

AMD Projects

Innovate • Transform • Protect

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CDC's Advanced Molecular Detection and Response to Infectious Disease Outbreaks (AMD) initiative fosters scientific innovation to transform public health and protect people from disease threats.

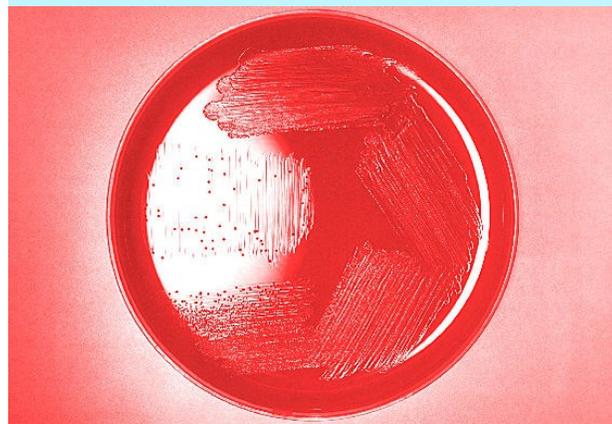
AMD Projects: Analyzing Leading Causes of Bacterial Meningitis

Using AMD methods to develop a one-step testing scheme

When bacterial meningitis strikes, it hits quickly and severely, with intense symptoms of headache, muscle aches, a stiff neck, and sometimes nausea and vomiting. While these symptoms can resemble a bad case of the flu, bacterial meningitis causes the membranes around the brain and spinal cord to swell. This can lead to serious and life-changing complications such as brain damage, hearing loss, or learning disabilities. Early diagnosis and immediate treatment are key to preventing further serious illness and death.

Vaccines are available for some strains of *Neisseria meningitidis* and *Haemophilus influenzae*, two of the main causes of bacterial meningitis in the United States. While these vaccines have prevented many from falling ill, some regions have seen an increase in disease caused by strains that aren't covered by the vaccines. Even more concerning, both *N. meningitidis* and *H. influenzae* are able to receive genetic material (DNA) from other bacterial strains and add it to their own DNA, which allows them to become new strains, some of which can be resistant to antibiotics or no longer covered by available vaccines.

Presently, only a few tests are available to identify which bacterium caused someone's meningitis. 



AMD will improve disease surveillance and increase laboratory efficiency for identifying bacteria strains during meningitis outbreaks.



These tests are time-consuming, require multiple steps to complete, only provide limited information on the bacteria, and can sometimes miss uncommon or mutated strains. New testing methods are needed to identify the cause of bacterial meningitis sooner and track changes in the bacterial DNA.

Using advanced molecular detection (AMD) methods, researchers will be able to view all of the genetic material in the *N. meningitidis* and *H. influenzae* bacteria and identify even the smallest changes in genetic material using just one method, rather than the seven to ten currently used. Armed with this information, scientists will be able to quickly determine the strain of bacteria involved in a meningitis outbreak, know whether it is resistant to available antibiotics, and understand how the bacterial strain is different from other strains. In addition, the information from AMD methods will give researchers a better understanding of how the bacteria are changing in the community and the ability to track changes that cause vaccine and antibiotic resistance.

The information gathered through this project will transform current bacterial meningitis surveillance and improve case and outbreak detection. In addition, the diagnostic system created through this work can be expanded to other bacteria, leading to improved surveillance and outbreak response for a wide variety of diseases.



For more information on bacterial meningitis, visit the CDC website at www.cdc.gov/meningitis/bacterial.html.

