UNMET NEEDS

Public health laboratories play a crucial role in foodborne disease surveillance and the detection of foodborne outbreaks. In recent years, advances in testing methodologies and a highly-trained public health laboratory workforce coupled with key networks such as PulseNet and the Food Emergency Response Network (FERN) have resulted in the detection of a large number of nationwide outbreaks and subsequent food recalls. However, gaps still remain and these vital food safety networks are being threatened with deep cuts.

• **PulseNet** is the only national laboratory-based surveillance system in the United States that uses DNA fingerprinting technology to detect clusters of foodborne pathogens. Without this network, many large national outbreaks will never be detected. Continued funding for training, infrastructure and supplies are essential for PulseNet’s maintenance and survival.

• **Culture independent diagnostics (CIDT):** With the increasing availability of CIDT for detection of foodborne pathogens, it is essential to evolve and develop new molecular methods to conduct laboratory surveillance, collect important information, and detect outbreaks. No longer will laboratories be able to rely on culture as the gold standard for pathogen isolation.

• **FERN** has been threatened in recent years with severe funding cuts and elimination. This network provides critical surge capacity for nationwide food emergencies, ranging from natural disasters such as the Deepwater Horizon oil spill in the Gulf of Mexico in 2010 to inadvertent contamination of the food supply including the highly publicized Listeriosis outbreak linked to cantaloupe.

• **New technology:** Resources are needed to develop new technologies and implement them in the public health laboratory. Public health must continually evolve to identify and respond to emerging threats such as the recent outbreak of *E. coli* O104 in Europe that sickened ~4,000 people and killed 50.

BACKGROUND

Nationwide outbreaks of *Listeriosis* in cantaloupe, Norovirus in oysters, and *Salmonella* in peanut butter and ground turkey highlight just a few examples of a much larger problem. In 2011, the Centers for Disease Control and Prevention (CDC) estimated 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.

What Role Do Public Health Laboratories Play?

DISEASE SURVEILLANCE AND PULSENET

Surveillance is the ongoing collection and analysis of data in order to monitor illness. Through PulseNet, public health laboratories routinely perform DNA fingerprinting on common foodborne bacteria and transmit those data electronically, allowing public health laboratories to identify related bacterial strains across state borders in a timely manner. This nationwide cluster detection mechanism...
acts as an early warning system for foodborne disease outbreaks. Since its inception in 1998, PulseNet continues to expand in scope and utility by engaging federal partners and veterinarians, targeting emerging food pathogens such as non-O157 shiga toxin-producing *E. coli*, and expanding to include patterns from animal and produce commodities.

- In 2012, PulseNet identified over 250 clusters of foodborne pathogens.
- Almost 200 PulseNet clusters were followed by epidemiologists at CDC. Of those, 179 involved engaging epidemiologists at the state and local levels to conduct intensive epidemiological follow up.
- PulseNet was critical in identifying the scope of the *Listeria monocytogenes* outbreak associated with cantaloupe from Colorado.

**OUTBREAK TESTING**

When a foodborne outbreak occurs, public health laboratories test human specimens and food samples to determine the chemical or biological contaminant and identify links between human illness and food sources. These links promote food safety initiatives that help prevent future illness.

Instrumentation, supplies, training and proficiency testing provided through the FERN network prepared the Colorado public health laboratory to rapidly respond to the 2011 *Listeria* outbreak linked to contaminated cantaloupe. The Colorado results were important in identifying the culprit and in ruling out other cantaloupe that was safe to eat. Molecular subtyping of patient and food isolates through PulseNet, combined with strong epidemiologic investigations at the state and local level, completed the outbreak picture. Without the resources of the FERN network, this and other foodborne outbreaks would go undetected, and food producers would not have the opportunity to improve their practices to prevent future illnesses.

**Consequences of Culture-independent Diagnostic Tests to Foodborne Illness Outbreak Response**

The essential ingredient in the PulseNet system is the availability of an isolate of the disease-causing bacteria. Without this isolate, discovery of the source of foodborne illness and its linkage to an outbreak of human illness becomes nearly impossible. Most bacterial cultures that are characterized in public health laboratories and entered into the PulseNet database have their origins in the clinical laboratory setting. A rising number of clinical providers are choosing to perform culture-independent diagnostic tests (CIDT) that have been FDA-approved for clinical use.

- CIDTs are attractive in that they provide rapid and often less expensive results.
- Loss of bacterial culture for characterization in public health laboratories will:
  - Slow down and/or increase the cost of foodborne outbreak detection
  - Reduce antibiotic resistance monitoring, which also requires an isolate, thereby negatively affecting patient treatment and enabling drug-resistant bacteria to spread
  - Diminish public health’s ability to attribute food commodities to certain pathogens, e.g., *E. coli* to ground beef
  - Eliminate the ability of PulseNet to detect outbreaks

To remedy this potentially dangerous situation, all partners with a commitment to national food safety must contribute to solutions that will ensure that the needs of our highly effective national surveillance system remain intact.

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