Board of Scientific Counselors, Office of Infectious Diseases

Food Safety Modernization Act Surveillance Working Group

Annual Report to the Secretary, Department of Health and Human Services

2015

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SUMMARY

The Food Safety Modernization Act of 2010 (FSMA), signed into law on January 4, 2011, authorized the Centers for Disease Control and Prevention (CDC) to create a diverse working group of experts and stakeholders to provide routine and ongoing guidance to improve foodborne illness surveillance systems in the United States. Accordingly, in fiscal year (FY) 2012, CDC established a FSMA Surveillance Working Group (FSMA-SWG) under the Board of Scientific Counselors, Office of Infectious Diseases (BSC/OID), a federal advisory committee. This fourth annual report summarizes the FSMA-SWG's activities and recommendations during FY 2015.

The FSMA-SWG held two 2-day meetings at CDC in FY 2015, convening in December 2014 and again in May 2015 to review, respond to specific questions on, and provide guidance on foodborne illness and outbreak surveillance projects in the following areas:
- Improving governmental coordination, integration, and collaboration
- Improving environmental factor surveillance for foodborne illnesses
- Advancing several CDC FSMA-related projects to enhance foodborne disease surveillance

The December 2014 Working Group meeting focused on a review and discussion of how governmental coordination, integration, and collaboration could be further improved. Specific guidance was provided on how to enhance foodborne illness and outbreak surveillance via enhancements of
- The Interagency Food Safety Analytics Collaboration (IFSAC)
- The Interagency Foodborne Outbreak Response Collaboration (IFORC)
- Multi-agency collaborations using whole genome sequencing (WGS)
- Collaborations with state and local partners, including the Integrated Food Safety Centers of Excellence (CoEs), the Council to Improve Foodborne Outbreak Response (CIFOR), and the Foodborne Disease Centers for Outbreak Response Enhancement (FoodCORE)
- Surveillance tools to improve national cylosporiasis surveillance and multistate outbreak investigations, including the use of the System for Enteric Disease Response, Investigation, and Coordination (SEDRIC)

The May 2015 meeting focused on a review and discussion of the role of environmental health surveillance, an area widely considered to need increased attention. Specific topics reviewed included environmental contributing factors (collected for only 40%–45% of nationally reported outbreaks), environmental antecedents (rarely reported), and environmental interventions and evaluations needed to make policy recommendations to prevent future illnesses. Several initiatives to improve the quality of environmental data were reviewed, including the National Environmental Assessment Reporting System (NEARS), the E-Learning training for environmental assessments for foodborne illness outbreaks, and the Environmental Health Specialists Network (EHS-Net). The Working Group agreed that environmental foodborne surveillance data could be improved by
- Mapping and documenting ongoing surveillance efforts by all partners
- Collaborating and integrating efforts to
  - Provide training in collection and use of environmental health data. Current trainings are provided by CoEs, Epi-Ready (a collaboration by the National Environmental Health Association [NEHA] and CDC), E-Learning, and the U.S. Food and Drug Administration (FDA) and U.S. Department of Agriculture (USDA) (for food-safety inspectors).

- o Develop data collection guidelines. This effort can be facilitated by CIFOR.
- o Conduct investigations. Coordination can be facilitated by IFORC.

In the course of its work, the Working Group repeatedly noted the importance of national and state/local surveillance for foodborne illness and emphasized that the data gathered from this surveillance are critical for detecting outbreaks and identifying new vehicles for foodborne illness; monitoring the safety of the food supply; and directing risk-based food safety efforts by CDC, FDA, and USDA. Further, the Working Group noted the loss of capacity at state and local levels and underscored the need for additional resources to build on and better integrate existing surveillance systems and fill existing and emerging data gaps. The Working Group is pleased that initial funding was appropriated in FY 2014 and 2015 to help move forward the important tasks authorized by FSMA, but continues to be concerned about the lack of attention to adequate funding levels for the programmatic efforts uniquely directed by CDC and implemented by state and local health departments to meet the enhanced surveillance requirements. Finally, the Working Group also stressed that foodborne illness surveillance and outbreak investigations to determine root causes lead to better hazard analysis and more targeted food safety controls at food production, processing, and distribution levels. The absence of this information undermines the effectiveness of preventive control programs mandated by FSMA for the food industry.

BSC/OID FSMA SURVEILLANCE WORKING GROUP 2015 REPORT TO HHS SECRETARY

INTRODUCTION

This report describes the fiscal year (FY) 2015 activities of the Food Safety Modernization Act Surveillance Working Group (FSMA-SWG) of the Board of Scientific Counselors, Office of Infectious Diseases (BSC/OID), a federal advisory committee at the Centers for Disease Control and Prevention (CDC). This Working Group was established in FY 2012 under authorization by the Food Safety Modernization Act of 2010 (FSMA). Membership comprises 21 experts representing local, state, and federal governments; academia; industry; and consumer groups (Appendix 1).

During FY 2015, the Working Group reviewed activities, responded to specific questions, and provided guidance on 1) improving governmental coordination, integration, and collaboration; and 2) improving environmental factor surveillance for foodborne illnesses. The Working Group also reviewed, discussed, and provided guidance on several other CDC FSMA-related projects to enhance foodborne surveillance. For reference, a summary of selected CDC activities conducted in FY 2015 to address FSMA is included in Appendix 2.

BACKGROUND

Each year, an estimated 48 million people in the United States (1 in 6 Americans) get sick, 128,000 are hospitalized, and 3,000 die from (largely) preventable foodborne diseases.[1,2]

Foodborne illness is costly. According to a 2015 study,[3] 15 pathogens alone are estimated to cost $15.5 billion in the United States per year. This includes medical costs (doctor visits and hospitalizations), and productivity loss due to premature death and time lost from work.

Public health surveillance is necessary for improving food safety. Timely detection and control of foodborne disease cases and outbreaks can directly reduce their public health impact; identify new food safety hazards; and enable investigators, regulators, and the food industry to learn more about ways to prevent these diseases.

Foodborne illnesses and outbreaks are reported and investigated at the local and state levels. These investigations help identify and prevent foodborne illness in local/state jurisdictions and provide essential information for national public health and food safety systems. CDC compiles information from local and state agencies and works with them to identify and link outbreak-associated illnesses, leading to identification of contaminated foods and management and control of outbreaks. Outbreak data are collected, analyzed, and shared with many stakeholders (List of Selected Multistate Foodborne Outbreak Investigations; Foodborne Outbreak Tracking and Reporting). Data from these outbreaks serve as a foundation for action by CDC, regulatory agencies, the food-producing industry, and others interested in improving food safety.

Foodborne disease and outbreak surveillance data aggregated by CDC are essential for many functions, including informing evidence-based policy, effectively assessing policy and public health risk, and developing prevention messages for food safety improvements. These data are relied upon by other government regulatory agencies and analyzed by the media, public health, and consumer organizations that provide food safety advice to consumers and policymakers. In January 2013, CDC released the first comprehensive set of estimates of the food categories responsible for foodborne illnesses acquired in the United States from 1998–2008.[4] Building on the 2011 estimates, which showed that about 48 million people (1 in 6) get sick each year from food, these newer estimates

along with annual foodborne illness trend data from the Foodborne Diseases Active Surveillance Network (FoodNet) help regulators and industry identify the groups of foods most responsible for foodborne illness. These data also provide a historical baseline of estimates that can be further refined over time as more data and improved analytic methods become available.

Over the years, differences in data collection and reporting among states, along with issues regarding integration among various government agencies, have led to calls for improvements to ensure that foodborne illness surveillance systems provide the necessary data to assist government agencies, industry, and other food safety stakeholders in their risk-management activities (Center for Science and Public Interest Outbreaks & Recalls; Risky Meat: A CSPI Field Guide to Meat & Poultry Safety).

CDC AND THE FOOD SAFETY MODERNIZATION ACT

The Food Safety Modernization Act of 2010 provided the U.S. Food and Drug Administration (FDA) with new enforcement authority designed to achieve higher rates of compliance with prevention and risk-based food safety standards to better prevent contamination events as well as respond to and contain problems when they occur. Additionally, the law directed FDA to build an integrated national food safety system in partnership with state and local authorities. Recognizing the critical role of foodborne illness surveillance data in informing prevention efforts and CDC's expertise in this area, FSMA also directed CDC to improve governmental coordination and integration, evaluate and improve foodborne illness surveillance systems, and enhance external stakeholder collaboration.

Signed into law on January 4, 2011, FSMA authorized CDC to create a diverse working group of experts and stakeholders to provide routine and ongoing guidance to improve foodborne illness surveillance systems in the United States and to provide advice on the criteria for the designation of five Integrated Food Safety Centers of Excellence (CoEs). In response, the FSMA-SWG of CDC's BSC/OID was created, with BSC/OID member Dr. James Hadler of Yale University's School of Public Health serving as Chair from November 2011 through December 2013 and BSC/OID member Dr. Harry Chen, Commissioner, Vermont Department of Health, serving as Chair from January 2014 to the present.

According to FSMA legislation regarding improvement of foodborne illness surveillance systems, areas for working group discussion and provision of guidance are

"(A) the priority needs of regulatory agencies, the food industry, and consumers for information and analysis on foodborne illness and its causes;

(B) opportunities to improve the effectiveness of initiatives at the Federal, State, and local levels, including coordination and integration of activities among Federal agencies, and between the Federal, State, and local levels of government;

(C) improvement in the timeliness and depth of access by regulatory and health agencies, the food industry, academic researchers, and consumers to foodborne illness aggregated, de-identified surveillance data collected by government agencies at all levels, including data compiled by the Centers for Disease Control and Prevention;

(D) key barriers at Federal, State, and local levels to improving foodborne illness surveillance and the utility of such surveillance for preventing foodborne illness;

(E) the capabilities needed for establishing automatic electronic searches of surveillance data; and

(F) specific actions to reduce barriers to improvement, implement the Working Group's recommendations, and achieve the purposes of this section, with measurable objectives and timelines, and identification of resource and staffing needs."

This annual report to the Secretary, Department of Health and Human Services (required by FSMA) highlights the FSMA-SWG's activities and recommendations in FY 2015 and summarizes priority areas for focus in the coming year.

WORKING GROUP ACTIVITIES – FY 2015

During its fourth year, the FSMA-SWG met twice at CDC to consider several recent and ongoing developments in foodborne illness surveillance that are key to maintaining and improving surveillance systems. Focused discussions were held on two primary issues: 1) improving governmental coordination, integration, and collaboration; and 2) improving environmental factor surveillance for foodborne illnesses. These issues and working group discussions are summarized as follows.

I. Improving governmental coordination, integration, and collaboration *(Discussed at December 2014 FSMA-SWG meeting)*

Because six new members joined the Working Group at the beginning of the 2015 fiscal year, the December 2014 meeting included a review of several previously discussed priority surveillance activities. Discussion of new topics was postponed until the May 2015 meeting.

A. The Interagency Food Safety Analytics Collaboration (IFSAC)

Background: IFSAC is a joint effort by FDA's Center for Food Safety and Applied Nutrition (CFSAN), the U.S. Department of Agriculture's (USDA's) Food Safety and Inspection Service (FSIS), and CDC's Division of Foodborne, Waterborne, and Environmental Diseases (DFWED) to improve coordination of federal food-safety analytic efforts and address cross-cutting priorities for food safety data collection, analysis, and use. The IFSAC Strategic Plan for 2012–17 focuses on four foodborne pathogens: *Campylobacter, Listeria, Salmonella,* and Shiga toxin-producing *Escherichia coli* (STEC) O157. As part of these efforts, IFSAC has developed a new food categorization scheme to increase the accuracy and utility of the food categories used to describe foods implicated in outbreaks and to generate foodborne illness source attribution estimates.

Guidance on IFSAC. The Working Group agreed that it is important to promote the visibility of IFSAC to industry, regulatory agencies, and consumer groups (e.g., via data-sharing) who can help advance foodborne attribution surveillance activities, such as
- Evaluation of interactions between organisms and foods to identify food vehicles that are likely or unlikely to cause outbreaks and to frame attribution models
- Integration of data to identify factors that contribute to foodborne outbreaks, including environmental antecedents, to better characterize outbreak causation
- Use of industry data, including food testing and environmental testing data, for food-safety research
- Evaluation of data on sporadic cases of foodborne disease, using case-control studies and laboratory methods such as whole genome sequencing (WGS) to learn more about attribution and about the relationship between sporadic cases and outbreaks

B. The Interagency Foodborne Outbreak Response Collaboration (IFORC)

Background: IFORC is a joint effort by CDC's Outbreak Response and Prevention Branch (ORPB), FDA's Coordinated Outbreak Response and Evaluation (CORE) Network, and USDA's FSIS to improve coordination of multistate outbreak investigations. It develops and coordinates federal best practices for a) detection of foodborne outbreaks; b) generation and testing of hypotheses about outbreak causation, with input from industry partners; c) identification of food vehicles for outbreak-causing microbes; d) enhancement of data-sharing and analyses; and e) development of interagency and public health communication strategies and processes.

Guidance on IFORC. The Working Group agreed that IFORC can help advance
- Coordinated messaging and timing of communications with state and local health departments
- Education of the public and media about the science behind outbreak processes
- Promotion of transparency and consistency in the decision-making process
- Inclusion of state officials and industry partners in discussions about lessons learned during outbreaks so that future outbreaks can be prevented
- Creation of metrics to evaluate the success of the interagency collaboration

C. Multi-Agency WGS collaborations

Background: Multi-agency collaborations (such as the *Listeria* WGS surveillance project) can improve outbreak detection and investigation; make information on attribution, virulence, and resistance available more quickly; and enhance analyses of resistance trends. They can also advance
- Development of a practical system for local, national, and global WGS data-sharing, data analysis, and communication
- Adaptation of public health practices to changing clinical diagnostics (e.g., use of culture-independent diagnostic tests)

Guidance on Multi-Agency WGS Collaborations. The Working Group recognizes that significant progress has been made in this area over a short period of time. Multi-agency WGS collaborations should be used to help
- Standardize sequencing methodology across federal agencies
- Create a uniform platform that provides standardized nomenclature for identifying pathogen strains
- Provide an implementation toolkit for the adoption of WGS in industry. These efforts may be advanced through collaboration with the Council to Improve Foodborne Outbreak Response (CIFOR) Industry Guidelines Workgroup, which is developing response guidelines to help industry in day-to-day operations and during investigations of foodborne illness outbreaks. (CIFOR is discussed further below.)

D. Collaborations with State and Local Partners

Background: Updates were provided on
- **Integrated Food Safety Centers of Excellence**, which were established as a FSMA requirement to "serve as resources for federal, state, and local public health professionals to respond to foodborne illness outbreaks." The CoEs—located at state health departments in Colorado, Florida, Minnesota, New York, Oregon, and Tennessee—partner with academic institutions.
- **CIFOR**, a multi-disciplinary workgroup formed in 2006 that is co-chaired by the Council of State and Territorial Epidemiologists (CSTE) and the National Association of County and City Health Officials (NACCHO) and includes representatives from federal agencies and national professional organizations.

- **Foodborne Disease Centers for Outbreak Response Enhancement (FoodCORE)**, which aims to improve detection, investigation, and control of foodborne outbreaks. The FoodCORE Centers— located in Connecticut, Colorado, Minnesota, New York City, Ohio, Oregon, South Carolina, Tennessee, Utah, and Wisconsin—work together to test innovative methods, share strategies, and identify and document model practices.

   Guidance on FoodCORE. The Working Group agreed that FoodCORE
   - Is a relatively inexpensive, sustainable investment that provides a vision for a national program to improve detection, investigation, and control of foodborne disease outbreaks
   - Provides surge capacity that goes beyond foodborne outbreaks, as demonstrated by FoodCORE's assistance with the 2014 Ebola responses in Ohio and New York City
   - Should use core measures developed by CIFOR to identify target goals and measure progress in achieving them
   - Should be expanded nationally, through public health investment in the 40 states that do not currently host FoodCORE sites

E. **Enhanced Surveillance Tools**

   1) **Improved surveillance for cyclosporiasis**

      Background: Surveillance for cyclosporiasis is currently conducted by the National Notifiable Disease Surveillance System (NNDSS), with trends monitored by the 10 FoodNet sites. Cyclosporiais is currently a reportable disease in 40 states.

      The 2014 outbreak of cyclosporiasis—which was traced to contaminated cilantro imported from Mexico—involved 345 confirmed cases, including 235 cases with no history of international travel. The non-travel cases were reported by 22 states and New York City, with 57% reported by Texas.

      During FY 2015, CDC will explore research options for improving surveillance and reducing outbreaks, and FDA will continue to work with the Mexican National Service for Agro-Alimentary Public Health, Safety and Quality (SENASICA) and the Federal Commission for the Protection from Sanitary Risks (COFEPRIS) to promote the safety of fresh and minimally processed agricultural products through a produce safety partnership.

      Guidance on Surveillance for Cyclosporiasis. The Working Group stressed that additional efforts are needed to
      - Educate providers about identifying cases and ordering proper diagnostic laboratory tests
      - Improve reporting of cases to federal agencies, using electronic reporting systems
      - Modernize laboratory methods to improve identification of illness
      - Focus on the regulatory relationship with Mexico and other source countries

   2) **Use of the System for Enteric Disease Response, Investigation, and Coordination (SEDRIC)**

      Background: SEDRIC is a **s**oftware program to facilitate tracking of foodborne diseases during multistate outbreaks. SEDRIC was developed by CDC and Palantir Technologies to integrate data from different sources in real time; facilitate epidemiologic, laboratory, and traceback activities; facilitate data visualization; and enable secure information sharing among state, local, and federal partners.

Guidance on SEDRIC. The Working Group agreed that while the technology is in its infancy, SEDRIC should be used to

- Provide flexibility and security in sharing information with states and partners
- Help assess outbreak metrics (e.g., timeliness, completeness)
- Develop a resource base in anticipation of WGS to make decisions about which clusters to investigate and when to do so

II. Environmental surveillance for foodborne illness, including surveillance for environmental antecedents and contributing factors (*Discussed at May 2015 FSMA-SWG meeting*)

Background: The ultimate goal for public health and food safety officials is not just stopping foodborne disease outbreaks once they occur but preventing them from happening. Long-term prevention of foodborne outbreaks involves the actions of many partners along the farm-to-fork continuum. Staff from CDC's National Center for Environmental Health (NCEH) gave introductory presentations to the Working Group on the following topics:

- **The importance of environmental data for foodborne illness and outbreak surveillance.** NCEH encourages and supports state and local food safety efforts to conduct foodborne illness outbreak environmental assessments that help
  - Identify contributing factors (to learn how the outbreak occurred)
  - Identify environmental antecedents (to learn why the outbreak occurred)
  - Generate data for informed interventions and policy development

- **NCEH Environmental Surveillance Initiatives**. Currently, contributing factors are reported for only 40–45% of foodborne outbreaks; environmental antecedents are rarely reported. In April 2014 NCEH launched two initiatives aimed at improving data collection:
  - **National Environmental Assessment Reporting System (NEARS)** (formerly National Voluntary Environmental Assessment Information System [NVEAIS]), whose goals are to
    - Identify the underlying environmental factors—including contributing factors and environmental antecedents—that cause foodborne outbreaks
    - Use this information to
      – Characterize food vehicles and monitor trends
      – Generate hypotheses on root causes in outbreak investigations
      – Guide planning, implementation, and evaluation of food outbreak prevention programs
  - **E-Learning on environmental assessments for foodborne illness outbreaks**. This training program, which has more than 2,000 users to date,
    - Provides web-based training to improve foodborne outbreak investigation practices that can lead to information that will help prevent foodborne outbreaks
    - Assists outbreak response teams in investigating foodborne illness outbreaks
    - Identifies outbreaks' environmental causes
    - Provides training on recommending appropriate control measures

- **The Environmental Health Specialists Network (EHS-Net).** EHS-Net is a collaborative network of federal, state, and local environmental health and food safety specialists that focuses on retail food safety policies and practices. Its objectives include
  - Improving our understanding of environmental factors linked to foodborne illness outbreaks
  - Strengthening federal, state, local, and industry food safety policies and practices
  - Reducing foodborne illness

  As part of these efforts, EHS-Net conducts retail food safety studies to
  - Identify food safety policy and practice gaps (e.g., undercooked hamburgers at restaurants)
  - Identify ways to address these gaps
  - Make policy and practice recommendations

- **Other examples of initiatives to collect foodborne illness environmental surveillance data**

  The May 2015 Working Group meeting also included a panel discussion that emphasized the importance of collaboration among epidemiologists, laboratorians, and environmental health specialists in investigating foodborne disease outbreaks. An example highlighted from a recent Integrated Foodborne Outbreak Response Management (InFORM) meeting, included a discussion of a 2012 outbreak of Salmonella with 425 cases that affected 28 states. State and local health departments, FDA, and CDC traced the source of the outbreak to a contaminated food product (imported frozen raw scraped ground tuna product).
  - Groups and projects that collect foodborne illness environmental surveillance data include
    - The National Outbreak Reporting System (NORS), which has found that foodborne disease outbreaks in the United States are associated with a wide range of foods and that the majority of such outbreaks are associated with restaurants
    - FoodCORE, whose environmental health activities include conducting environmental assessments, participating in traceback efforts, and providing training for local specialists
    - FDA Rapid Response Teams (RRTs) and training programs, which aim to
      - Develop and maintain multi-jurisdictional rapid response teams that support integrated all-hazards prevention, response, and recovery efforts
      - Unify and coordinate federal/state/local emergency response efforts
      - Capture, develop, and support adoption of best practices and encourage mentorship
      - Ensure alignment with national priorities, including those of FSMA
    - FDA's CORE Network, which conducts in-depth after-action evaluations of outbreaks responses
    - FDA Environmental Assessments, which provide
      - An in-depth, multi-disciplinary, systems-based approach to determining how contamination may have occurred so it can be prevented in the future
      - A way to determine how the "environment" contributed to the introduction, transmission, and proliferation of pathogens or other hazards that caused illness or contamination
    - USDA/FSIS *Listeria monocytogenes* Environmental Sampling Program
    - USDA/Animal and Plant Health Inspection Service (APHIS)/Veterinary Service (VS) role in pre-harvest food safety

- **Other presentation topics at the May 2015 meeting**
  - *The Environmental Health Investigator Perspective* (National Environmental Health Association)
  - *CIFOR Environmental Guidelines* (Council of State and Territorial Epidemiologists)
  - *Environmental activities of the CoEs*, including trainings (e.g., to improve awareness and performance) and the identification of major threats facing the food industry, including
    - Pathogen contamination of raw ingredients
    - Scale of production and distribution that turns minor errors into large outbreaks
    - Food-handler contamination of ready-to-eat foods
  - *Contributing Factor Data: One of the Keys to Using Outbreak Data to Drive Attribution Models* (Craig Hedberg, University of Minnesota)
  - *An Agricultural Perspective on Environmental Activities* (Association of Food and Drug Officials)

- **Questions presented to the Working Group and subsequent discussions/guidance**

  1. **How can we promote and encourage participation in NEARS and E-Learning? How do we create champions to implement these initiatives?**
     Discussion and Guidance: The Working Group stressed the importance of
     - Demonstrating the impact and value of NEARS and E-Learning
     - Engaging state and local officials in these initiatives and gain their buy-in to support and promote implementation of these programs
     - Leveraging partnerships to promote training (e.g., partnerships with Centers of Excellence, FoodCORE, OutbreakNet, and EHS-Net)
     - Integrating and streamlining NEARS and NORS (e.g., NEARS and NORS survey tools should be harmonized)
  2. **What NEARS data are most important to share?**
     Discussion and Guidance: The Working Group emphasized that
     - NEARS data should be representative, timely, and actionable
     - The most important data for sharing depends on the audience (regulators, policymakers, and the public) and should be adapted for use accordingly
     - NEARS should conduct assessments to determine the needs of these audiences

  3. **How can we better disseminate EHS-Net data to public health and industry partners?**
     Discussion and Guidance: The Working Group agreed that EHS-Net should engage with partners in their jurisdictions by
     - Attending the annual InFORM Conference and annual meetings of such groups as the National Restaurant Association and the National Environmental Health Association
     - Providing information through social media
     - Targeting communications and marketing efforts to specific partners
     - Engaging educational organizations

  4. **How can we formalize our relationship with industry?**
     Discussion and Guidance: The Working Group stressed that EHS-Net should
     - Engage the senior leadership of trade organizations
     - Join and contribute expertise to the CIFOR industry workgroup

5. **How can we better integrate and improve our environmental foodborne surveillance data?**
   Discussion and Guidance: The Working Group concluded that better collection, integration, and use of environmental foodborne disease surveillance data requires
   - Mapping and documenting ongoing surveillance efforts by all partners.
   - Collaborating and integrating efforts to
     – Provide training in the collection and use of environmental health data. Current training classes are provided by CoEs, Epi-Ready (a collaboration by the National Environmental Health Association [NEHA] and CDC), E-Learning, and FDA and USDA (for food-safety inspectors).
     – Develop data collection guidelines. This effort can be facilitated by CIFOR.
     – Conduct investigations. Coordination can be facilitated by IFORC.
   - More environmental investigations when tracebacks point to specific farms or facilities. These consistent, in-depth investigations (with environmental sampling when appropriate) are critical in improving our understanding of how certain foods become contaminated and/or how some processes fail to reduce the risk of contamination with or growth of pathogens.
   - Improvements in our ability to communicate (internally and externally) lessons learned from previous outbreak investigations and ensure that strategies are developed to reduce the risk of additional illnesses and outbreaks.

6. **How can we further improve our foodborne *Vibrio* illness surveillance?**
   Background information reviewed by the Working Group on Vibrio *surveillance in the United States*: According to FoodNet data, *V. parahaemolyticus* is responsible for about 85% of foodborne *Vibrio* infections in the United States. *Vibrio* infections are generally undiagnosed or not tested for, but overall there has been a general upward multiple-year trend in the number of reported cases of illnesses from *Vibrio* (all species) and *V. parahaemolyticus.*

   Data from Japan suggest that V. parahaemolyticus illnesses and outbreaks can be reduced by rapidly chilling shellfish on ice as soon as they are caught (i.e., on board harvesting vessels).[5-7] Pilot tests in 2014 by Connecticut and New York that used this approach to harvest oysters showed promise in reducing the number of Vibrio illnesses, but the practice has not been yet widely adapted by the industry.

   Discussion and Guidance: The Working Group emphasized that CDC and its partners should
   - Monitor the effects of culture-independent diagnostic tests on *Vibrio* illness surveillance
   - Continue education of physicians on *Vibrio* infections and their diagnosis
   - Assess the effects of state-level interventions on industry
   - Continue to disseminate surveillance information to public health and industry partners

RESOURCES

The FSMA-SWG acknowledged that additional resources are required to integrate environmental data into foodborne illness surveillance; to develop human resource capacity of state and local health departments to conduct timely exposure assessments to enhance the value of new technologies, including DNA sequencing; to find, investigate, and quickly stop multistate foodborne outbreaks; and to build on and better integrate existing

surveillance systems and fill existing data gaps. There is also a critical need to build capacity at the state and local levels that have experienced severe losses in capacity, including hiring experienced foodborne epidemiology, laboratory, and environmental personnel. This effort includes the need to engage schools of public health to train the existing workforce and the next generation of state and local food safety public health scientists and practitioners. The Working Group is pleased that initial funding was appropriated in 2014 and 2015 to help move forward the important tasks authorized by FSMA, but continues to be concerned about the lack of attention to adequate funding levels for the programmatic efforts uniquely directed by CDC and implemented by state and local health departments to meet the enhanced surveillance requirements.

NEXT STEPS

To provide additional guidance on these and other emerging priority areas, the Working Group will devote time at future meetings to explore priority areas in more depth and provide associated advice for future actions.

These reviews will include expert presentations on the current status and progress of each priority followed by a discussion on possible enhancements to improve foodborne illness surveillance in that area. These topics may include

- Engaging industry in foodborne illness surveillance
- Providing updates on improving governmental coordination and integration (e.g., attribution, multistate outbreak investigation, whole genome sequencing, the *Listeria* project),
- Evaluating and improving foodborne illness surveillance tools and systems (e.g., SEDRIC multistate outbreak investigation software, CIFOR guidelines and tool kit, CoEs, FoodCORE performance measures)
- Addressing "orphan" diseases such as toxoplasmosis, cryptosporidiosis, hepatitis A, and shigellosis
- Enhancing external collaboration and communication
- Ensuring traceback and traceability of foods implicated in foodborne illnesses and outbreaks

In conclusion, the Working Group believes that important progress has been made in the implementation of FSMA, but that significant gaps remain that impact the quality of foodborne illness surveillance data.

Ensuring that states have the staff and resources to fully investigate outbreaks by identifying both the food and pathogen responsible and reporting these data to NORS, along with improvements in the integration and sharing of data, is a prerequisite to the formulation, implementation, and evaluation of science-based disease prevention and control policies and to an improved overall integrated food safety system.

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APPENDIX 1: SURVEILLANCE WORKING GROUP

WORKING GROUP MEMBERS

Meetings held in December 2014 and May 2015

BSC Representative Members:

Chair, Harry Chen, MD – Commissioner, Vermont Department of Health

Member, Kristy Bradley, DVM, MPH – State Epidemiologist and State Public Health Veterinarian, Oklahoma State Department of Health

Member, Timothy Jones, MD – State Epidemiologist, Tennessee Department of Health (also CSTE representative)

Federal Partner Members:

Dale Morse, MD, MS – Centers for Disease Control and Prevention

Jeffrey Farrar, DVM, MPH, PhD – Food and Drug Administration

David Goldman, MD, MPH – United States Department of Agriculture, Food Safety and Inspection Service

Public Health Partner Agency Members:

Natalie Adan – National Association of State Departments of Agriculture

Robyn Atkinson, PhD, HCLD – Association of Public Health Laboratories

Thomas S. Dunlop, MPH, REHS – National Environmental Health Association

Timothy Jones, MD – Council of State and Territorial Epidemiologists

Heidi Kassenborg, DVM, MPH – Association of Food and Drug Officials

Nathaniel Smith, MD, MPH – Association of State and Territorial Health Officials

Joseph Russell, MPH, RS – National Association of County and City Health Officials

Consumer Partner Members:

Caroline Smith DeWaal, JD – Center for Science in the Public Interest

Barbara Kowalcyk, PhD – Center for Foodborne Illness Research and Prevention

Chris Waldrop – The Food Policy Institute, Consumer Federation of America

Industry Partner Members:

Catherine Adams Hutt, PhD, RD – National Restaurant Association

Scott K. Hood, PhD – General Mills

Joan Menke-Schaenzer – ConAgra Foods, Inc.

Academia Partner Members:

Craig Hedberg, MS, PhD – Professor, University of Minnesota

Michael P. Doyle, PhD – University of Georgia

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APPENDIX 2: SELECTED CDC ACCOMPLISHMENTS IN IMPLEMENTING FSMA SURVEILLANCE REQUIREMENTS

The Food Safety Modernization Act (FSMA) recognizes that robust foodborne illness surveillance data are needed to inform prevention efforts. FSMA directly links surveillance with prevention and highlights the need for stronger partnerships at the local, state, and federal levels. FSMA directs the Centers for Disease Control and Prevention (CDC) to

    I.   Improve governmental coordination and integration
    II.   Evaluate and improve foodborne illness surveillance systems
    III.   Enhance external stakeholder collaboration

CDC supports the implementation of FSMA in many ways. For instance, in fiscal year (FY) 2015, CDC increased support for existing infrastructure for laboratory, surveillance, and outbreak response activities and continued the activities of the Integrated [Food Safety Centers of Excellence](#) (CoEs), including adding a sixth site.

The following summary of selected CDC accomplishments support FSMA. While the majority build on existing infrastructure and labor capacity, some, like the OutbreakNet Enhanced initiative launched in 11 sites, are new in 2015 and exclusively address CDC's surveillance responsibilities under FSMA.

I. Improving Governmental Coordination and Integration

Food safety is a shared initiative among local, state, and federal public health partners. FSMA recognizes that strong coordination among partners is essential to rapidly detect food safety problems, determine where issues are occurring, and identify and use effective strategies to prevent foodborne illness. CDC is working to strengthen coordination and data sharing across government agencies and with external partners.

A. Coordinating federal, state, and local foodborne illness surveillance systems

- ***Multistate foodborne illness outbreak investigations***
  In FY 2015, CDC supported federal, state, and local health agencies to monitor between 15 and 40 clusters of potential foodborne illness per week, resulting in approximately 14 major multistate outbreak investigations (Table 2.1).

  CDC continues to improve foodborne illness and outbreak metrics through the [Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) Cooperative Agreement](#) sites and by working with the [Council to Improve Foodborne Outbreak Response](#) (CIFOR) to use performance measures and associated targets as guidelines for states to use in their outbreak investigations. The council serves many professional organizations focused on state and local health department activities.

Table 2.1 Selected Multistate Foodborne Illness Outbreaks, United States, FY 2015*

Pathogen	Distribution	Vehicle
Listeria monocytogenes	24 illnesses reported from 9 states[†]	Soft cheese distributed by Karoun Dairies
Salmonella Poona	671 illnesses reported from 34 states[†]	Cucumbers
Salmonella I 4,[5],12:i:-	152 illnesses reported from 1 state[†]	Pork
Salmonella Enteriditis	5 illnesses reported from 1 state	Stuffed chicken entrees from Aspen Foods
Salmonella Enteriditis	9 illnesses reported from 4 states	Stuffed chicken entrees from Barber Foods
Cyclosporiasis	Outbreaks in 3 states[‡]	Cilantro
Salmonella Paratyphi B variant L(+) tartrate(+) and *Salmonella* Weltevreden	65 illnesses reported from 11 states	Frozen raw tuna
Listeria monocytogenes	10 illnesses reported from 4 states	Blue Bell Creameries products
Salmonella Newport	275 illnesses reported from 29 states and Washington, DC	Cucumbers
Listeria monocytogenes	35 illnesses reported from 12 states	Commercially produced, prepackaged caramel apples made from Bidart Bros. apples
Salmonella Stanley	17 illnesses reported from 3 states	Raw cashew cheese
Salmonella Enteriditis	115 illnesses reported from 12 states	Bean sprouts
Listeria monocytogenes	5 illnesses reported from 2 states	Wholesome Soy Products, Inc. sprouts
Listeria monocytogenes	5 illnesses reported from 4 states	Oasis Brands, Inc. cheese

*Pathogens listed in chronological order of outbreaks
[†]Data through 09/30/2015
[‡]Epidemiologic and traceback investigations conducted in Texas, Wisconsin, and Georgia by state and local public health and regulatory officials; FDA indicated that some illnesses among residents in these states were linked to fresh cilantro from Puebla, Mexico (see Cyclosporiasis Outbreak Investigations - 2015)

- *CDC support of FDA implementation of FSMA*
  CDC works closely with the U.S. Food and Drug Administration (FDA) to support FSMA implementation efforts by providing expert participation in a number of FDA-led activities and workgroups. These efforts include

  o **Participating in an FDA-led collaboration to develop top-tier metrics for evaluating the effectiveness of FSMA implementation on food safety**. CDC assisted in planning and joined representatives from FDA, the U.S. Department of Agriculture (USDA), industry, consumer advocacy groups, academia, and associations at a 2-day Collaborative Food Safety Forum workshop. Representatives discussed and developed potential public health-based metrics to successfully implement FSMA, drew on other regulatory systems' models for evaluating impact on public

health, discussed key fundamentals of the draft Preventive Controls and Produce Safety Strategic Program Planning framework, and determined possible next steps for developing FSMA metrics. CDC will continue to assist into FY 2016.

o **Participating on the FDA-led FSMA Implementation State Strategy Workgroup.** A CDC representative serves on this workgroup aimed at strengthening federal/state integration to focus on FSMA deliverables.

o **Participating on the National Agriculture and Food Defense Strategy Interagency Workgroup**. The workgroup continued to consult with FDA to assist in U.S. Department of Health and Human Services (HHS) final clearance and publication of the National Agriculture and Food Defense Strategy, which also includes an implementation plan and a coordinated research agenda. The [Report to Congress on the National Agriculture and Food Defense Strategy (NAFDS)](#) was submitted to Congress in April 2015. A [PDF copy of the Report to Congress](#) is also available.

  – FSMA Section 108 directs the development of a National Agriculture and Food Defense Strategy, where FDA; USDA; the Department of Homeland Security; the Environmental Protection Agency; CDC; and state, local, and tribal health authorities work together to protect the food supply from hazards that might be intentionally added to food in the United States

o **Serving on the Network Advisory Committee to the [FDA Rapid Response Teams](#) (RRTs).** CDC representatives, in collaboration with FDA and its RRT network operating in 18 states, provided updates on CDC-related food safety activities at and participated in the Annual RRT Face-to-Face Meeting (in FY 2015 held in Des Moines, Iowa, on November 18–20, 2014). CDC representatives continue to participate and present on CDC's outbreak investigation teams and protocols during monthly RRT calls. (FSMA Sections 202, 205[c], and 209).

o **Inviting participation by FDA RRTs to plan and participate in four Regional Outbreak Net/PulseNet Meetings**. CDC invited RRTs to participate in four Regional Outbreak Net/PulseNet meetings in FY 2015: South Central/Southeast (New Orleans, January 6–8); Mountain/West (San Diego, February 10–12); Central/Midwest (Chicago, March 24–26); and Northeast/Mid-Atlantic (Baltimore, April 28–30).

o **Serving on the FDA-led Partnership for Food Protection (PFP) Governing Council.** A CDC representative serves as a voting member on the Council in monthly telephone conferences and at an annual face-to-face meeting. CDC is participating in the planning for the next PFP biennial meeting to be held in 2016. The PFP supports FSMA Section 205(2)[c], Improving Food Safety and Defense Capacity at the State and Local Level, Subparagraphs (1)(A-F).

o **Serving on the PFP Surveillance, Response, and Post-Response Workgroup**. CDC representatives participate in this workgroup aimed at strengthening and enabling faster and more effective surveillance, response, and post-response efforts through coordination among strategic partners.

o **Participating in the 2015 FDA/Office of Regulatory Affairs (ORA) Public Health and Regulatory Food and Feed Training Summit, September 28–30, 2015, Rockville, Maryland.** Organized under the auspices of PFP, the summit was aimed at building a national training curriculum standard for an Integrated Food Safety System.

o **Inviting active participation by FDA representatives in the planning of the Integrated Foodborne Outbreak Response Management (InFORM) meeting and soliciting and ensuring active FDA participation in the program**. Held in November 2015, this meeting was intended for public health and regulatory officials involved in foodborne outbreak response activities. Laboratorians, epidemiologists, and environmental health/regulatory personnel involved in foodborne and enteric disease outbreak responses at state, federal, and national levels attended the meeting. (FSMA Section 205(2)[c]).

- o **Collaborating with FDA to finalize a chapter on surveillance in a FSMA Biennial Report to Congress (currently in HHS clearance).** The chapter reviews and outlines successes of previous food safety surveillance programs and practices by both agencies, identifies future programs and practices, and includes information related to FSMA Section 110[a] (2).

- o **Participating on the Food Safety Research Report Interagency Work Group.** This workgroup developed a joint food safety and food defense research plan and report. (FSMA Section 110[g]),

- o **Collaborating with FDA to prepare for the biennial Conference for Food Protection.** CDC provides expert consultation on questions related to the revision of the *Food Code* and is contributing to planning for the next biennial meeting, to be held in 2016.

- *Cholera and Other* Vibrio *Illness Surveillance (COVIS)*

  In FY 2015, CDC continued to oversee the COVIS electronic database as well as

  - o Worked with states to improve seafood traceback information and to collect the exposure history of all cases

  - o Investigated all potential clusters for possible common source food vehicles

  - o Developed a spreadsheet on SharePoint for states to record traceback information in real time to aid in early outbreak detection

  - o Facilitated a national workgroup of foodborne epidemiologists to improve communication across states to aid in outbreak and traceback investigations leading to the closure of contaminated shellfish harvest areas

  - o Published the annual summary of 2013 data in July 2015, with measures for reporting timeliness and completeness

- *The* Listeria *Initiative*

  To better detect and investigate illness clusters, CDC continued to work with states to identify ways to improve the reporting of epidemiologic and laboratory data in a timely manner. In FY 2015, each state was notified of recent uploads of *Listeria* isolates to PulseNet from their state on a weekly basis to increase the percentage of isolates that had linked epidemiological data. These efforts led to improvements in *Listeria* reporting during calendar year 2015, as indicated by increases in the proportion of all listeriosis cases with linked epidemiologic and laboratory data.

  - o CDC's Advanced Molecular Detection (AMD) component of the *Listeria* Initiative continued

    - – Providing funding to improve the integration of epidemiologic exposure data with whole genome sequencing (WGS) to better detect and solve outbreaks

    - – Disseminating cluster investigation information to states through the System for Enteric Disease Response, Investigation, and Coordination (SEDRIC), a web-based platform developed by CDC and Palantir Technologies

    - – Working with states to identify ways to improve reporting of linked epidemiologic and laboratory data in a timely manner to better detect and investigate illness clusters

    - – Contacting states weekly to notify them of recent uploads of *Listeria* isolates to PulseNet from their state to increase the percentage of isolates that have linked epidemiological data. These efforts continued to lead to an increased proportion of listeriosis cases with linked epidemiologic and laboratory data

    - – Receiving funding through CDC's AMD Initiative to improve integration of epidemiologic exposure data with whole genome sequencing data to better detect and solve outbreaks

- Working with the laboratory to integrate the *Listeria* Whole Genome Sequencing Project data into BioNumerics software to perform rapid epidemiologic and WGS analyses and better find foods responsible for outbreaks

- Conducting routine, near-real-time WGS of all food, environmental, and clinical isolates in integrated farm-to-table listeriosis surveillance through collaboration with FDA, USDA's Food Safety and Inspection Service (FSIS), the National Institutes of Health (NIH), and state partners (Pulsed-field gel electrophoresis [PFGE] alone would have likely missed linkages between illnesses and food products)

- Investigating outbreaks of *Listeria* infections, including identification of new food vehicles such as caramel apples and ice cream (Table 2.1 on page 15 of this report includes five *Listeria* outbreaks). As a direct result of the WGS project, the number of listeriosis cases linked to food source and he number of solved outbreaks were improved.

- Coupling traditional epidemiologic data from the *Listeria* Initiative with WGS data to solve nine outbreaks and determine the likely food source of a sporadic case during WGS year 2. By comparison, an average of two outbreaks per year were solved during the pre-WGS year (Figure 2.1)

Figure 2.1. Comparison of listeriosis cases before and after whole genome sequencing and reported to the *Listeria* Initiative
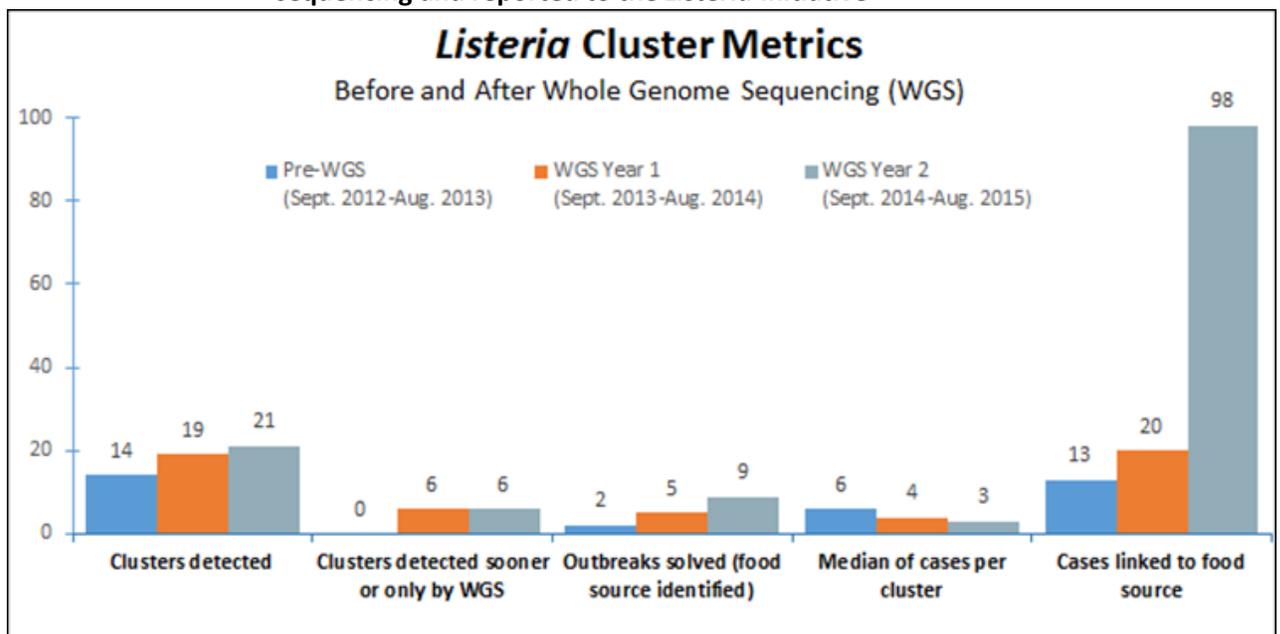
- **Toxoplasma gondii *sero-surveillance***

  In 2015, CDC's Division of Parasitic Diseases and Malaria (DPDM) conducted sero-surveillance including

  o Conducting *Toxoplasma gondii* sero-surveillance using serum samples from the 2013–14 National Health and Nutrition Examination Survey that allows completion of the periodic 6-year sample period (2009–2014) to adequately stratify the data by race/ethnic group, gender, and region, and to fully evaluate trends. This survey is a collaboration at CDC among DPDM, the Center for Global Health, and the National Center for Health Statistics' Division of Health and Nutrition Examination Surveys

  o Developing sampling methods in collaboration with the USDA Agricultural Research Service to conduct a national survey of *T. gondii* contamination in field-raised and "organic" pork and lamb

- o Collaborating with the Palo Alto Medical Foundation, Stanford University School of Medicine, and the David Geffen School of Medicine at the University of California, Los Angeles on the assessment and publication of a manuscript on *T. gondii*–related ocular infections in the United States[1]

- o Providing the USDA Economic Research Service with *T. gondii* surveillance data to help determine the annual cost attributed to foodborne toxoplasmosis in the United States. In this evaluation, "Economic Burden of Major Foodborne Illnesses Acquired in the United States," *T. gondii* was the second most costly foodborne illness in the United States[2]

- **Interagency Collaboration on Genomics and Food Safety (Gen-FS)**

  During FY 2015, CDC, FDA, NIH/National Center for Biotechnology Information (NCBI), and USDA/FSIS, began to formalize their ongoing collaboration on the application and use of whole genome sequencing to improve food safety. They established the Interagency Collaboration on Genomics and Food Safety for timely access to foodborne epidemiologic, food and traceback, environmental, and laboratory data for the following applications:

  - o Clinical, food, and environmental foodborne pathogen surveillance
  - o Quick, accurate detection and mitigation of outbreaks
  - o Removal of contaminated food sources to prevent additional illnesses
  - o Studies that attribute foodborne illnesses to food sources
  - o Regulatory food safety research

  The strength of Gen-FS is built on the complementary roles and responsibilities for protecting food safety of the four federal agencies, with state and other partners:
  - o CDC oversees foodborne Illness surveillance
  - o FDA oversees regulatory oversight and surveillance of produce, seafood, dairy products, processed foods, nuts, and other foods
  - o USDA/FSIS has regulatory oversight and surveillance of meat, poultry, processed eggs, and catfish
  - o NIH/NCBI provides the big data infrastructure for data storage, curation, bioinformatics analytics, and other expertise necessary to use integrated data from different sources

  The purpose of Gen-FS is to
  - o Sequence isolates of foodborne pathogens from clinical, food, feed, and environmental sources; store the information; facilitate analysis and use of the data for disease surveillance, regulatory testing, and oversight of food safety; and conduct food safety research to improve public health
  - o Develop and harmonize laboratory procedures, protocols, and standards
  - o Streamline sharing of data among partner agencies, and to the extent possible, with the public
  - o Compare, interpret, and use WGS and metadata for analytical studies
  - o Communicate information on shared projects and programs
  - o Support state food safety agencies in their adoption of WGS technology

  Results of Gen-FS during FY 2015 include
  - o Launching real-time WGS surveillance for *Listeria monocytogenes* (Lm) isolates. WGS and metadata from more than 2,520 food and environmental Lm isolates and from more than 2,030 clinical Lm isolates were uploaded to the NCBI database
  - o Using WGS Lm data for real-time outbreak detection, investigation, and response
  - o Beginning to sequence isolates and uploading data on additional foodborne pathogens (for example, *Salmonella* sp.), as resources permitted
  - o Improving subtyping, outbreak detection, investigation, and regulatory response

- Differentiating sources of food contamination, even within the same outbreak
- Eliminating likely clusters of foodborne illness or cases within clusters
- Determining the potential usefulness for identifying clusters PFGE could miss
- Identifying links between clinical, food, and environmental outbreak isolates more quickly for more timely public health and regulatory action

The demonstrated benefits of Gen-FS have shown improved, more timely regular action, such as

- Identifying links between FDA food testing program positives and sporadic clinical isolates early, helping lead to quicker regulatory actions
- Narrowing searches/tracebacks for the source of a contaminated food or ingredient
- Identifying the contaminated ingredient(s) in a multi-ingredient food associated with outbreaks
- Providing preventive control monitoring for compliance standards
- Providing genotyping and phenotyping schemes for risk assessment, and monitoring adaptive changes in enteric pathogens contaminating foods

Whole genome sequencing improves the cost-effectiveness of laboratory testing programs by offering a single test that yields information on serotype markers for source attribution and emerging trends in pathogen resistance to antibiotics and virulence factors.

- *FoodNet surveillance*

  CDC, FDA, USDA/FSIS, and 10 state health departments participate in the Foodborne Diseases Active Surveillance Network (FoodNet) and collaborate to provide critical data[3,4] for policymakers, the scientific community, and the public. This collaboration

  - Published preliminary 2014 FoodNet data on the incidence and trends of infection with pathogens transmitted commonly through food in the May 2015 *Morbidity and Mortality Weekly Report* (*MMWR*)[3] and online in data facts and figures tables

  - Published a summary of culture-independent diagnostic test (CIDT) activities and data in the March 2015 *MMWR*[4] (Foodborne Illness and Culture-Independent Diagnostic Tests [CIDTs])

  - Updated the FoodNet webpages to make the site more accessible and easier to navigate

  - Provided data updates for monitoring the Healthy People 2020 (HP2020) goals on the incidence of infection with *Campylobacter*, *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* O157, *Vibrio*, and *Yersinia;* and incidence of hemolytic uremic syndrome. Participated in the HP2020 progress review

  - Continued to provide quarterly reports on the incidence of *Salmonella* serotype Enteritidis to support the HHS High Priority Health Goal aimed at reducing foodborne illness in the population by decreasing the rate of *Salmonella* Enteritidis illness in the population to 1.9 cases per 100,000 by December 2015

  - Published a more interactive format of the FoodNet 2013 annual report in spring 2015

- **Shigella** *surveillance*

  CDC led 21 multistate and assisted with 7 single-state shigellosis outbreaks, including 2 international outbreaks. Outbreak case counts ranged from 7 to 975 and were detected in as many as 34 states and Puerto Rico. PulseNet assisted with identifying the majority of multistate outbreaks through PFGE patterns. National Antimicrobial Resistance Monitoring System (NARMS) testing was completed for 18 outbreaks (>100 isolates), and in those instances, *Shigella* was resistant to a variety of antibiotics including ampicillin, ciprofloxacin, azithromycin, trimethoprim/ sulphamethoxazole, streptomycin, sulfisoxazole, nalidixic acid, tetracycline, and ceftriaxone.

Two *MMWR* reports, published in 2015, highlight the growing threat of multidrug-resistant shigellosis ("Importation and Domestic Transmission of *Shigella sonnei* Resistant to Ciprofloxacin — United States, May 2014–February 2015" and "*Notes from the Field*: Outbreaks of *Shigella sonnei* Infection with Decreased Susceptibility to Azithromycin Among Men Who Have Sex with Men — Chicago and Metropolitan Minneapolis-St. Paul, 2014"). A *Health Alert Network* (*HAN*) advisory provided recommendations for general prevention (such as frequent handwashing) for shigellosis patients (on how to stop the spread of *Shigella)* and for clinicians (on performing antimicrobial susceptibility testing and counseling patients on proper hygiene methods). The *HAN* advisory encouraged state and local health department to use the disk diffusion screening test to detect decreased susceptibility to azithromycin among *Shigella* isolates.

Additional *Shigella* surveillance activities included

o   Tracking and investigating more than 20 multistate shigellosis outbreaks by collaborating with PulseNet on outbreaks that were transmitted person to person in childcare settings or among men who have sex with men (MSM), and with CDC's Outbreak Response Prevention Branch to conduct interviews and analyze data on foodborne outbreaks

o   Reporting shigellosis outbreaks to the National Outbreak Response System (NORS) and supporting data-cleaning efforts

o   Assisting the NARMS team with requesting antibacterial resistance testing for shigellosis isolates associated with outbreaks

o   Assisting state and local health departments with shigellosis outbreaks and prevention

o   Creating prevention materials for specific risk groups (e.g. MSM, children in daycare facilities) and the general public during shigellosis outbreaks (Shigella Infections among Gay and Bisexual Men and Safe and Healthy Diapering Guidance)

o   Updating content for *Shigella* and hygiene pages on the CDC website using appropriate references

o   Analyzing *Shigella* surveillance data from 2009–2013 in NORS, NARMS, and PulseNet to understand how to improve *Shigella* outbreak surveillance and presenting data at the Council of State and Territorial Epidemiologists (CSTE) conference

o   Collaborating with the Chicago Department of Health to write an abstract regarding the increase in the number of shigellosis cases with decreased susceptibility to azithromycin among MSM for the CSTE conference

B. Increasing participation of public health and food regulatory agencies and laboratories in national networks

Local and state health departments serve as the foundation of food safety efforts by investigating outbreaks, conducting disease surveillance, and implementing local control measures. FSMA recognizes the critical role of local, territorial, tribal, and state agencies in a national food safety system and incorporates provisions to coordinate, integrate, and enhance surveillance and outbreak response activities at all levels.

> CDC provides funding, tools, training, and strategic leadership. These enhancements are expected to
>
> - Improve the quality of data obtained at the state and local levels
> - Ensure that data are analyzed and shared quickly to aid in the rapid response to food safety gaps

CDC provides resources to enhance and integrate critical national surveillance, outbreak detection, and response networks. Scientists need strong data to quickly identify the source of outbreaks and inform prevention efforts. In FY 2015, CDC provided approximately $22 million to local and state public health

departments through the [Epidemiology and Laboratory Capacity for Infectious Diseases Cooperative Agreement](#) and the [Emerging Infections Programs](#) (EIP) to support critical foodborne illness surveillance efforts. This funding was essential to maintain capacity to track, detect, investigate, and respond to emerging foodborne disease threats. Other activities to support national networks included

- ***Supporting enteric disease labs***
  - PulseNet Central (CDC) and the Association of Public Health Laboratories (APHL) completed a Request for Applications (RFA) from network-participating public health laboratories to serve as PulseNet Area Laboratories—the first request of this nature since the last Area Laboratories were added in 1999. One RFA goal was to identify laboratories with next-generation sequencing/whole genome sequencing capacity and help set up this revolutionary technology for PulseNet and public health laboratories with combined reference and subtyping functions. As a result, the PulseNet USA Area Laboratory Map was re-drawn to divide the nation into seven regions (one fewer than on the previous map; Figure 2.2). The newly selected laboratories—which include the New York State Department of Health (Northeast region); Division of Consolidated Laboratory Services, Virginia (Mid-Atlantic region); Tennessee Department of Health (Southeast region); Michigan Department of Community Health Bureau of Laboratories (Midwest region); Minnesota Public Health Laboratory (Central region); Colorado Public Health Laboratory (Mountain region); and Washington State Department of Health (West region)—assumed their responsibilities on August 1, 2015.

Figure 2.2. U.S. map showing new regions and locations of PulseNet laboratories
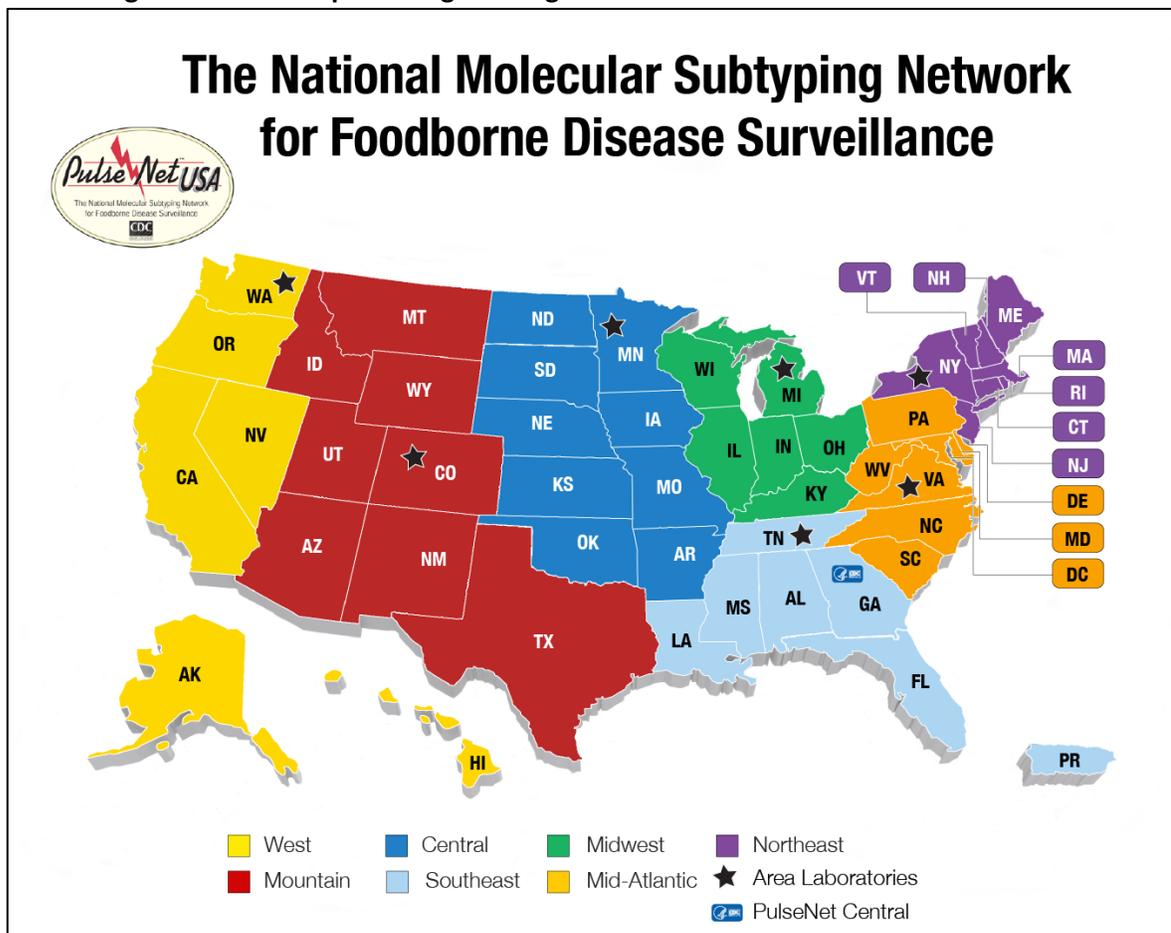
  - The consortium of five state and local health agencies and CDC—a consortium created in FY 2014 to develop and test best practices for isolate recovery by state and local public health laboratories to address the threat of the adoption of culture-independent diagnostic tests by clinical

laboratories—is finalizing the optimization of culture methods for isolation of *Salmonella*, *Campylobacter*, and Shiga toxin-producing *Escherichia coli* (STEC) from CIDT-positive specimens. The results will be presented at InFORM 2015 and will be incorporated in evidence-based guidelines to preserve cultures from CIDT-positive specimens to be published by the CIDT Steering Committee under APHL in FY 2016.

o An alternative to the mouse bioassay has been developed for the identification of botulinum toxin in clinical specimens and foods during botulism investigations. The National Botulism Laboratory Team is validating an in vitro method, the Endopep-Mass Spectrometry assay, for the detection of botulinum toxin in clinical and food samples on a desktop spectrometry platform that may be used in the Laboratory Response Network (LRN) laboratories in the states.

o The PulseNet web portal that is part of the USDA Public Health Information System (PHIS) was updated with new reporting capabilities. This electronic analysis system, developed in collaboration with USDA, APHL, and Carnegie Mellon University, allows for sophisticated electronic queries, analyses, and presentation of PulseNet data and has been updated with enhanced reporting capacities.

o [NARMS Now: Human Data](), was established as a public facing interactive web tool from CDC. The tool contains antibiotic resistance data from bacteria isolated from humans as part of NARMS. Visitors can produce graphs, tables, and time lapse maps of the data, and download the raw isolate level data. *NARMS Now: Human Data* makes it easier and quicker to determine how antibiotic resistance has changed over the past 20 years for four bacteria transmitted commonly through food—*Campylobacter*, *E. coli* O157, *Salmonella*, and *Shigella*.

o With the development of whole genome sequencing for classification of cases as part of foodborne disease surveillance, WGS is now used routinely for real-time surveillance of listeriosis, and for investigation of outbreaks caused by *Salmonella, Campylobacter,* STEC, *Shigella*, *Yersinia*, and *Cronobacter*. A WGS-based enteric reference identification database, as well as organism-specific databases for *Campylobacter* and *E.coli*, has been developed, and internal validation at CDC is underway. A similar database for characterization and subtyping of *Salmonella* is under development. The software developer, Applied Maths, and NCBI, along with international partners, are engaged to assist in the development. WGS data were used to evaluate antimicrobial resistance gene prediction databases. Studies conducted in FY 2015 show good concordance between genotypic resistance prediction and traditional antimicrobial susceptibility testing.

o All sequences of pathogens generated as part of WGS system development, routine surveillance, and investigation of outbreaks (>2,500 sequences) have been made publicly available on a real-time basis in the Sequence Read Archive at NCBI. This archive is accessed by the food industry, academia, consumers, and the public, in addition to public health and regulatory agencies.

o Applied research was continued to detect and subtype foodborne pathogens by metagenomic approaches: 1) a project of whole sample metagenomic sequencing to identify pathogens in biological samples recovered from human cases of foodborne illness, and 2) a project to identify pathogen-specific targets in samples that may be used to develop sequencing applications that efficiently and specifically identify and subtype a foodborne pathogen, beginning with *Salmonella* and STEC.

● *Developing CryptoNet*
o To improve the surveillance and outbreak investigation of cryptosporidiosis, CDC's Waterborne Disease Prevention Branch developed CryptoNet, a molecular typing system (similar to PulseNet) that targets *Cryptosporidium* and integrates traditional epidemiology data. In FY 2015, collaborating state public health departments continued to send outbreak and sporadic case specimens for molecular analysis at CDC. Funding was provided through the ELC Cooperative

Agreement to Alabama, Maine, Minnesota, Nebraska, New Hampshire, Tennessee, and Wisconsin to begin building state capacity to molecularly type *Cryptosporidium*.

- *Trichinellosis surveillance*
  - o CDC published a summary of [trichinellosis surveillance data from 2008–2012 in an *MMWR Surveillance Summary*](#) on January 16, 2015.

- *Establishing the Norovirus Sentinel Testing and Tracking network*
  - o In August 2012, CDC established the [Norovirus Sentinel Testing and Tracking](#) (NoroSTAT) network to improve the timeliness of norovirus outbreak reporting through [NORS](#) and [CaliciNet (National Norovirus Outbreak Network)](#). NoroSTAT allows for near-real-time assessment of norovirus activity. State health departments that participate in NoroSTAT report suspected norovirus outbreaks through NORS and CaliciNet within 7 business days of being notified about the outbreak. NoroSTAT reporting allows norovirus strain data uploaded through CaliciNet to be rapidly linked with epidemiologic characteristics of outbreaks reported through NORS by using consistent outbreak identifiers in each system.

> NoroSTAT information can be used to
> - Quickly evaluate current norovirus outbreak activity
> - Compare outbreak activity with activity in previous years
> - Assess strain-specific characteristics of norovirus outbreaks, including the impact of new strains on outbreak frequency and severity

  - o During the first 3 years of implementation, five states participated in NoroSTAT: Minnesota, Ohio, Oregon, Tennessee, and Wisconsin. These five states had the highest per capita reporting rates for norovirus outbreaks historically, and therefore were least likely to be affected by underreporting biases. A total of 1,995 suspected and confirmed norovirus outbreaks were reported by these five states during the first 3 years of NoroSTAT. The median reporting lag decreased from 22 days in the 3 years preceding NoroSTAT to 2 days after the network's implementation. Nearly all (99.8%) of the 1,995 outbreak reports contained all required data elements, while only 1,183 (87%) of the 1,357 outbreaks in the 3 years preceding NoroSTAT reported these data. The mean time required for testing and genotype reporting decreased from 9 days during the 3 years preceding NoroSTAT to 3 days after its implementation.

  - o Data collected through NoroSTAT reaffirm that most norovirus outbreaks occur in long-term care facilities and are spread through direct person-to-person transmission. Moreover, norovirus outbreak reporting through NoroSTAT has substantially improved both the completeness and the timeliness of these reports. In August 2015, two additional states were added to NoroSTAT: Michigan and South Carolina. The seven states currently participating in NoroSTAT include approximately 48 million residents, representing 15% of the U.S. population.

- *CaliciNet enhancements*
  - o In FY 2015, state health departments uploaded data on 878 outbreaks to CaliciNet. Twenty-eight states, with 33 CaliciNet-certified laboratories, uploaded data from 754 (86%) outbreaks. The remaining 22 states uploaded data on 124 (14%) outbreaks that were typed by five regional support centers. Of the norovirus outbreaks that were reported in 2015, 16.7% could epidemiologically be identified as foodborne. The predominant genotype in 2015 was, as in the previous 2 years, GII.4 Sydney. A dual genotyping system was piloted that includes typing of norovirus strains based on two different regions (capsid and polymerase), which improves the accuracy for typing strains and allows for better matching strains from common (e.g., foodborne) outbreaks. In 2016, this dual typing system will be piloted initially in the five regional support centers.

[CaliciNet participating states](#) and regional support centers (selected through competitive award) include departments of health in California, Idaho, New York, Tennessee, and Wisconsin.

C. Sharing surveillance information on a timelier basis among federal, state, and local agencies

- *National Antimicrobial Resistance Monitoring System for Enteric Bacteria*

    NARMS, established in 1996, is a collaboration among CDC, FDA, USDA, and state and local public health departments. During FY 2015, data prepared and shared with partners included the following:

    o In early 2015, NARMS published the 2013 NARMS report and the tri-agency integrated report.

    o In August 2015, NARMS launched *NARMS Now: Human Data*, a tool that gives the public access to view and download the latest antibiotic resistance data on enteric bacteria. The increased resistance to antibiotic agents that treat serious enteric bacterial infections has made antibiotic resistance an urgent threat to public health and a topic of great interest. *NARMS Now: Human Data* allows users to access antibiotic resistance data by bacterial serotype, antibiotic, year (1996– 2013), and geographic region. Users can view data on an interactive map or in tables. *NARMS Now: Human Data* plans to provide access to the most up-to-date antibiotic resistance results by uploading data regularly. NARMS developed *NARMS Now: Human Data* in response to requests from Congress, consumer groups, academia, and the public for timely access to data on antibiotic resistance. The tool is an important step towards President Barack Obama's Open Government Initiative to foster openness in government and establish a culture of transparency, public participation, and collaboration.

- *Foodborne Disease Outbreak Surveillance System (FDOSS)*
    o In FY 2015, CDC conducted four webinars on foodborne disease outbreaks to improve the sharing of surveillance data and provide training to state and local health departments about foodborne disease outbreak reporting. Nearly all states participated.

    o The Foodborne Outbreak Online Database (FOOD) was updated with data on foodborne disease outbreaks through 2013 (the most timely update made to the database).

    o *Surveillance for Foodborne Disease Outbreaks, Annual Report, United States, 2013* was published online.

D. Identifying and proposing solutions to eliminate key barriers at federal, state, and local levels to improve foodborne illness surveillance

- *National Center for Environmental Health Enhancements*
    o The National Environmental Assessment Reporting System (NEARS), formerly the National Voluntary Environmental Assessment Information System (NVEAIS), is a surveillance system that enables ongoing, systematic collection, management, analysis, interpretation, and dissemination of foodborne outbreak environmental assessment data. NEARS began data collection in April 2014. State programs participating in NEARS include the following state departments of health: California, Connecticut, Minnesota, New York, North Carolina, Rhode Island, Tennessee, and Wisconsin. Local programs participating in NEARS include Davis County Health Department (Utah), Fairfax County Health Department (Virginia), Harris County Health Department (Texas), Kansas City Health Department (Missouri), New York City Department of Health and Mental Hygiene (New York), and the Southern Nevada Health District (Nevada). A summary of data reported to NEARS is expected in 2016.

o The [Environmental Health Specialists Network](#) (EHS-Net) works to improve the practice of environmental health service programs by collaborating with epidemiologists, laboratorians, and other public health professionals to conduct practice-based research to identify and prevent environmental risk factors contributing to foodborne illness.

o For the 2015 through 2020 grant renewal application, EHS-Net–related research projects for food safety activities are being funded under the jurisdiction of departments of health or other agencies responsible for regulatory oversight of retail food service, including restaurants, delis, cafeterias, and schools. In 2015, two sites were added, bringing the total number of sites to eight. These sites include California; Harris County, Texas (the third most populous U.S. county); Minnesota; New York City; New York State; Southern Nevada Health District (which includes 70% of Nevada's population); Rhode Island; and Tennessee. All eight EHS-Net sites engage in activities that increase collaboration and communication between epidemiology and environmental health programs during foodborne illness outbreak investigations, ensure that environmental assessments are conducted during foodborne illness outbreak investigations, and report those environmental assessment data to NEARS.

II. Evaluating and Improving Surveillance Systems

To implement FSMA requirements to evaluate and improve surveillance systems, CDC has improved epidemiological tools and microbiological methods for obtaining quality exposure data and identifying and classifying cases. Selected CDC activities include

A. Tracking and analyzing culture-independent test use in laboratories

- *Foodborne Diseases Active Surveillance Network*
  o Continued surveillance to measure effects of CIDTs on foodborne illness surveillance
  o Continued to collect information on laboratory methods used to diagnose FoodNet pathogens
  o Continued to collect reports of infections diagnosed using CIDTs

B. Developing better methods to detect, investigate, respond to, and control multistate foodborne outbreaks

- *System for Enteric Disease Response, Investigation, and Coordination*
  [SEDRIC](#) allows state, local and federal officials to share and visualize information relating to multistate enteric disease outbreaks in real time via a web-based application. It facilitates collaborative multistate outbreak investigations of enteric disease by integrating relevant surveillance data sources in real time, rapidly visualizing outbreak data, providing a secure platform for partner collaboration, and managing a repository of historic surveillance and outbreak data.

  o During the past year, SEDRIC increased from 225 to more than 525 users from CDC, all 50 states (plus Puerto Rico and Guam), FDA, and USDA. The SEDRIC line list editor is being actively used with state and federal partners. States have obtained cluster-specific outbreak information 24–48 hours faster using SEDRIC than through typical laboratory communications. More than 30 SEDRIC-specific training classes have been given in the last 2 years, including four training classes at each of the OutbreakNet/PulseNet Regional Meetings during FY 2015.

  o As part of SEDRIC, a newly released Epi Info module is being used to collect structured questionnaire data directly from ill persons during outbreaks. This module includes the ability to deploy online the National Hypothesis Generating Questionnaire ([Foodborne Disease Outbreak Investigation and Surveillance Tools](#)), which collects information on more than 300 food items and other exposures commonly seen in multistate outbreaks. Related accomplishments include recent Office of Management and Budget approval of the questionnaire.

- o SEDRIC is reducing the time to pinpoint how and where contamination occurs in multistate foodborne disease outbreaks. Tools developed in this framework employ an all-hazards approach to multistate outbreak response and can be evaluated in multiple real events broadly applicable to programs across CDC.

- **Foodborne Diseases Centers for Outbreak Response Enhancement (FoodCORE)**

  FoodCORE centers work together to develop new and better methods to detect, investigate, respond to, and control multistate outbreaks of foodborne diseases. Currently 10 centers participate, covering about 18% of the U.S. population.

  - o Key findings from FoodCORE from the first year of the program in October 2010 to the end of the fourth year in December 2014 include finding that the centers completed molecular subtyping for a higher proportion of *Salmonella*, Shiga toxin-producing *Escherichia coli*, and *Listeria* (SSL) isolates (86% vs. 93%) and reduced the average time to complete testing from a median of 8 to 4.5 days. The centers attempted epidemiologic interviews with more SSL case-patients (93% vs. 99%), and the average time to attempt interviews was reduced from a median of 4 days to less than 1 day. During the fourth year, more than 280 environmental health assessments were conducted.

  - o A Joint Vision Meeting was held between the FoodCORE Program and the Integrated Food Safety Centers of Excellence (CoEs) in October 2014. Nearly 50 people attended the meeting in Denver, Colorado. The programs met individually but also convened a joint session to discuss building collaborations across both programs. FoodCORE-specific discussions focused on model practices, metrics reporting, and future projects. FoodCORE centers were able to share accomplishments from the past year and network with each other and the CoEs.

  - o From January to April 2015, four joint PulseNet/OutbreakNet Regional Meetings were held. These meetings marked the first time that regional meetings included laboratorians, epidemiologists, and environmental health specialists. Staff from across CDC's Division of Foodborne, Waterborne, and Environmental Diseases, as well as partners from CSTE, APHL, USDA/FSIS, and FDA, also attended the meeting. Participants discussed regional issues and strategies to improve outbreak surveillance and response activities. Topics included the emerging challenges of CIDT and the role of WGS and AMD in outbreak surveillance and response. Approximately 100 people attended each of the four meetings.

  - o FoodCORE findings, data, and lessons learned have been presented at various national meetings and conferences, and in partnership with other food safety programs. Updated programmatic findings, including the third year of data and model practices, were presented at the 2015 CSTE Annual Conference in June 2015, the 2015 International Association for Food Protection (IAFP) meeting in July 2015, the 2015 International Conference on Emerging Infectious Diseases in August 2015, and the 2015 American Public Health Association conference in November 2015. Data summaries and additional model practices will be made publicly available during FY 2016. FoodCORE Center staff also presented their own center-specific experiences at a variety of local, state, and national conferences, meetings, and training sessions. Data and summary information from previous grant years are publicly available on the FoodCORE website (FoodCORE: Year One Summary Report and FoodCORE Year One Cumulative Metrics Data), and updated annual data summaries are being prepared for the website, to be released during FY 2016.

- **OutbreakNet Enhanced Initiative**
  - o In August 2015, a new capacity-building program was started named OutbreakNet Enhanced. This new program provides support to state health departments to improve their capacity to detect, investigate, control, and report foodborne disease outbreaks.

o Eleven states were selected as OutbreakNet Enhanced Sites for the first year of the program: Arizona, Georgia, Kansas, Massachusetts, Michigan, New Hampshire, New Mexico, New York, Rhode Island, Virginia, and Washington. Sites will use funds to hire additional epidemiologists and students for foodborne disease interviewing as well as for travel to relevant training courses and conferences to build on their existing outbreak response capacity to implement faster and more complete review of surveillance data, improved interviewing and data sharing, and documentation of these improvements with performance metrics.

- ***Improving cyclosporiasis surveillance and outbreak investigation resources***
  CDC's Parasitic Diseases Branch (PDB) coordinates national surveillance and outbreak response for cyclosporiasis.

  o In summer 2015, for the third straight year, PDB coordinated CDC's cyclosporiasis case and cluster investigations. During May–August 2015, laboratory-confirmed clusters of cyclosporiasis were reported and investigated in three states, and as of September 15, 2015, 546 laboratory-confirmed cases of cyclosporiasis were reported from 31 states. Each reported case is investigated by the PDB foodborne epidemiologist to exclude the possibility of its being part of a known or new outbreak.

  o PDB staff expanded deployment of the web-based cyclosporiasis national hypothesis-generating questionnaire during May–August 2015 to 10 states (up from 0 states in 2014). Receiving extended food exposure data electronically allowed CDC to receive and analyze the data more quickly by eliminating the scanning/faxing of paper forms from states to CDC, and the data entry step at CDC.

  o In 2015 cyclosporiasis became a reportable disease in Vermont. Cyclosporiasis is now reportable in 41 states and New York City.

  o Several health communication pieces were published to increase awareness among clinicians about cyclosporiasis and the need to specifically request testing for *Cyclospora* in persons with prolonged diarrheal illnesses, particularly in persons with travel to tropical and subtropical regions during the 14 days before onset of illness. The pieces were timed to coincide with the start of the period when most cyclosporiasis cases are reported (i.e., May to August), and included a cyclosporiasis feature on the CDC Parasitic Diseases website and a CDC Clinician Outreach and Communication Activity (COCA) webinar with a PDB cyclosporiasis subject matter expert.

  o As part of a *Cyclospora* AMD project that began in 2014, the PDB laboratory obtained and purified *Cyclospora* DNA from stool specimens from cyclosporiasis case-patients and assembled a draft *Cyclospora* genome. In addition, genomes were assembled from seven additional samples. These sequences will be used to facilitate comparative genomics studies to differentiate between outbreak strains of *C. cayetanensis*. There are currently no molecular methods with which to link *Cyclospora* cases to each other or to particular food vehicles or sources, which makes it extremely difficult to characterize the extent of particular outbreaks or to distinguish between multiple concurrent outbreaks.

  o CDC worked with state and FDA colleagues to post regular outbreak investigation updates during summer 2015, with the first posting occurring in conjunction with the release of FDA Import Alert #23-24 "Detention Without Physical Examination of Fresh Cilantro From the State of Puebla, Mexico." Additional postings occurred at least weekly to keep the food industry, academia, consumers, and the public aware of the progress of the case/cluster and traceback investigations.

  o PDB cyclosporiasis subject matter experts updated the historic cyclosporiasis outbreak table on the cyclosporiasis website to include 2014 data. These data were also presented on a poster at the International Conference on Emerging Infectious Diseases in Atlanta on August 24, 2015.

- *Microbial quality of irrigation water*

  CDC's Waterborne Disease Prevention Branch (and collaborators at the University of Georgia and Emory University) was awarded a 2-year research project in 2014 from the Center for Produce Safety. The project is investigating the use of a large-volume water sampling technique ("dead-end ultrafiltration") and methods for detecting pathogens (e.g., *Salmonella*, *Cryptosporidium*) and alternative microbial water quality indicators for irrigation water. Water samples have been collected since May 2015 from three irrigation ponds located at farms in southeast Georgia. Early indications are that the ultrafiltration method is yielding more detections of pathogens and pathogen surrogates than simple, 1-L grab sampling. Additional sampling is planned through April 2016.

- *Effect of produce wash water turbidity on chlorine disinfection*

  CDC's Waterborne Disease Prevention Branch is working with produce industry partners to investigate the effect that produce wash water turbidity has on the effectiveness of chlorination for inactivating pathogenic *E. coli* and *Salmonella*. The project is focusing on leafy greens wash water systems. The turbidity of water in produce washing flumes increases through the production day as increasing cumulative amounts of leafy greens are processed. Data from this project will provide producers with an evidence base for evaluating the need to manage turbidity in wash water systems.

C. Improving attribution of foodborne illness outbreaks to specific foods

- *Interagency Food Safety Analytics Collaboration (IFSAC)*

  Since its creation in 2011, IFSAC, a collaboration of CDC, FDA, and USDA/FSIS, has focused its analytic efforts to develop methods to estimate foodborne illness source attribution for four priority pathogens (*Salmonella*, *E. coli* O157, *Campylobacter,* and *Listeria)*. In 2015, IFSAC project teams, composed of members of each agency and coordinated by a steering committee, completed the following:

  o Held an [IFSAC Public Meeting in February 2015](#) to engage with food safety partners and the public on IFSAC work to improve foodborne illness source attribution.

  o Publicly released a shared method to estimate the percentages of foodborne illnesses caused by the four priority pathogens attributable to different food categories ("[Foodborne Illness Source Attribution Estimates Report](#)").

  o Reviewed stakeholder comments from the public meeting and planned for improvements such as exploring a mechanism to obtain more frequent stakeholder input to IFSAC.

  o Updated the [IFSAC website](#) regularly with past, current, and future activities on foodborne attribution illness efforts to inform federal, state, and local officials.

  o Led a six-presentation symposium at the 2015 IAFP meeting in Portland, Oregon, entitled "[Evolving Methods for Foodborne Illness Source Attribution](#)," which provided an overview of active research in foodborne illness source attribution, including perspectives from IFSAC and other scientists from international governmental agencies and academia.

III. Collaborating and Sharing Information with External Stakeholders

A. Sharing surveillance information on a timelier basis with the food industry, academia, consumers, and the public

Stakeholders—food producers, regulators, and consumers—depend on CDC for practical and understandable information about keeping the food supply safe. Historically, food safety communications included annual summaries with data from surveillance networks, scientific publications and presentations, and outbreak alerts. Today, partners and the public want access to more information—more frequently, and through multiple channels.

Since the introduction of FSMA, CDC has integrated communication, science, and policy expertise to improve the exchange and dissemination of food safety information. This team-based approach supports FSMA's call to action to provide fast, accurate, and relevant information.

> **_Making food safety information accessible to a broader audience_**
>
> CDC's food safety website has had more than 1 million (1,268,614) page views since January 2015—the highest number of page views of any cross-cutting CDC website about foodborne illness, not including individual foodborne pathogen pages.
>
> The website, redesigned in August 2015, makes it easier for users to find information on preventing foodborne disease, improving food safety, and investigating foodborne outbreaks.

- *Selected activities that support CDC's effort to collaborate and share information*
 - **Business Pulse: sharing food safety messages to protect America's businesses and consumers**
    CDC worked with the CDC Foundation to provide targeted food safety information to businesses through the foundation's Business Pulse program, which educates businesses and their workforce about how CDC protects the health of Americans. The June issue of Business Pulse provided CDC resources and recommendations for improving food safety in the workplace and increasing employee awareness of foodborne disease prevention. The campaign included an interactive infographic, media outreach, a blog, a question-and-answer session with a CDC expert, and social media posts.
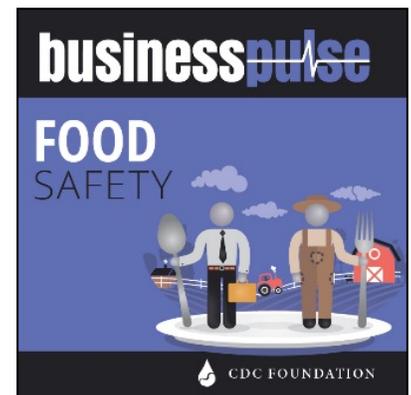
  - *Vital Signs*: **reaching a wider audience through multiple platforms, channels, and languages**
    CDC Vital Signs is a monthly campaign that includes a suite of communication materials with a call to action about a critical public health topic based on current surveillance data. Once a year, CDC scientists and communicators highlight an important food safety topic.

    The November 2015 *Vital Signs* presented data on multistate foodborne outbreaks from 2010 to 2014, and the key role the food industry plays in stopping outbreaks or keeping them from happening in the first place. The campaign translated the science to inform a wider audience by using multiple platforms and channels in English and Spanish, including a four-page infographic, a digital press kit, a feature article, a teleconference with the food industry and health departments, and social media posts. Although
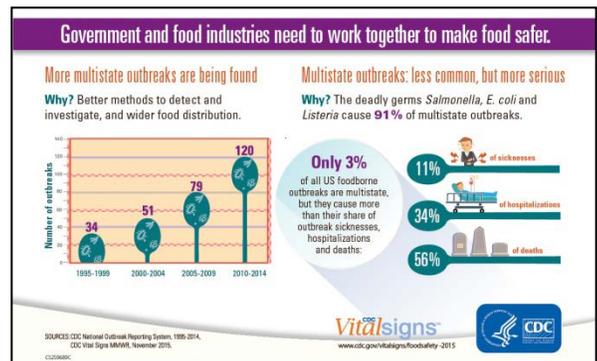
this *Vital Signs* provided recommendations for the food industry, its content was relevant for the general public, health departments, and regulators. Using multiple platforms, channels, and languages made this important food safety information more accessible to a wider audience.

o **Foodborne outbreak notices: raising awareness to protect consumers' health**
CDC communicates with the public and media about outbreaks of foodborne illness through [investigation notices]. These notices include consumer advice, epidemiologic information, and details about the investigation. CDC outbreak notices for *Listeria*, *E. coli*, and food-related *Salmonella* infections attracted nearly 1.7 million (1,686,362) page views in 2015, an increase of nearly 42% from the previous year.

o **Sharing food safety tips with consumers for seasonal celebrations and awareness days**
CDC prepared and posted feature articles, blogs, social media, and infographics throughout 2015 that coincided with seasonal celebrations and food safety awareness observances. CDC collaborated with external partners and within the agency to share important food safety messages widely for winter holidays, summer celebrations, and other seasonal occasions.

For National Food Safety Education Month in September 2015, CDC highlighted the [four steps] for food safety (cook, clean, chill, separate) in an [infographic]. These messages were shared on social media and posted as a [CDC feature] and [Foodsafety.gov blog]. For [World Health Day], CDC emphasized the importance of food safety globally through a [blog] and an [infographic].

o **Epi-Ready: team-based training approach**
In September 2014, CDC funded the [National Environmental Health Association (NEHA)] to conduct a 2-day [Epi-Ready team training course] combined with a special 1-day train-the-trainer course. These two courses in Seattle drew 52 participants, including local and state public health officials. The primary purpose of both courses was to train three-member laboratory, epidemiology, and environmental teams from the five Integrated Food Safety Centers of Excellence. With collaboration from NEHA, the CoEs successfully conducted five CDC-funded Epi-Ready courses in non-CoE states during FY 2015. These courses covered foodborne disease outbreak topics such as team formation, planning, detection, and investigation by epidemiologists, laboratorians, environmental health specialists, public health nurses, communication experts, and others.

o **Food allergy and anaphylaxis management: collaborating on a common goal**
To meet FSMA requirements to establish guidelines for voluntary food allergy and anaphylaxis management for use in schools and early childhood education programs, CDC convened a panel of federal, medical, and school-affiliated experts.[*] This expert panel informed guidance priorities and content and summarized scientific and school health-related data and papers related to managing food allergies in schools. In 2013 [guidelines] were released, and in 2014 [multiple food allergy publications] for specific school audiences, including an allergy toolkit, tip sheets for school personnel, and downloadable PowerPoint presentations for specific school audiences, were created.

During FY 2015, CDC's [school health programs] launched the [Food Allergies in Schools Toolkit], found at the new [Healthy Schools website], and continued dissemination activities, including a [webinar] presented in August 2015 in collaboration with Food Allergy Research & Education, Inc.

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[*]Panel members were from the following agencies and organizations: CDC; the U.S. Department of Education; USDA; FDA; NIH/National Heart, Lung, and Blood Institute; the Food Allergy and Anaphylaxis Network; the Food Allergy Institute; the American Academy of Allergy, Asthma, and Immunology; the National School Boards Association; the National Education Association; the National Association of School Administrators; the National Association of School Nurses; and the American School Health Association.

(FARE), which also provided continuing education units for a number of professionals. Additionally, "Resources to Integrate CDC Voluntary Guidelines for Managing Food Allergies into Practice" was presented at a 60-minute workshop at the American School Health Association on October 16, 2015.

o **VoluntaryNet: encouraging data sharing among food safety partners**
VoluntaryNet, a collaboration between CDC's PulseNet and the food industry through the University of Georgia Center for Food Safety, provides food industry partners and PulseNet with indirect access to each other's current PulseNet data. This new collaboration began in FY 2014. VoluntaryNet encourages industry to share their own data (without compromising themselves) and data from PulseNet (without violating data-sharing agreements or compromising state or federal patient privacy laws).

o **Integrated Food Safety Centers of Excellence: sharing best practices for foodborne disease surveillance and outbreak investigation**

The Integrated Food Safety CoEs serve as resources for local, state, and federal public health professionals who respond to foodborne illness and outbreaks. Each of the original five Centers leads a workgroup (Colorado—training, Florida—academic coordination, Minnesota—metrics, Oregon—informatics, and Tennessee—communications/website). The New York center will lead a workgroup to be selected in FY 2016.

> **Integrated Food Safety Centers of Excellence**
>
> CDC named Colorado, Florida, Minnesota, Oregon, and Tennessee state health departments and their partner academic institutions as Centers in 2012 under the authority of FSMA. New York was added in 2015 to fill in the gap in the northeastern United States.

Selected projects of the original five Centers include the following:

Colorado
– Continued to add articles to the Food Source Information wiki, with input from other Centers and external subject matter experts. The wiki provides needed information for epidemiologists to understand how various agricultural products are grown, processed, stored, and distributed to better inform outbreak investigations and response efforts

– Began developing online training, called QuickTrains, to increase awareness for non-laboratorians on the basic methods and protocols performed at public health labs

– Began development of a series of case studies on outbreaks. Each case study will have a paper-based version and an interactive online version

Florida
– Developed a webpage to house the online products of all the Centers. The webpage is housed on the University of Florida website, but all Centers are able to upload and edit their own products

– Developed online videos on topics in foodborne illness for novice investigators. The first video in the series, *Foodborne Illness, What Problem?*, is online in English and Spanish, and the second video is under development

– Used the CIFOR metrics and target ranges to conduct an evaluation of the Puerto Rico Department of Health

Minnesota
– Developed a case series covering the day-to-day epidemiology activities during an *E. coli* O157 outbreak linked to frozen Angus beef burgers. Additional case series will be developed for multistate outbreaks of commercially distributed food products

– Developed brief [summaries](#) on various foodborne outbreak detection and investigation topics. Summaries on setting up a foodborne illness complaint system, investigating establishment sub-clusters, and creating a team of student workers are on their website. Additional summaries are being developed

– Provided outbreak investigation [guidance](#) to several states and local health departments

[Oregon](#)

– Developed the [International Outbreak Museum](#) website to catalog outbreak exhibits. The website was launched in August 2015, and the physical museum is being redesigned to better accommodate museum tours

– Launched Project Mercury, a project to aggregate case exposure data from multiple sites to estimate background rates, in 2015

– Conducted database demonstration webinars with state, federal, and international surveillance partners to discuss the design of Oregon's data system

[Tennessee](#)

– Conducted five Epi Ready training courses in Kentucky, West Virginia, and Tennessee

– Developed the second online [outbreak training course](#) that targets laboratory, epidemiology, and environmental health staff at the local and state levels

– Created quarterly CoE Newsletters entitled *[Centered on Food Safety](#)* in collaboration with the other Centers

o **Council to Improve Foodborne Outbreak Response: developing and sharing guidelines, processes, and products that will facilitate good foodborne outbreak response**
[CIFOR](#) is a diverse, multidisciplinary collaboration of eight national associations and three federal agencies that seeks to improve methods at the local, state, and federal levels to detect, investigate, control, and prevent foodborne disease outbreaks. CIFOR, which held its first meeting in 2006 and is primarily funded by CDC, includes member organizations that represent epidemiology, environmental health, public health laboratories, and regulatory agencies involved in foodborne disease surveillance and outbreak response. The food industry is represented on the CIFOR Industry Workgroup.

CIFOR held two face-to-face meetings, began development of new products, and released several products in FY 2015, including the following:

– [CIFOR *Guidelines Toolkit*, Second Edition, published in 2015](#), was developed to aid in the implementation of the second edition of the *[Guidelines for Foodborne Disease Outbreak Response](#),* which was released in 2014. The *Toolkit* is intended to further the ability of local and state health departments to understand the contents of the *Guidelines,* to conduct self-assessments of their outbreak detection and investigation procedures, and to implement appropriate recommendations from the nine chapters in the *Guidelines*. The CIFOR Guidelines and Toolkit Implementation Webinar for Decision Makers was conducted in September 2015 and targeted local and state health department directors and program managers. The webinar covered the burden of foodborne diseases in the United States, the impact large outbreaks can have on jurisdictions, and resources that can help improve foodborne outbreak prevention and control efforts.

- o **Cooperative agreements**
  The CDC Food Safety Office manages several cooperative agreements with national associations. Many, but not all, of the activities funded through these associations involve CIFOR workgroups, projects, and products. The overall goal of the work with the associations is to improve foodborne disease surveillance and outbreak response at the local and state levels, which directly affects federal disease control efforts. By funding these associations, CDC gains direct access to front-line experts at the local and state levels who provide guidance and extensive effort on workgroups and in meetings to develop solutions to current barriers to prompt outbreak detection and response.

  – **Association of Public Health Laboratories**
    APHL assists with several CIFOR projects, including the CIFOR *Guidelines*; the CIFOR Lab-Epi Integrated Reporting software (freeware to help states and large cities more quickly identify clusters of enteric illness); the CIFOR Economic Evaluation of PulseNet, a web portal for states to upload their results for the 16 CIFOR metrics with target ranges; guidelines for outbreaks of unknown etiology; and the APHL Food Safety Workgroup, which is actively addressing many issues, including WGS and CIDT.

  – **Association of State and Territorial Health Officials (ASTHO)**
    ASTHO members and staff participate in development of all CIFOR products, such as the CIFOR *Guidelines* and the *Guidelines* Toolkit, CIFOR deliberations at all in-person meetings, development of a wide range of foodborne illness fact sheets and background materials for new and longtime state health officials, and various food safety activities through the Environmental Health Policy Committee.

  – **Council of State and Territorial Epidemiologists**
    CSTE was heavily engaged in the development of the *Second Edition CIFOR Guidelines* Toolkit, conducting webinars to publicize CIFOR products, convening the CIFOR Council and Governance Committee meetings twice a year, managing the CSTE Food Safety Fellowship (fellows are placed in state health departments for 2 years), and other activities.

  – **National Association of County and City Health Officials (NACCHO)**
    NACCHO actively maintains the CIFOR website, including the CIFOR Clearinghouse, and manages the CIFOR Industry Workgroup and the CIFOR Marketing Workgroup. NACCHO members assisted with the development of the revised *Guidelines* Toolkit. NACCHO also has a very active Food Safety Workgroup, which is involved in a wide range of local issues related to foodborne illness reporting and investigation.

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