in the hemoglobin gene indicating Sickle Cell Anemia. R

*Cat# 315*

*For 5 groups*

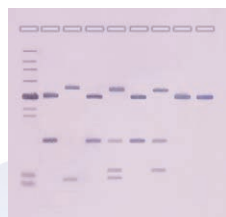


## DNA Fingerprinting by Southern Blot

In this experiment, students gain experience in non-isotopic DNA detection and the use of Southern blot analysis in DNA fingerprinting for a hypothetical paternity test. Includes three modules: agarose gel electrophoresis, Southern blot transfer, and non-isotopic detection of DNA. R

*Cat# 311*

*For 5 groups*



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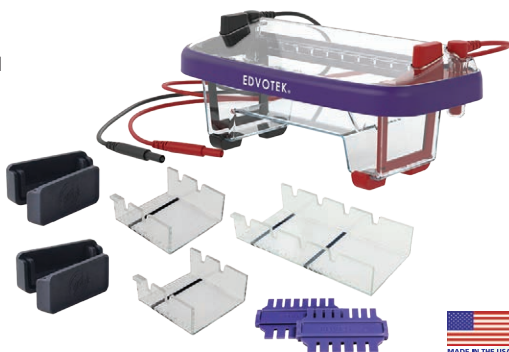


## M12 Complete™ Electrophoresis Package

Run the full spectrum of horizontal electrophoresis experiments with this versatile package! Our newly reimagined M12 Complete™ supports one or two student groups in two standard length gel trays for experiments that require less separation, or one long gel tray for experiments that require more. Produces excellent results in 10-20 minutes and includes a lifetime warranty.

### Features:

- Sleek New Design Speeds Electrophoresis
- Complete Set of Electrophoresis Accessories Included
- Contoured Lid for Enhanced Gel Visualization
- Large Color Coded Push Tabs for Easy Lid Insertion and Removal
- Pour Spout for Buffer Disposal
- Improved Ventilation Reduces Lid Condensation
- User Replaceable Electrodes
- Reverse Compatible with Previous Edvotek® Accessories
- Ability to Run at High Voltage Saves Time
- US Design Patent No. D749,235
- Made in USA



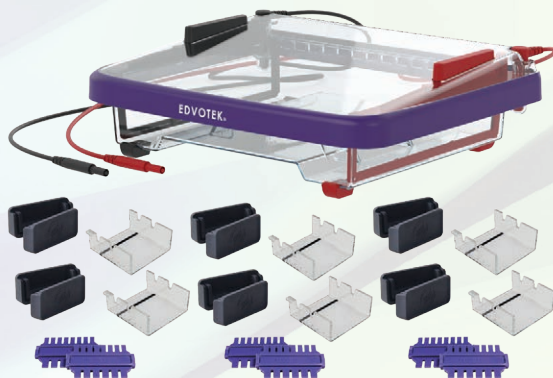
**Cat# 502-504**    *For 1 or 2 lab groups*

## M36 HexaGel™ Electrophoresis Apparatus

The latest in electrophoresis design! Our newly reengineered M36 Electrophoresis Apparatus supports up to six student groups. Produces excellent results in 10-20 minutes and includes a lifetime warranty.

### Features:

- Sleek New Design Speeds Electrophoresis
- Contoured Lid for Enhanced Gel Visualization
- Large Color Coded Push Tabs for Easy Lid Insertion and Removal
- Pour Spout for Buffer Disposal
- Improved Ventilation Reduces Lid Condensation
- User Replaceable Electrodes
- Reverse Compatible with Previous Edvotek® Accessories
- Ability to Run at High Voltage Saves Time
- US Design Patent No. D749,235
- Made in USA

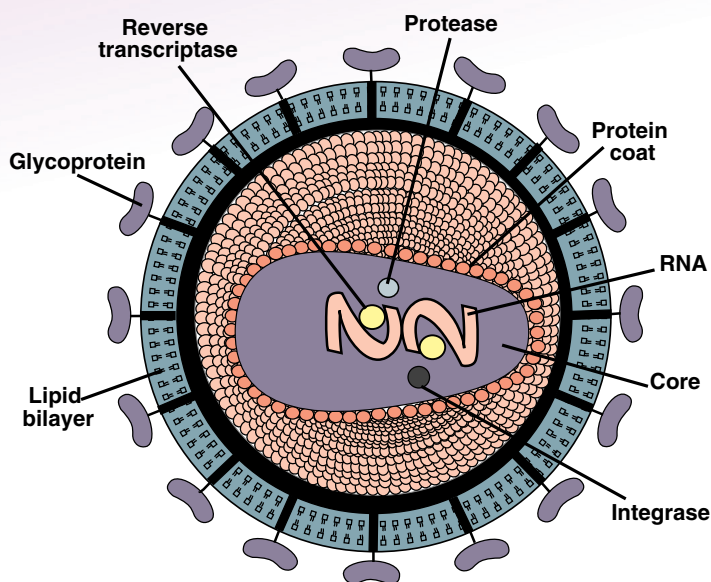


**Cat# 515**    *For 6 lab groups*


# Investigating Human Immunodeficiency Virus (HIV)

Human Immunodeficiency Virus (HIV) is an infectious agent that causes Acquired Immunodeficiency Syndrome (AIDS) in humans. Most infectious human viruses have DNA as the genetic material, but the HIV-1 virus has its genetic information encoded in RNA. With Edvotek® kits, your students can learn how doctors utilize a variety of different diagnostic tests to study HIV.

## Human Immunodeficiency Virus HIV

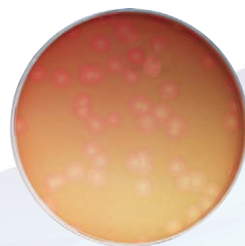


## Exploring the Nature of Viruses

Although bacterial viruses, or bacteriophages, are present in many natural environments, they cannot survive autonomously. They require a host cell to reproduce and survive. In this experiment, students will learn about the different life cycles of bacterial viruses. They will then perform a viral plaque assay to indirectly visualize the viruses and to determine viral titer and multiplicity of infection (MOI). 

*Cat# 209*

*For 10 groups*



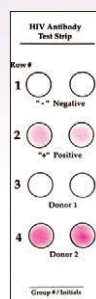
This icon indicates that Kit Replenishers are available for this experiment. See page 23 for details.

## How Does a Doctor Test for AIDS?

Your body defends itself from attack by infectious agents like bacteria and viruses by producing antibodies. Enzyme Linked Immunosorbent Assays (ELISAs) test for antibodies present in the blood, which indicate infection. In this kit, students perform a simulated ELISA test to identify infected samples and compare them to control samples.

**Cat# S-70**

**For 10 groups**



## Simulation of HIV Detection by ELISA

An HIV test detects HIV infection indirectly using an ELISA against HIV antibodies in the blood. The test works by taking antibodies from the patient's blood and adding them to a microtiter plate coated with HIV antigen. If HIV antibodies are present in the blood, they will bind to the antigens on the plate. This binding is detected with an enzyme-linked secondary antibody that causes a color change upon addition of substrate. In this experiment, your students will perform an ELISA test by coating microtiter plate wells with simulated HIV antigen and then test simulated donor serum for anti-HIV antibodies. R

**Cat# 271**

**For 10 groups**

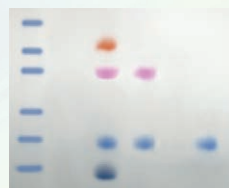


## Simulation of HIV Detection by Protein Electrophoresis

Human Immunodeficiency Virus (HIV) causes acquired immune deficiency syndrome (AIDS), a serious disease that suppresses a patient's immune system and leaves them susceptible to infections. In this experiment, students will use SDS-PAGE to simulate the identification of HIV proteins in simulated patient samples. The results of this test are used to diagnose an HIV infection. R

**Cat# 151**

**For 6 groups**



## Simulation of HIV Detection by Western Blot

Students separate protein samples from hypothetical patients on agarose gels, transfer the samples to a membrane and detect the simulated HIV proteins. This kit is an introductory level experiment. For a comprehensive advanced course, we recommend Cat. #317. R

**Cat# 275**

**For 6 blots**






## Cell Culture and Cell Biology

Cell culture, the ability to grow and study bacteria, viruses, and eukaryotic cells, is a cornerstone of modern biology. In cell culture experiments, scientists recreate the natural environment of the cells in a laboratory to answer important biological questions. With cell culture and biology kits from Edvotek®, you can bring this science directly into your classroom!

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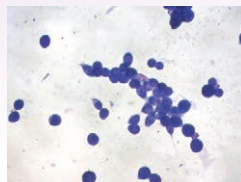


## Eukaryotic Cell Biology

Cell Culture is a vital technology used in life science research and in biotechnology laboratories. The study of basic cell biology, diseases and cancer, the development and testing of new therapeutics, and the production of new drugs rely on using the techniques introduced in this experiment. Students will learn how to grow eukaryotic cells in culture, basic cell staining and how to count cells. 

*Cat# 1001*

*For 6 groups*



## Chromosome Spread

During mitosis, each of our chromosomes are duplicated. The chromosomes are then separated during mitosis, moving to opposite ends of the cell before cell division. In this experiment, cells have been arrested during metaphase and fixed to slides, allowing students to stain and observe the condensed chromosomes. Students will develop an understanding of karyotyping and the association of chromosomal abnormalities with diseases.

*Cat# 987*

*For 6 groups*



## Morphology of Cancer Cells

When normal cells are grown in culture they stop growing when they become overcrowded. This is called contact inhibition. Cancer cells in culture grow in an uncontrolled way because they have lost this property. This helps tumors to form in the body. In addition, many different cell types can be present in a single tumor. This experiment allows students to see the differences between normal and cancer cells in both their growth and cell types.

*Cat# 990*

*For 6 groups*

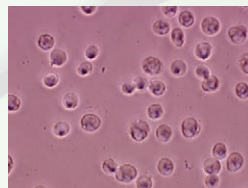


## Analysis of Mammalian Cell Types

Your students will be amazed at the differences they observe between various mammalian cell types and how these cells function. Cells are fixed on microscope slides and students stain the cells on the slide to view morphological characteristics of the cell types. These cells are very safe for classroom use.

*Cat# 986*

*For 6 lab groups*





## Protein Analysis of Disease

Each cell type in the body plays a specific role. However, it is impossible to differentiate them by their DNA code, because every cell in your body contains the same DNA! Instead, the way that a DNA sequence is translated into protein, and which proteins are expressed within a cell, allows for each cell to have a unique profile and function. In order to differentiate and examine different cell types from the same organism, one must examine the different proteins expressed.

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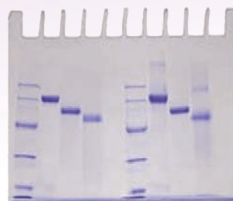


## Determination of Protein Molecular Weight

Using prestained LyphoProteins™, subunit molecular weights are determined by analysis using denaturing SDS vertical polyacrylamide gel electrophoresis. Prestained proteins with unknown molecular weights are assigned molecular weights based on the relative mobility of prestained standard protein markers. R

*Cat# 153*

*For 6 groups*

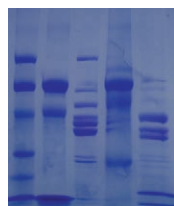


## NEW! Cell Types in the Brain

The brain is an incredibly complex organ and is responsible for regulating almost everything within our body. It allows us to form complex thoughts, read, write, move, breathe, play sports, and listen to music. It does this through a network of cells working together to function. The objective of the experiment is for students to examine the differences between cell types in the brain based on their profiles of proteins.

*Cat# 1110*

*For 6 groups*

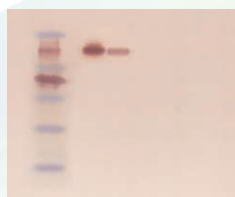


## Western Blot Analysis

In Western blot analysis, protein identification is based on antibody and antigen reactions. Proteins are separated on polyacrylamide gels and transferred (blotted) to a nylon membrane. The membrane is exposed to solutions containing primary antibody, followed by a secondary antibody coupled to an enzyme. The membrane is then soaked in a substrate solution to develop the color reaction, which results in identification of the antigen protein band. The molecular weights of the visible bands are measured using prestained protein markers of known molecular weight. This kit does not require an electrotransfer apparatus. R

*Cat# 317*

*For 6 groups*

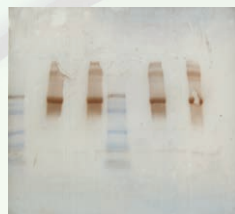


## NEW! Detecting Risk Factors for Alzheimer's Disease Using Western Blot

The objective of this experiment is for students to understand the theory and application of Western blotting as used in a clinical setting. Students will perform a Western blot to determine simulated clinical trial participants' risk of developing Alzheimer's Disease.

*Cat# 1115*

*For 6 groups*



## Additional Diagnostic Techniques

### Antigen-Antibody Interaction: The Ouchterlony Procedure

Introduce your students to the principles of antigen-antibody interactions by using the Ouchterlony procedure. Antibodies and antigens form complexes that precipitate, making it possible to assay antibody-antigen systems. The binding interaction results in the formation of a white precipitate after diffusion in agarose. R

*Cat# 270*

*For 10 sets of reactions*

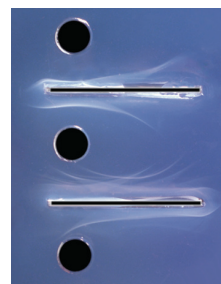


### Immunoelectrophoresis

Learn how immunoelectrophoresis identifies proteins based on their combined electrophoretic and immunological properties. This method is useful to monitor antigen and antigen-antibody purity and to identify a single antigen in a mixture of antigens. In this experiment, serum proteins are separated by agarose gel electrophoresis and the point of equivalence is observed by the antigen-antibody complex formation. R

*Cat# 272*

*For 10 separations*



### Radial Immunodiffusion

Radial immunodiffusion quantitatively determines the level of an antigen. Antibody is incorporated into liquefied agar and allowed to gel. The antigen is added to small wells and radiates throughout the antibody-containing medium, leaving a precipitate throughout the gel. The amount of diffusion is quantified. R

*Cat# 273*

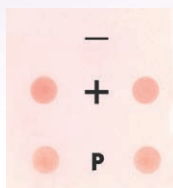
*For 10 quantifications, 6 reactions each*



## Clinical Diagnostic Immunoblot

The dot blot (immunoblot) technique is used to determine the presence of an antigen. Clinical diagnostic kits employ the principles of the dot blot. In this experiment, antigens are absorbed to a membrane that is then treated with an antigen-specific antibody solution and then a secondary antibody conjugated to an enzyme. The enzyme-substrate reaction generates a color product that precipitates onto the membrane, indicating a positive reaction. **R**

**Cat# 276** *For 10 groups*



## Blood Typing

ABO typing of blood left at the scene of a crime can help narrow down a list of suspects. In this experiment, your students will use agglutination to identify the blood group of unknown blood samples as a step to identify a criminal. **R**

**Cat# 140** *For 10 groups*



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