FOOD SAFETY

ENSURING A STRONG SURVEILLANCE SYSTEM

UNMET NEEDS

- **Accreditation:** Accreditation in food and feed testing laboratories recognizes the competency and credibility of both the staff and the results they generate. Laboratory accreditation requires extensive resources. A dedicated full-time employee is required to develop and update the quality management system, equipment must be maintained, and training programs must be sustained to meet requirements of ISO, the standard currently preferred by federal agencies.
- **Surveillance**: PulseNet is a national laboratory-based surveillance system that uses DNA fingerprinting and whole genome sequencing (WGS) to detect clusters of foodborne pathogens. Without this network, most national outbreaks would not be detected. With the increasing availability of culture-independent diagnostic tests for the detection of foodborne pathogens, public health laboratories will need increased resources for pathogen isolation.
- **New Technology**: Sustained funding is critical for implementation of new technologies, such as next generation sequencing, in public health laboratories. Such technology has the ability to replace a myriad of costly and inefficient traditional methods and more quickly and efficiently identify outbreaks.

BACKGROUND

The Centers for Disease Control and Prevention (CDC) estimates that foodborne disease causes approximately 48 million illnesses (1 in 6 Americans) annually, accounting for 128,000 hospitalizations and 3,000 deaths in the US.[1] Public health laboratories perform specialized testing on

tens of thousands of foodborne pathogens from sick people, detect and respond to foodborne outbreaks, and test food for pathogens, chemicals and other contaminants that can threaten our health.

PulseNet, the national laboratory-based surveillance system for foodborne pathogens, prevents an estimated 270,000 illnesses every year from the three most common causes of foodborne illness: *Salmonella*, *E. coli* O157 and *Listeria monocytogenes*. As a result, an estimated $507 million is saved every year in medical costs and lost productivity.

A recent economic evaluation of PulseNet activities from 1994-2009 shows the exceptional cost-effectiveness of this network. PulseNet costs public health agencies $7.3 million annually, but it provides an economic benefit about 70 times greater than its cost by quickly identifying problems in the food supply that would not otherwise be recognized. This fast detection of problems leads to prompt actions to stop foodborne outbreaks, prevent additional illnesses, and save lives.

PULSENET AT WORK

In 2016, PulseNet is celebrating its 20th anniversary. For two decades, the network has been the premiere early warning system for foodborne disease outbreaks. PulseNet continues to expand in scope and utility by engaging a broad

[1] Scallan E, Hoekstra RM, Angulo FJ, Tauxe RV, Widdowson M-A, Roy SL, et al. Foodborne illness acquired in the United States—major pathogens. Emerg Infect Dis [serial on the Internet]. 2011 Jan [February 26, 2016]. http://dx.doi.org/10.3201/eid1701.P11101

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set of partners, by targeting emerging pathogens such as non-O157 Shiga toxin-producing *E. coli* and by including strains from animal and produce commodities. For example:

- Using WGS, PulseNet was critical in identifying a *Listeria monocytogenes* outbreak associated with prepackaged caramel apples
- Two outbreak clusters were identified using PFGE. WGS, combined with epidemiological information, revealed that two clusters were highly related and should be investigated together
- Testing with WGS also revealed that *Listeria* found in the apple-packing facility was highly related to the outbreak strain
- If all public health laboratories had WGS technology, the scope and source of the caramel apple outbreak would have been identified faster

The essential ingredient in PulseNet is a cultured isolate of the disease-causing bacteria. Without these isolates, linkage of related cases of human illnesses becomes nearly impossible. A rising number of physicians are choosing culture-independent diagnostic tests (CIDT) for their patients. CIDTs are attractive to physicians in that they provide rapid results and may be less-costly.

The public health impact of CIDT implementation without reflex culture includes:

- No ability for PulseNet to detect outbreaks
- Increased costs of foodborne outbreak investigations
- Reduced antibiotic resistance monitoring (**AMR initiative**), negatively affecting patient treatment and enabling drug-resistant bacteria to spread
- Diminished ability to attribute pathogens to food commodities, e.g., *E. coli* to ground beef

MONITORING OUR FOOD SUPPLY

Laboratory accreditation has been identified as a critical element for ensuring the integrity and accuracy of food testing results. Benefits of laboratory accreditation include increased laboratory capacity and enhanced technical capabilities, less re-testing resulting in lowered costs, and fully actionable results. All of the above will lead to earlier identification of and regulatory response to adulterants in the nation's food supply.

A nation of accredited laboratories can be leveraged to facilitate mutual reliance, open sharing of data, implementation of program standards and consistent determination of risk. An increase in the number of accredited governmental laboratories and broader acceptance of laboratory data will advance the goal of a nationally integrated food safety system.

Recent accreditation efforts have had a direct impact on public health.

- As part of routine food surveillance activities, the South Carolina Department of Health and Environmental Control (DHEC) began testing frozen dessert products for *Salmonella* and *Listeria*.
- DHEC detected two positive results for *Listeria monocytogenes* in retail ice cream samples. Collaboration with the state in which the product was manufactured quickly established a link between outbreak cases and the positive ice cream samples, resulting in a recall of a well-known ice cream brand.
- The outbreak involved 10 illnesses, including three deaths; however, early detection of the outbreak source prevented countless additional illnesses and likely saved lives. ■

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