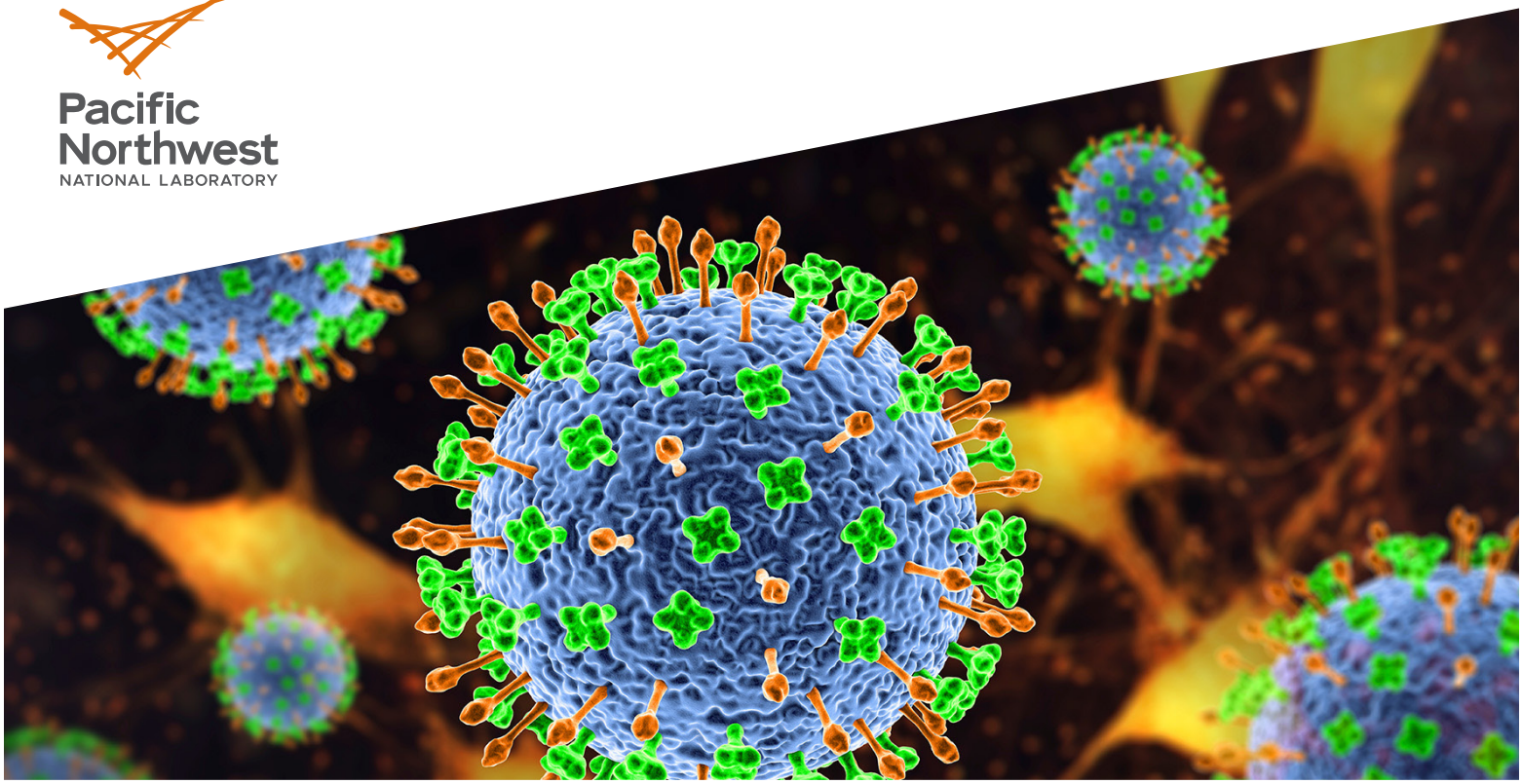
Pacific Northwest
NATIONAL LABORATORY



PNNL's patent-pending probe will allow physicians, for the first time, to identify pathogenic bacteria based on virulence-correlated enzyme activity with a rapid and easy fluorescence measurement. (Kateryna Kon | Shutterstock.com)

RAPID VIRULENCE PROBE

For detecting infectious bacteria

A CHEMICAL PROBE CAPABLE OF LABELING PATHOGENIC BACTERIA

Rapid detection of bacterial pathogens without the need for culturing or time-consuming and costly genomic methods is evolving as an important goal in clinical diagnostics. Similarly, detection of novel or emergent pathogens is critically important to ensuring the safety of U.S. citizens and U.S. armed forces overseas who are susceptible to contracting diseases, such as typhoid fever. Development of rapid and informative diagnostics will enable clinicians to quickly determine the most effective treatment for infected individuals.

To address these and other issues, researchers at Pacific Northwest National Laboratory (PNNL) have synthesized a novel, patent-pending, activity-based probe for bacterial neuraminidase. The probe labels pathogenic bacteria for identification and subsequent isolation using fluorescent-activated cell sorting (FACS). This discovery would allow physicians, for the first time, to identify pathogenic bacteria based on virulence-correlated enzyme activity with a rapid and easy fluorescence measurement.

TECHNOLOGY FEATURES

- Rapidly detects and identifies pathogenic bacteria phenotypes, such as pneumonia and meningitis, persistent infections, nosocomial infections, cholera, typhoid fever, and food poisoning
- Isolates and cultures the species to establish treatment
- Provides a robust, high-throughput method of detection
- Screens multiple classes and species of bacteria simultaneously
- Isolates new or emergent microbes to study and, eventually, develop methods of treatment
- Benefits healthcare, military, biotechnology, pharmacology, and veterinary medicine industries

PNNL's activity-based probe can be biotinylated or conjugated with a fluorescent reporter through click chemistry for proteomics analysis and fluorescent-based assays.

ISOLATE AND CULTURE SPECIES TO ESTABLISH TREATMENT

PNNL's fluorescent activity-based probe rapidly detects pathogenic bacterial presence, and FACS then can be used to isolate and culture the species to establish treatment.

Unlike a genomics approach, this approach is a robust and high-throughput method of detection, in which many classes and species of bacteria can be screened simultaneously. Neuraminidases are conserved among several gram positive and gram-negative bacteria, including *S. pneumoniae, P. aeruginosa, A. baumannii, V. cholerae, S. typhi,* and *S. typhimurium*. By targeting a commonly observed virulence factor, such as neuraminidase expression, researchers were able to develop an activity-based probe that could screen—for the first time—across a wide scope of pathogenic bacteria simultaneously. Such a capability would aid in rapid detection and isolation of pathogenic bacteria.

Activity-based probes for neuraminidase will

- rapidly identify pathogenic bacterial phenotypes
- expand on previously discovered knowledge regarding specific mechanisms by which these pathogens can cause disease
- isolate new or emergent microbes to study and, eventually, develop methods of treatment.

By coupling these together, scientists can now identify, investigate, and inform the way that this class of enzyme operates within the pathogenesis of these bacteria.

ADVANCING PROBES TO AN ENTIRELY NEW LEVEL

Other organizations have developed similar activity-based probes for other glycoside hydrolases. Combining this established approach with previous work by a group that developed a similar biotinylated probe for neuraminidase, PNNL researchers have been able to develop an activity-based probe that can be both biotinylated or conjugated with a fluorescent reporter through click chemistry.

This modular approach allows for PNNL's chemical probe to be used for proteomics analysis, as well as in fluorescent-based assays, such as SDS-PAGE and fluorescence-activated cell sorting.

BENEFITS MULTIPLE INDUSTRIES

PNNL's technology focuses on dependent analysis and can be developed into a diagnostic tool that develops in minutes. Without the need for time-consuming bacterial culture or lengthy genetic analysis, this method will be able to screen for infectious, disease-causing bacteria rapidly and with minimal sample required.

The probe also will be able to distinguish between bacteria that might be dormant or not currently pathogenic from those that are actively expressing this virulence factor.

Industries such as healthcare, military, biotechnology, synthetic biology, pharmacology, and veterinary medicine could apply PNNL's new activity-based probe for neuraminidases. It is available for licensing in all fields of use.

To view this invention and other PNNL technologies ready to be moved to U.S. markets, visit www.pnnl.gov/available-technologies.

LET'S CONNECT

If you have questions, please send inquiries to commercialization@pnnl.gov. You can view all PNNL inventions available for licensing at www.pnnl.gov/available-technologies.

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