

# Biothreats

## Identifying Pathogens Faster Using Portable PCR System



San Antonio (Brooks City-Base)—Scientists are developing tools that can find dangerous pathogens quickly to help prevent the spread of disease. They are creating portable technology to identify organisms in a shorter time using PCR (polymerase chain reaction). This webisode includes an animation of how PCR works to duplicate the DNA of organisms.

*“We want to test for biological organisms because some are naturally occurring and can make us sick and some can be used to harm or threaten us.” Elizabeth Escamilla, molecular biologist*

Framework	Standards
Middle School	<ul style="list-style-type: none"> <li>NSES - C.i.6 ➤ Disease is the result of infection.</li> <li>STL - 2.M ➤ Systems include input, processes, and output.</li> <li>STL - 4.G ➤ Technological systems can be connected.</li> <li>STL - 14.G ➤ Medical technologies improve health care.</li> <li>STL - 15.H ➤ Biotechnology creates products.</li> </ul>

### Content Illustrated

- Images of many different bacteria and viruses.



# Content



## Life Science

- ▶ Pathogenic organisms can make humans sick. Naturally occurring pathogenic organisms include salmonella, e. coli, anthrax, and plague (Yersinia). Salmonella causes food poisoning. Within 48 hours someone can be exposed to a pathogen, experience symptoms, and pass the pathogen on to someone else.
- ▶ Pathogens have a specific DNA sequence.
- ▶ Polymerase is an enzyme that comes from an organism called *Thermus aquaticus*. It can live in very high-temperature water and can be found in the hot springs at Yellowstone National Park.

## Technology

- ▶ Polymerase chain reaction (PCR) acts like a copying machine by using a primer to bind to a split strand of DNA. The primer copies the pattern of the DNA, and two full strands of DNA are completed using the help of polymerase.
- ▶ JBAIDS is a portable technology that uses PCR to detect pathogens. It is rugged enough to be thrown out of an airplane so that military personnel on the ground can use it. Samples of pathogens are placed in a capillary testing system, and, using PCR, can be analyzed by a computer in two hours.

## Math

- ▶ Logarithmic growth ( $2^n$ ).

## Guiding Questions

*To think about as you watch:*

- ▶ How are scientists able to speed up the identification of pathogens? Why is that important?

## Suggested Activities

- ▶ Research the diseases that are associated with the different pathogens mentioned in the webisode.

## Keywords

anthrax  
capillary  
DNA  
*e. coli*  
enzyme  
molecular biology  
pathogens  
polymerase chain  
reaction (PCR)  
plague  
salmonella  
virus