

Submission Type Breakout/Quick/Lightning/Poster
ID [8198](#)

Abstract Type Breakout

Abstract Title *Shigella Sonnei* Outbreak Among Homeless Persons after Substantial Rainfall — Oregon, 2015–2016
Abstract

BACKGROUND: The largest outbreak of shigellosis in Oregon state history occurred from July 2015 to June 2016. In November 2015, the outbreak strain spread among Portland’s homeless population, coinciding with onset of the wettest rainy season on record. *Shigella* transmission occurs through fecal-oral contact, and outbreaks tend to occur in overcrowded settings where personal hygiene is challenging. We hypothesized that substantial rainfall might have led to increased congregation and breakdown of hygienic conditions among homeless persons, facilitating *Shigella* transmission. We investigated whether rainfall was associated with shigellosis during this outbreak.

METHODS: A case was defined as a *Shigella sonnei* infection in an Oregonian with a pulsed-field gel electrophoresis pattern indistinguishable from the outbreak strain occurring 7/1/2015–6/30/2016. We interviewed patients and reviewed medical charts. Using Poisson regression, we analyzed the association between daily case count and cumulative rainfall during the period 8–14 days prior to each patient’s symptom onset. We stratified by homelessness status and controlled for temperature.

RESULTS: One hundred and five shigellosis cases were identified during the outbreak; 79 (75%) were among men; all occurred among persons aged ≥18 years. Forty-five (43%) infections were reported among homeless persons. Among homeless persons, the risk ratio (RR) for shigellosis was 1.46 (95% confidence interval [CI] = 1.28–1.68) for each additional inch of cumulative rainfall; the association was not significant for housed persons (RR = 1.05; 95% CI = 0.88–1.26).

CONCLUSIONS: Rainfall was associated with increased reports of shigellosis among homeless persons during this outbreak. Substantial rainfall might have caused behavior changes that facilitated *Shigella* transmission. During forecasted heavy rainstorms, public health departments might take proactive measures to mitigate the spread of infectious disease among homeless persons.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Special/Vulnerable Populations; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) nicole.west@multco.us

Presenting Author(s) Nicole G West

Institution Multnomah County Health Department

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7698](#)

Abstract Type Breakout

Abstract Title Abstract A Novel Approach to Analysis of Cryptosporidiosis and Giardiasis Surveillance in the United States — 2005–2015

BACKGROUND: Traditionally, population-based case-control studies have been used to identify risk factors for cryptosporidiosis and giardiasis. However, these studies are expensive and include controls with characteristics that likely differ from reported cases since they are selected from the general population while only a relatively small proportion of cases of cryptosporidiosis and giardiasis are reported to public health authorities. In this analysis, we use a variation of the case-control analysis wherein reported cases of a different disease are used as a comparison group to identify potential risk factors for cryptosporidiosis and giardiasis.

METHODS: Surveillance data from the National Notifiable Disease Surveillance System (NNDSS) were accessed through the NNDSS Data Availability Project (NDAP). Exposures reported for cryptosporidiosis and giardiasis case-patients were compared to exposures of salmonellosis case-patients reported by 16 states (2005 – 2015). Odds ratios adjusted for age and reporting state (aOR) and 95% confidence intervals (95% CI) for exposures were calculated using SAS 9.3.

RESULTS: A total of 14,996 cryptosporidiosis, 22,595 giardiasis, and 123,180 salmonellosis cases were reported. When compared to cases of salmonellosis, exposure to treated recreational water (aOR: 5.3; 95% CI: 5.0-5.6) and livestock (aOR: 2.8; 95% CI: 2.5-3.1) were risk factors for cryptosporidiosis, and exposure to untreated drinking (aOR: 5.8; 95% CI: 5.3-6.4) or recreational water (aOR: 3.4; 95% CI: 3.2-3.7) and previous travel (aOR: 2.5; 95% CI: 2.4-2.7) were risk factors for giardiasis.

CONCLUSIONS: Risk factors for cryptosporidiosis and giardiasis identified through national surveillance data were comparable to those identified in outbreak investigations or population based case-control studies. Case-case analyses can be used to better understand disease epidemiology and more efficiently identify risk factors to guide the development of prevention and control measures.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Waterborne Disease; NNDSS; Risk Factors

Consider for Different Presentation? Yes

Presenting Author Email Address(es) kfullerton@cdc.gov

Presenting Author(s) Kathleen E Fullerton

Institution Centers for Disease Control and Prevention

Affiliation CDC

Submission Type ID	Breakout/Quick/Lightning/Poster 8465
Abstract Type	Breakout
Abstract Title Abstract	An Integrated Surveillance for Antimicrobial-Resistance in Salmonella from Clinical and Retail Meat Sources — Pennsylvania, 2009-2014

BACKGROUND: *Salmonella* is the leading cause of bacterial foodborne illness in the United States. Although salmonellosis is often self-limiting, persons with drug-resistant infections are at risk for severe clinical outcomes. Pennsylvania conducts integrated surveillance that compares isolates from clinical and retail meat sources.

METHODS: During 2009-2014, chicken breasts, ground turkey, ground beef, and pork chops (600 of each) were purchased from randomly selected retail outlets in southeastern Pennsylvania and cultured for enteric pathogens. *Salmonella* isolates were analyzed by pulsed-field gel electrophoresis (PFGE). We compared the PFGE patterns from retail meat specimens with those of human clinical isolates in the Pennsylvania surveillance database. A subset of isolates was subtyped using a novel technique, CRISPR-MVLST, and compared to a database of clinical isolates. We performed antimicrobial susceptibility testing (AST) on retail meat isolates and a subset of matched clinical isolates.

RESULTS: A total of 177 *Salmonella* isolates were recovered from 2400 meat samples: 18.2% of chicken samples, 9.5% of turkey, 0.3% of beef, and 1.1% of pork were culture-positive. PFGE patterns of 86 (48.6%) retail meat isolates matched to patterns obtained from 1665 clinical isolates; 40 distinct PFGE patterns were represented among the shared patterns found in both meat and clinical isolates. Seventeen (43%) of the 40 shared PFGE patterns were associated with multiple drug resistance (MDR) (resistant to ≥ 3 drugs). Among the 175 retail meat, 74 (42%) were MDR; 10 (59%) of the 17 shared MDR-associated PFGE patterns had identical AST profiles in both meat and clinical isolates. One *S. Dublin* PFGE pattern (JDXX01.0004) found in 11 isolates (10 clinical and one beef) showed resistance to ≥ 6 antimicrobials, including resistance to ampicillin and ceftriaxone. One *S. Typhimurium* isolate from pork and 22 clinical *S. Typhimurium* isolates had an ACSSuT resistance profile. Four *S. Kentucky* meat isolates had same PFGE profile with six clinical isolates and all were resistant to streptomycin. CRISPR-MVLST analysis confirmed that *Salmonella* strains overlap between retail meat and clinical isolates.

CONCLUSIONS: *Salmonella* isolates cultured from retail meat samples shared 40 unique PFGE patterns with isolates known to have caused human illness. Of these shared patterns, 43% were multidrug resistant. This comparative investigation suggests that some antimicrobial resistant *Salmonella* infections in humans are likely related to exposure to contaminated meat.

Submission Complete? Yes

Committee	Infectious Disease
Topic	Enteric Diseases
Keywords	Foodborne Disease; Genomics; Antimicrobial Resistance
Consider for Different Presentation?	Yes

Presenting Author Email Address(es) nmikanatha@pa.gov

Presenting Author(s) Nkuchia M M'ikanatha

Institution	Pennsylvania Department of Health
Affiliation	State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 8527
Abstract Type	Breakout
Abstract Title Abstract	Analysis of Timeliness and Completion of Shiga Toxin-Producing <i>E. coli</i> and Salmonellosis Case Investigations Conducted during Year One of Centralized Interviewing in Kansas

BACKGROUND: Approximately 100 confirmed cases of Shiga toxin-producing *E. coli* (STEC) and 450 confirmed cases of salmonellosis are reported annually in Kansas. Kansas has a decentralized public health system; local health departments (LHD) have historically been responsible for interviewing all cases with a standard hypothesis-generating questionnaire. In 2016, Kansas used OutbreakNet Enhanced (OBNE) funding to implement a centralized interviewing program based on FoodCORE model practices. Centralized investigations began January 4, 2016 for salmonellosis and STEC cases that resided in the 96 of 100 LHDs that opted in to the KS-OBNE program. To evaluate the performance of KS-OBNE, timeliness and completion of case investigations were analyzed.

METHODS: Salmonellosis and STEC data for cases reported in 2012–2016 was extracted from the Kansas electronic disease surveillance system. Targets were set for the first interview attempt (3 weekdays) and investigation completion (5 weekdays) from the date of case report to public health. Data from 2016 cases was compared to data from 2012–2015 cases to measure overall statewide improvement. Confirmed cases investigated by KS-OBNE in 2016 were compared with those investigated by LHDs to measure program performance.

RESULTS: Statewide, 76% of 555 persons with confirmed salmonellosis or STEC were interviewed in 2016 compared to 69% of 2,206 cases in 2012-2015 (OR=1.4, 95%CI: 1.2-1.8). Investigations were completed within 5 weekdays for 89% of 2016 cases and 69% of 2012-2015 cases (OR=3.7, 95%CI: 2.7-5.1). Demographic and clinical information was complete for 81% of 2016 cases compared to 59% of 2012-2015 cases (OR=3.0, 95%CI: 2.3-3.9). In 2016, KS-OBNE investigated 79% of Kansas’s 555 salmonellosis and STEC cases. Interviews were completed for 82% of the 439 KS-OBNE cases compared with 54% of the 116 cases investigated by LHDs (OR=3.8, 95%CI: 2.5-5.9). Interviews were attempted within 3 weekdays for 90% of KS-OBNE cases compared with 58% of LHD cases (OR=6.4, 95%CI: 4.0-10.4). Case interviews were completed within 5 weekdays for 94% of KS-OBNE cases and 63% of LHD cases (OR=8.4, 95%CI: 4.3-16.4).

CONCLUSIONS: The implementation of centralized interviewing led to significant improvement in target measures for STEC and salmonellosis investigations in Kansas. Investigations conducted by KS-OBNE were significantly more likely to meet target measures for timeliness and completeness, highlighting the impact of centralized interviewing in Kansas. Timely and complete data collection is essential to rapid outbreak identification and efficient response. States with decentralized public health programs can benefit from implementation of centralized interviewing programs.

Submission Complete?	Yes
Committee	Infectious Disease
Topic	Enteric Diseases
Keywords	Enteric Infectious Diseases; Program Evaluation; Data Collection
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	Lindsey.Webb@ks.gov
Presenting Author(s)	Lindsey Martin Webb
Institution Affiliation	Kansas Department of Health and Environment State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 8580
Abstract Type	Breakout
Abstract Title Abstract	Concurrent Norovirus and Clostridium Perfringens Outbreaks at a Popular Dinner Theatre —Kansas, January 2016 BACKGROUND: On January 16, 2016, a citizen reported gastrointestinal illness among dinner theatre attendees to the Kansas Department of Health and Environment (KDHE). An investigation was initiated by KDHE and the Johnson County Department of Health and Environment to determine the cause of illness and implement control measures. METHODS: Theatre attendees were interviewed with an outbreak-specific questionnaire by telephone or self-administered online survey. Stool specimens were tested at the Kansas Health and Environmental Laboratories, the Wisconsin State Laboratory of Hygiene, and the Minnesota Department of Health Public Health Laboratory. Environmental assessments were conducted by the Kansas Department of Agriculture on January 20, January 29, and April 5. Among theatre attendees from January 14—31, a retrospective cohort study evaluated persons meeting norovirus case definition (diarrhea or vomiting within 12–72 hours of attendance), and a nested case-control study evaluated persons reporting illness compatible with <i>Clostridium perfringens</i> (diarrhea within 6–24 hours of attendance). RESULTS: Questionnaires were completed by 2,117 persons; 1,743 attended the theatre January 14—31. Seven stool specimens were tested; 5 (71%) were PCR-positive for norovirus Kawasaki 2014 GII.17, and 1 was positive for <i>Clostridium perfringens</i> enterotoxin type A and culture-confirmed. No pathogens were identified in the remaining specimen. Retrospective cohort analysis for norovirus included 1,567 persons of whom 621 (40%) were ill. Bread (OR=1.2, 95%CI: 1.1-1.5), salad (OR=2.5, 95%CI: 1.6-4.0), and salad ingredients jicama (OR=1.9, 95%CI: 1.5-2.4) and ranch dressing (OR=1.2, 95%CI: 1.0-1.3) were significantly associated with illness, as was eating food from the right-side buffet (OR=1.2, 95%CI: 1.1-1.4). Nested case-control analysis for <i>Clostridium perfringens</i> included 988 persons of whom 55 (6%) were ill. Eating burnt ends (OR=2.6, 95%CI: 1.0-6.8) and poppy seed dressing (OR=2.7, 95%CI: 1.2-6.2) were significantly associated with illness. Environmental assessments identified violations including bare-hand contact with ready-to-eat foods. Employee health checks were implemented. A cleaning company was hired January 29 to disinfect the facility when transmission continued following the norovirus clean-up procedure conducted by theatre employees January 22. CONCLUSIONS: This outbreak marks the first identified outbreak of norovirus Kawasaki 2014 GII.17 in Kansas. Additionally, a subset of individuals with <i>Clostridium perfringens</i> was identified through epidemiological and laboratory investigation. Using an online questionnaire enhanced our ability to reach a large number of patrons while minimizing staff time required to conduct interviews. Educating employees on illness prevention and implementing the norovirus clean-up procedure reduced the spread of illness, and professional disinfection appeared effective in stopping transmission.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Outbreaks; Enteric Infectious Diseases; Foodborne Disease
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	Lindsey.Webb@ks.gov
Presenting Author(s)	Lindsey Martin Webb
Institution Affiliation	Kansas Department of Health and Environment State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8352](#)

Abstract Type Breakout

Abstract Title Abstract
E. coli O157:H7 Strikes Chicago: An Investigation of Stec Associated with a Chicago Restaurant

BACKGROUND: On June 28, 2016, Chicago Department of Public Health (CDPH) received five reports of Shiga toxin-producing *Escherichia Coli* (STEC) illness. Interviews revealed a common exposure to food items from Restaurant A, with two locations in Chicago, prompting an investigation.

METHODS: A case control study was conducted to determine risk factors for STEC infection. A confirmed case was a person with illness onset June 3–July 23, with isolation of STEC with an outbreak-associated pulsed-field gel electrophoresis (PFGE) pattern. Probable cases had clinically compatible symptoms without laboratory confirmation. Controls were identified by interviewing case meal companions and patrons who ordered meals on-line. Controls were frequency matched 4:1 to primary (restaurant-exposure) confirmed cases by meal date and restaurant location. Bivariate associations between illness and individual food items were assessed. Multivariable logistic regression was performed to evaluate age- and gender-adjusted associations. Food handler interviews and environmental inspections were performed. Food handler rectal swabs and food samples were collected and cultured for STEC.

RESULTS: Sixty-nine confirmed and 37 probable cases were identified. Among the confirmed, 55 were primary cases, four were secondary (household contacts), and 10 had incomplete data or no identifiable epidemiologic linkage. Among 40 food handlers tested, 38 consumed Restaurant A food items, none reported symptoms, and 16 (40%) yielded STEC isolates. Ten distinct PFGE patterns were identified among primary cases, and an additional four among food handlers. Primary confirmed case illness onset dates ranged from June 19–July 3. Consumption of raw cilantro (adjusted odds ratio [aOR] 4.6, 95% confidence interval [CI]: 1.8–12.0), salsa fresca (aOR 2.8, CI: 1.3–6.0), and lettuce (aOR 2.5, CI: 1.2–5.2) were independently associated with illness. A composite variable representing consumption of either raw cilantro or salsa fresca, which also contained raw cilantro, explained 95% of cases (aOR 6.9, CI: 2.0–24.0). No STEC was isolated from cilantro collected from the restaurant or the restaurant’s distributor.

CONCLUSIONS: Cilantro was the most likely food vehicle causing this STEC outbreak, based on the strong association of raw cilantro consumption with illness, and the high percentage of cases explained by cilantro consumption. The large number of associated PFGE patterns was suggestive of a heavily contaminated food item as the outbreak source. Additionally, the large proportion of food handlers found to have asymptomatic STEC shedding might have amplified the outbreak. Testing and restriction of positive food handlers during restaurant-associated STEC outbreaks can be an important outbreak control measure.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Surveillance; Foodborne Disease; Environmental Health

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Shamika.Smith@cityofchicago.org

Presenting Author(s) Shamika S. Smith

Institution Chicago Department of Public Health

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8285](#)

Abstract Type Breakout

Abstract Title Factors Associated with Fsis-Regulated Establishments Implicated in Foodborne Outbreak Investigations, 2010–2015
Abstract

BACKGROUND: In carrying out its regulatory mission, the US Department of Agriculture Food Safety and Inspection Service (FSIS) conducts numerous activities to verify food safety in federally-regulated meat and poultry establishments. These activities include inspections, food safety assessments (FSAs), and product sampling. FSIS maintains records for these activities that can be used for fact-finding during outbreak investigations. In addition, product recalls and enforcement actions may result when an establishment has failed to comply with certain regulatory standards. To gain insight into characteristics that distinguish establishments linked to foodborne outbreaks, we assessed the extent to which historical regulatory findings and other factors are associated with establishments implicated in outbreak investigations.

METHODS: We reviewed FSIS investigation records for 2010–2015 and selected investigations associated with evidence sufficient to prompt a voluntary product recall. FSIS-regulated establishments implicated in these investigations were then compared to similar establishments using a matched case-control design. Factors assessed included history of product sampling positives, inspection noncompliances, FSAs, enforcement actions, and product recalls. In addition, geographic proximity to outbreak-associated illnesses was also examined to explore whether case establishments were more likely to be located near the outbreaks to which they were linked. Univariate conditional logistic regression was used to model relationships.

RESULTS: During the study period, FSIS investigated 19 outbreaks conclusively linked to 21 FSIS-regulated establishments. Of these outbreaks, 11 (58%) involved *Salmonella* spp. and 8 (42%) involved Shiga toxin-producing *E.coli*. Case establishments were more likely to have a history of product sampling positives with PFGE patterns indistinguishable to an outbreak strain (OR 29.6, 95 CI% 1.1–771.2). Case establishments were also more likely to be located in the same census region (OR 10.9, 95 CI% 2.5–47.2) and state (OR 57.7, 95% CI 2.7 – 1216.4) as the outbreak to which they were linked. Some factors (such as history of recalling product and being implicated in a previous outbreak investigation) showed some association with case establishments but not to a statistically significant extent, while other factors (such as history of FSAs and enforcement actions) showed no association.

CONCLUSIONS: Recognizing factors associated with outbreaks may facilitate more rapid identification of outbreak-linked establishments, which may reduce the number of illnesses associated with contaminated food. Such clues may also assist FSIS in identifying and directing regulatory resources toward high-risk establishments in advance of an outbreak, resulting in illness prevention.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Foodborne Disease; Risk Factors

Consider for Different Presentation? No

Presenting Author Email Address(es) Kis.Robertson@fsis.usda.gov

Presenting Author(s) Kis Robertson Hale

Institution U.S. Department of Agriculture

Affiliation Federal Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8045](#)

Abstract Type Breakout

Abstract Title Food Safety in Long Term Care Facilities: Are We Protecting Vulnerable Populations?
Abstract

BACKGROUND: Adults over 65 have increased incidence of enteric disease, subsequent hospitalization and death. Seniors living in long term care facilities (LTCF) consume most of their meals onsite; lapses in food safety puts residents at risk. As is the case in many other states, Colorado LTCF kitchens are exempt from retail food inspections. LTCF kitchens are regulated by the Health Facilities Emergency Medical Services Division (HF) as part of facility-wide inspections conducted every 1-3 years by non-EH personnel. Following a deadly LTCF *Salmonella* outbreak, HF and the Division of Environmental Health and Sustainability (EH) collaborated to assess inspections of LTCF kitchens.

METHODS: An EH specialist inspected 150 Colorado LTCF kitchens using a standardized inspection form. Results were compared to the most recent HF inspection of the same facilities. Violations are classified as critical (presence/introduction/ proliferation of bacteria, viruses, and other contaminants in food; directly related to foodborne disease) or non-critical (basic sanitation/ cleaning; unlikely to lead to foodborne disease). For each violation, results could be concordant (both or neither HF and EH identified violation) or discordant (only HF or only EH identified the violation). McNemar's test was performed to compare frequencies of discordant results ($p=0.05$); when values of discordant results <20 , McNemar's exact test was used.

RESULTS: EH found more violations than HF in these categories: cross-contamination ($p<0.000$), handwashing ($p<0.000$), hygienic practices ($p<0.000$), cooling ($p=0.006$), hot holding($p<0.000$), cold holding ($p<0.000$), food thermometers ($p<0.000$), handwashing accessibility ($p<0.000$), soap and drying device availability ($p=0.013$), and plumbing installation/maintenance ($p=0.006$); all violations except plumbing were critical violations. HF found more violations than EH in these categories: food storage container ($p=0.02$), food protected from contamination ($p<0.000$), refrigerator thermometers ($p=0.039$), food-contact surfaces ($p=0.002$), non-food contact surfaces ($p<0.000$), single use utensils ($p<0.000$), floor/wall/ceiling maintenance ($p=0.016$), and personnel clothing /hair restraint ($p<0.000$); none of these were critical violations.

CONCLUSIONS: EH and HF inspections identified different types of violations. HF inspections identified non-critical violations that are observational, such as facility cleanliness, hair restraints, and utensil use. EH identified more critical violations associated with foodborne illness, such as cross-contamination, handwashing, and temperature violations. Though inspections occurred at different times, HF inspections likely missed critical violations that if not corrected can lead to foodborne illness. Based on these results, Colorado is recommending modifications to the current approach, that include more frequent, risk-based LTCF kitchen inspections be conducted by staff with specific training and expertise in food safety and environmental health.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Environmental Health; Foodborne Disease; Healthy Aging

Consider for Different Presentation? Yes

Presenting Author Email Address(es) rachel.jervis@state.co.us

Presenting Author(s) Rachel Jervis

Institution Colorado Department of Public Health and Environment

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 7621
Abstract Type	Breakout
Abstract Title Abstract	Foodnet Data Demonstrates Usefulness of Routine Exposure Data Collection from <i>Salmonella</i> Patients Using Two Comparison Groups BACKGROUND: An estimated 1.2 million salmonellosis cases occur in the United States annually. <i>Salmonella</i> serotype Enteritidis (SE) accounts for nearly 20% of salmonellosis cases reported to FoodNet. Identifying exposures associated with illness is essential for developing effective regulations and interventions. Exposure data can be obtained by case-control studies, but they are resource-intensive and not conducted regularly. To better understand exposures, FoodNet began routine collection of standardized exposure data for salmonellosis. We compared exposures reported by <i>Salmonella</i> serotype Enteritidis patients to those of patients infected with other <i>Salmonella</i> serotypes (non-SE) and to healthy controls from the 2006–2007 FoodNet Population Survey (PS) to assess the utility of different comparison groups. METHODS: Cases and non-SE cases were defined as sporadic, domestically-acquired, culture-confirmed <i>Salmonella</i> infections with documented serotype in patients over 1 year of age reported to FoodNet during 2014–2015. We excluded PS controls <1 years of age and those who reported diarrhea in the 7 days before interview. We compared 35 food, water, and animal exposures common to PS and FoodNet and calculated odds ratios (aOR), adjusted for site and season. Statistical significance was defined as $\alpha < 0.05$. RESULTS: Our analysis included 1,481 SE cases, 5,511 non-SE cases, and 16,377 PS controls. Increased risk of SE infection was significantly associated only with consumption of chicken outside the home (45% vs. 42%; aOR=1.2), lettuce (58% vs. 50%; aOR=1.2), and spinach (22% vs. 18%; aOR=1.2) compared with non-SE cases. Compared with PS controls, increased risk of SE infection was significantly associated only with consumption of chicken (80% vs. 67%; aOR=2.0), chicken outside the home (45% vs. 26%; aOR=2.3), fish (30% vs. 25%; aOR=1.4), and contact with live poultry (5% vs. 3%; aOR=1.4). Protective exposures were also identified, and differed among the two analyses. CONCLUSIONS: Risky exposures associated with SE infection were similar to those identified in case-control studies and outbreaks. More risky exposures were identified using PS controls, indicating that the exposure profile of non-SE cases differs from that of population controls from 10 years ago. These findings support the utility of routinely collected standardized exposure data. Monitoring these exposures over time could provide an on-going, readily available alternative to case-control studies for a limited set of exposures.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Foodborne Disease; Surveillance; Data Collection
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	emarder1@cdc.gov
Presenting Author(s)	Ellyn Marder
Institution Affiliation	Centers for Disease Control and Prevention CDC

Submission Type ID	Breakout/Quick/Lightning/Poster 8398
Abstract Type	Breakout
Abstract Title Abstract	Integrating Epidemiologic and Molecular Data during an Outbreak of a Rare Strain of <i>Shigella</i> Among Men Who Have Sex with Men — Southern California, 2016 BACKGROUND: Multidrug resistant <i>Shigella</i> outbreaks among men who have sex with men (MSM) have increased. In July 2016, the California Department of Public Health (CDPH) notified Los Angeles County of 7 <i>Shigella flexneri</i> cases, caused by serotype 7 (provisional 88-893), an uncommon strain. We investigated to find additional cases, determine risk factors and molecular relatedness of isolates, provide clinical guidance, and prevent additional cases. METHODS: Locally nontypable <i>S. flexneri</i> isolates were serotyped at CDPH's microbial disease laboratory. Cases were defined as persons with confirmed <i>S. flexneri</i> serotype 7 in Southern California with onset during March–October 2016. Patients were interviewed about risk factors and medical records abstracted. Six isolates were tested for antimicrobial susceptibilities by broth microdilution. Pulse-field gel electrophoresis and whole genome sequencing (WGS) were conducted. Kruskal-Wallis and Fisher exact tests were used to compare isolate subclusters. RESULTS: Of 34 patients identified, 13 required hospitalization; 1 died. All were male (median age 36 years); 97% self-identified as MSM; 80% (24/30) with known HIV status were positive, of whom 54% were not taking antiretrovirals consistently. Of the clinically relevant antimicrobials, all isolates were non-susceptible to azithromycin and trimethoprim-sulfamethoxazole, and 83% to amoxicillin. WGS of 28 isolates revealed all were ST-245 sequence type; 27 were clustered with 2-45 single-nucleotide polymorphisms (SNP) difference. Three subclusters were identified and differed by isolate date ($P < 0.001$) and local health jurisdiction ($P < 0.04$). CONCLUSIONS: This outbreak, caused by an uncommon <i>Shigella</i> strain, provides important data on genetic relatedness of <i>Shigella</i> isolates in a cluster with high selective pressure. Investigators may want to consider molecular testing to identify clusters and help guide investigation of risk factors and transmission. Treatment guidance to clinicians should be determined by antimicrobial susceptibility testing.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Outbreaks; Enteric Infectious Diseases; Sexually Transmitted Diseases
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	CJarashow@ph.lacounty.gov
Presenting Author(s)	Claire Dillavou Jarashow
Institution Affiliation	Los Angeles County Department of Public Health Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7784](#)

Abstract Type Breakout

Abstract Title Investigation of a Local Outbreak of Salmonella Javiana Involving a Seafood Restaurant Receiving Imported Product
Abstract

BACKGROUND: In August 2016, the Maricopa County Department of Public Health (MCDPH) identified an outbreak of *Salmonella* Javiana Pulsed-Field Gel Electrophoresis (PFGE) pattern JGGX01.1855 via a combination of PulseNet surveillance and local case investigation. *S. Javiana* has been isolated from produce, meats and spices, but this PFGE pattern appeared only four times in the PulseNet database. A common seafood restaurant exposure (Restaurant A) between one typed and two un-typed *Salmonella* cases was identified. MCDPH and Maricopa County Environmental Services (MCES) investigated to determine the outbreak source and prevent further *Salmonella* transmission.

METHODS: MCES inspected restaurant A, collected food and environmental specimens for *Salmonella* culture and obtained ingredient-specific menu item information. Standardized questionnaires were developed to gather information about grocery, restaurant and seafood exposures; cases reporting Restaurant A exposure were also interviewed with a menu-specific questionnaire. Non-ill dining partners of confirmed cases were identified and interviewed as controls. Gift card incentives were provided to cases and controls.

RESULTS: Forty confirmed and ten probable cases, including four closely related *S. Javiana* PFGE patterns were identified. Illness onset dates ranged from July 22nd to September 1st. Sixty-six percent of cases reported Restaurant A exposure in the week prior to illness; no other common exposures were identified among cases. On-site observations of restaurant A food preparation practices revealed no violations. Case-control study results revealed an odds ratio of 6.47 (CI= 1.6-33.01) for consumption of unfried shrimp among ill diners. No other food items were associated with illness. *Salmonella* Javiana PFGE pattern JGGX01.1855 was isolated from prepared, re-packaged shrimp and halibut and a freezer door handle swab. Subsequent collection of unopened frozen shrimp resulted in isolation of *Salmonella* Weltevreden from one of five shrimp types. This frozen shrimp brand and lot was recalled by the Food and Drug Administration.

CONCLUSIONS: Highly related *S. Javiana* indicates a commonly supplied food item, possibly shrimp, was the outbreak source; the outbreak was likely amplified by ongoing cross-contamination of shrimp and other seafood during preparation prior to cooking. We hypothesize that higher *Salmonella* loads, following preparation, likely survived the 145°F recommended shrimp cooking temperature. Recommendations to reduce cross contamination included improved hand hygiene practices, ensuring employees did not work while ill and careful attention to food preparation practices prior to cooking. This outbreak highlights the importance of avoiding cross-contamination of seafood since recommended cooking temperatures may not be sufficient to eliminate high bacterial burden.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Food Safety; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) JamesMatthews@mail.maricopa.gov

Presenting Author(s) James Matthews

Institution Maricopa County Department of Public Health

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8547](#)

Abstract Type Breakout

Abstract Title Knowledge, Attitudes and Practices of Raw Milk Consumer Groups in the Pacific Northwest
Abstract

BACKGROUND: Recently, there has been an increase in the number of outbreaks associated with the consumption of raw (i.e. unpasteurized) milk in the United States. Consuming raw milk carries an inherent risk of illness, particularly among at-risk populations including the chronically ill and immunocompromised. The reasons people choose to drink raw milk instead of pasteurized milk is unclear. Identifying who consumes raw milk and their reasons for consuming given the known health risk is critical in understanding the increase in outbreaks associated with raw milk consumption. The objective of the study was to determine the knowledge, attitudes and practices regarding raw milk consumption among raw milk consumers in the Pacific Northwest.

METHODS: An anonymous survey was distributed online targeting health conscious users in the Pacific Northwest from May through July 2014. The survey included information regarding basic demographics, history and frequency of consuming raw milk, reasons for or against drinking raw milk, source of raw milk, and risk perception of consuming raw milk. Descriptive statistics were generated to characterize the study population and bivariate analyses were performed to determine differences in knowledge, attitudes and practices between identified consumer groups (i.e. current (subgroups: exclusive (raw milk only), non-exclusive (raw and pasteurized), former, never).

RESULTS: A total of 227 surveys were completed. Approximately, 51% (n=116) were identified as non-consumers, 23% (n=53) as former consumers, and 26% (n=58) as current consumers. The majority of survey respondents in each group were female, white and on average, 41 to 47 years old. Non-raw milk consumers cited health risks (48.3%) while former consumers most often cited convenience (35.8%) for not consuming raw milk. Current consumers reported drinking raw milk due to taste (72.4%) and perceived holistic health benefits (67.2%). While exclusive current consumers were significantly more likely to drink raw milk due to holistic health benefits ($p<0.001$) and feeling processed milk is not safe ($p=0.002$) compared to non-exclusive current consumers. Nearly all (96%) of current consumers did not believe consuming raw milk increased their risk of illness and 67.9% reported not trusting state health officials' recommendations regarding food safety.

CONCLUSIONS: Raw milk consumers, particularly those who only consume raw milk, reported health benefits and concerns about safety of pasteurized milk as reasons for consuming raw milk, providing themes for future interventions to address. Future research is needed to address the most effective means of communicating these risks and common misperceptions among raw milk consumers.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Community Health; Risk Communication; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) bigouetj@oregonstate.edu

Presenting Author(s) John P Bigouette

Institution Oregon State University

Affiliation Student

Submission Type Breakout/Quick/Lightning/Poster
ID [8274](#)

Abstract Type Breakout

Abstract Title Launching the First Molecular-Based Surveillance System for a Parasitic Disease — CryptoNet, 2016
Abstract

BACKGROUND: Molecular testing has rewritten *Cryptosporidium* taxonomy. What was once thought to be a single species is at least 30 species that infect vertebrates. Most *Cryptosporidium* species are morphologically indistinguishable by traditional diagnostic tests; only molecular methods can distinguish species and their subtypes. After 2004, U.S. annual incidence of cryptosporidiosis has risen >3-fold, calling for a better understanding of *Cryptosporidium* transmission, and thus, cryptosporidiosis epidemiology, to direct development of evidence-based prevention and control strategies. Thus, in 2015, CDC formally launched CryptoNet, the first U.S. molecular-based surveillance system for a parasitic disease.

METHODS: CDC microbiologists and epidemiologists have been closely working with state partners in Alabama, Maine, Minnesota, Nebraska, New Hampshire, Tennessee, and Wisconsin since mid-2015. To date, the focus has been on increasing state public health laboratory capacity to perform Sanger-based amplicon typing and to collect corresponding diagnostic and epidemiologic data for each specimen submitted to CryptoNet for molecular typing. Ohio joined CryptoNet in mid-2016.

RESULTS: For 2016, CDC's CryptoNet laboratory received 272 specimens for molecular typing, of which 227 (83.5%) were positive for *Cryptosporidium* by molecular methods. Among the 2016 *Cryptosporidium* specimens, 8 (2.9%) and 264 (97.1%) were identified in specimens of patients with outbreak-associated and sporadic cases, respectively. The following subtypes were identified in specimens of patients with outbreak-associated cases: *C. hominis* IdA19, *C. hominis* IfA12G1, *C. parvum* IIaA18G3R1, and *C. parvum* IIaA15G2R1. The following subtypes were most frequently identified in specimens of patients with sporadic cases: *C. parvum* IIaA15G2R1, *C. hominis* IfA12G1, and *Cryptosporidium* chipmunk genotype I. Identification of non-*C. parvum* and non-*C. hominis* species led to further patient interviews and identification of distinct risk factors (e.g., squirrel contact).

CONCLUSIONS: The formal launch of CryptoNet has facilitated progress towards the ultimate CryptoNet objective of integrating molecular typing and epidemiologic data for each nationally notified cryptosporidiosis case. The 2016 submission count and positive proportion represent substantial increases over 2014; in 2014, 24 specimens were submitted, of which 18 (75%) positive. In addition to further increasing submission and positivity, CryptoNet next steps include 1) transferring protocols for whole genome-based multi-locus sequence typing (with substantially increased discriminatory power), once they are established, to state public health laboratories, 2) increasing state epidemiology capacity to collect and transmit epidemiologic data to CDC, and 3) overcoming barriers to specimen recovery (e.g., diagnosing cryptosporidiosis with rapid cartridge kits, which have low positive predictive value, and fixing specimens in formalin, which precludes DNA sequencing).

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Surveillance; Epi / Lab Capacity (ELC); Waterborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) acz3@cdc.gov

Presenting Author(s) Michele C. Hlavsa

Institution Centers for Disease Control and Prevention

Affiliation CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [7658](#)

Abstract Type Breakout

Abstract Title Molluscan Shellfish Traceback in *Vibrio* Infections in the United States, 2007–2015
Abstract

BACKGROUND: The Cholera and Other Vibriosis Illness Surveillance (COVIS) system collects data on domestic culture-confirmed vibriosis infections and works with state health departments and the Food and Drug Administration (FDA) to identify sources of infections. Cases are commonly associated with molluscan shellfish (clams, oysters, mussels, scallops), and traceback investigations can determine implicated shellfish harvest areas. Harvest area data can link single cases from multiple states and facilitate timely interventions to prevent further illnesses. Investigations can link cases to 1 (single source) or >1 harvest area (multisource). Often, multisource cases are excluded from an area's case counts and do not contribute to area closure decisions. Harvest area data reporting, multisource case frequency, and key traceback findings are summarized.

METHODS: Health departments, often with departments of agriculture or environmental health, investigate *Vibrio* cases with recent seafood exposure through retail outlets. Harvest areas are identified from shellfish identification tags. We summarize reports to COVIS between 2007 and 2015 associated with molluscan shellfish consumption, and we describe common reporting barriers based on state partner feedback.

RESULTS: Between 2007 and 2015, state health departments reported 3,007 foodborne *Vibrio* illnesses associated with molluscan shellfish consumption to CDC; 41.5% included harvest area information. Harvest area reporting decreased from 52.4% of cases in 2007 to 44.6% in 2015. Among cases with known harvest area, sources included Pacific states (49.5%), Atlantic states (30.4%), and Gulf states (20.1%). Among investigations that included harvest area information, 18.3% identified >1 harvest area. States identified difficulty following up on exposures across state lines and inadequate shellfish tag recordkeeping at retail as barriers to reporting harvest area information.

CONCLUSIONS: Harvest area information is obtained in fewer than half of *Vibrio* illnesses associated with molluscan shellfish, and reporting is decreasing. Increased collection of harvest area data can improve identification of *Vibrio* illnesses sources. Almost half of all traceback is reported from harvest areas in the Pacific. Multisource exposures are common; new methods that address uncertainty associated with multiple possible sources may increase the ability to use data from them. Barriers to reporting harvest area information need to be addressed. Common data sharing platforms may improve our ability to coordinate traceback investigations involving multiple states. Training on procedures for molluscan shellfish tag review and retention at retail establishments, in addition to new methods with which to track this information, could increase reporting of harvest area information, leading to timelier action to prevent further illness.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Surveillance; Data Collection

Consider for Different Presentation? Yes

Presenting Author Email Address(es) eburdette@cdc.gov

Presenting Author(s) Erin K Burdette

Institution Centers for Disease Control and Prevention

Affiliation CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [8010](#)

Abstract Type Breakout

Abstract Title Multi-State Salmonellosis Outbreak Associated with Egg Products: Is “Local” Food Always “Safe” Food?
Abstract

BACKGROUND: On August 22, 2016, the Missouri Department of Health and Senior Services (MDHSS) was notified about three cases of salmonellosis among patrons of Restaurant A located in a popular tourist area in Missouri, frequented by local and out-of-state visitors. Three cases who dined at Restaurant “A” prior to illness onset sought medical care at a local hospital, and their stool specimens tested positive for *Salmonella* by polymerase chain reaction (PCR). Serotype and pulse field gel electrophoresis (PFGE) of the isolates were identical for all three cases. The objective of the investigation by the MDHSS and the LPHA was to identify possible source(s) of exposure and prevent further transmission.

METHODS: Epidemiologic investigation included enhanced surveillance for cases (notifying mandated reporters in Missouri; EpiX notification) and interviewing all case-patients and all restaurant employees. Information from case-patients was collected by phone interview using a standardized questionnaire. An outbreak case was defined as any person who dined at Restaurant A on or after August 1, 2016, developed diarrheal illness within three days of exposure, and was infected with *Salmonella* serovar Enteritidis matching PFGE *Xba* I pattern JEGX01.0021. Stool specimens from suspect cases and food samples from Restaurant A were submitted to MDHSS for culture, serotyping, and PFGE analysis. The Missouri Rapid Response Team was consulted to assist with the environmental inspection of Restaurant A and traceback of a suspected food product.

RESULTS: Nineteen persons from three states met the case definition: Missouri (14), Wisconsin (3) and Minnesota (2). The age range of case-patients was 10 to 73 years (median= 43). Fifty-three percent of cases were male. Disease onset dates ranged from 8/14/2016 to 8/25/2016. Two hospitalizations and no deaths were reported. Eleven case-patients were culture-confirmed as *Salmonella* serovar Enteritidis, and 10 of those had a matching PFGE pattern. Sixteen case-patients recalled eating a dish containing raw or undercooked eggs. Outbreak strain of *Salmonella* was isolated from two undercooked eggs food samples. Traceback investigation revealed that Restaurant A purchased eggs from a small local farm which acquired hens from several larger, previously depopulated farms. Infection prevention measures were implemented by public health agency at the restaurant and the egg farm.

CONCLUSIONS: Consumption of foods containing raw or undercooked eggs served at Restaurant A likely caused the salmonellosis outbreak. This investigation highlighted a challenge to preventing foodborne illness among populations who may perceive locally-sourced food as being more wholesome and less likely to cause disease.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Food Safety; Outbreaks; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) drew.pratt@health.mo.gov

Presenting Author(s) P. Drew Pratt

Institution Missouri Department of Health and Senior Services

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8321](#)

Abstract Type Breakout

Abstract Title Multijurisdictional Norovirus Outbreak Associated with Commercially Distributed Ice Cream, Minnesota, 2016
Abstract

BACKGROUND: Norovirus causes approximately 60% of foodborne outbreaks identified in Minnesota. Nearly all are detected through the Minnesota Department of Health (MDH) Foodborne Illness Hotline, a centralized statewide complaint system. During August 2016, several complaints were received, and investigations were initiated at: a restaurant; two Ice Cream X retail locations; and a private gathering.

METHODS: Sanitarians from the City of Minneapolis Health Department, Hennepin County Human Services and Public Health Department (HSPHD), and the Minnesota Department of Agriculture (MDA) visited the food service facilities to implement norovirus interventions and assess food preparation procedures. MDH and HSPHD staff interviewed patrons and conducted a case-control study for the private gathering. A case was defined as an individual from a complainant group who developed vomiting or diarrhea (≥ 3 loose stools in a 24-hour period). Stool samples were tested at MDH, and ice cream and frozen raspberries were submitted to the FDA Center for Food Safety and Applied Nutrition (CFSAN) for norovirus testing.

RESULTS: Fifteen cases from four venues were identified. Meal dates occurred during August 4-14. Stool samples from patrons of three venues yielded the outbreak strain of norovirus GII.17 Kawasaki. All cases reported eating raspberry chocolate chip flavor Ice Cream X. Consumption of raspberry chocolate chip ice cream (5/5 cases vs. 1/8 controls; odds ratio, undefined; $p=0.005$) was significantly associated with illness at the private gathering. Ice Cream X is manufactured at a central commissary in Minnesota. Imported frozen raspberries were the only ingredient used exclusively in the raspberry chocolate chip flavor, and were not subjected to a kill step. A large shipment of raspberries sourced from Serbia, China, and Chile was received on July 22. No commissary workers reported recent illness. The manufacturer initiated a product withdrawal. Results from food samples sent to CFSAN in September are pending.

CONCLUSIONS: This was an outbreak of norovirus gastroenteritis associated with consumption of ice cream at multiple venues. The ice cream was produced and distributed by a Minnesota manufacturer. Imported frozen raspberries used in the implicated flavor were the suspected vehicle. Though norovirus outbreaks have been linked to frozen raspberries in Europe, this is the first norovirus outbreak identified in Minnesota due to a non-shellfish commercially distributed food. A centralized complaint hotline, rapid follow-up and investigation of all suspected norovirus outbreaks, and good agency collaboration were all key to the successful identification of a norovirus outbreak caused by a distributed food item.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Foodborne Disease; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) amy.saupe@state.mn.us

Presenting Author(s) Amy Saupe

Institution Minnesota Department of Health

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 7531
Abstract Type	Breakout
Abstract Title Abstract	Multistate Outbreak of Salmonella Paratyphi B Variant L(+) Tartrate(+) and Salmonella Weltevreden Infections Linked to Imported Frozen Raw Tuna – United States, March – July 2015 BACKGROUND: Foodborne salmonellosis causes an estimated 1 million illnesses and 400 deaths annually in the United States (US). In April 2015, PulseNet, the national molecular subtyping network for foodborne disease surveillance, identified a cluster of 11 <i>Salmonella</i> Paratyphi B variant L(+) tartrate(+) infections from 4 states with an indistinguishable pulsed-field gel electrophoresis (PFGE) pattern which was novel in the US. State and local health departments, FDA, and CDC initiated an investigation to determine the source of the outbreak. METHODS: A case was defined as infection with an outbreak strain of <i>Salmonella</i> Paratyphi B variant L(+) tartrate(+) or <i>Salmonella</i> Weltevreden reported to PulseNet occurring during March 1–July 31, 2015. Case-patients were interviewed to identify common exposures. Investigators conducted environmental and traceback investigations and tested product samples for <i>Salmonella</i>. Selected clinical and food isolates were further characterized by whole-genome sequencing (WGS). RESULTS: We identified 69 cases in 11 states. The median age of case-patients was 31 years (range < 1–83); 53% were male. Twelve (18%) of 66 case-patients were hospitalized, and no deaths were reported. Of those with available information, 49 (92%) of 53 case-patients reported consuming sushi in the week before illness onset; 46 (98%) of 47 reported eating a sushi item containing raw tuna, and 28 (88%) of 32 reported eating a sushi item containing raw “spicy tuna.” Traceback from 7 of 8 points of service associated with illnesses in 4 states identified Importer A as a common source of frozen raw tuna. Minnesota investigators collected 15 intact samples of frozen raw tuna from a point of service reported by a case-patient, which received product from Importer A. Nine samples yielded the outbreak strain of <i>Salmonella</i> Paratyphi B variant L(+) tartrate(+) and one sample yielded a strain of <i>Salmonella</i> Weltevreden rarely reported to PulseNet. Epidemiologic, traceback, and WGS information linked an additional strain of <i>Salmonella</i> Paratyphi B variant L(+) tartrate(+) and an additional strain of <i>Salmonella</i> Weltevreden to the outbreak. Importer A issued three voluntary recalls of frozen raw tuna supplied by one processor in Indonesia. CONCLUSIONS: Epidemiologic, traceback, and laboratory evidence implicated frozen raw tuna from Indonesia as the source of the outbreak. Due to the long shelf-life of this product, recalls likely prevented additional illnesses. This is the fourth multistate outbreak of <i>Salmonella</i> linked to frozen raw tuna reported since 2007 and highlights the continuing risk for foodborne illness associated with raw seafood consumption.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Outbreaks; Food Safety; Foodborne Disease
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	ykm6@cdc.gov
Presenting Author(s)	Rashida Hassan
Institution Affiliation	Centers for Disease Control and Prevention CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [7618](#)

Abstract Type Breakout

Abstract Title Multistate Outbreak of Shiga Toxin-Producing *E. coli* Infections Associated with Raw Flour
Abstract

BACKGROUND: Flour is a raw, minimally-processed product intended to be cooked before consumption. Although several previous Shiga-toxin producing *E. coli* (STEC) outbreak investigations in the United States suspected contaminated flour as the source, it had never been proven. In February 2016, PulseNet, the laboratory network for foodborne disease surveillance, detected a cluster of STEC O121 infections in 12 states having the same rare genetic fingerprint. A multistate outbreak investigation identified additional STEC strains that were linked to the outbreak through epidemiologic and laboratory analysis.

METHODS: We defined a case as infection with an outbreak strain of STEC O121 or O26 occurring between December 21, 2015, and September 5, 2016, and interviewed case-patients about foods and other exposures in the week before illness onset. We performed univariable matched exact conditional logistic regression to identify exposures associated with case-status, using people with non-STEC enteric infections as a comparison group, matched on age, gender, and state of residence. Samples of suspected food products were collected and cultured for STEC. A common point of contamination was sought through traceback. Whole genome sequencing (WGS) was performed on selected clinical and food isolates.

RESULTS: Sixty-two cases of STEC O121 and one case of STEC O26 were identified in 24 states; seventeen people were hospitalized and no deaths were reported. Using one flour brand (OR 21.04, 95% CI 4.69–94.37) and tasting unbaked homemade dough or batter (OR 36.02, 95% CI 4.63–280.17) were both significantly associated with illness. Traceback identified a common flour production facility. Three illnesses were identified in children exposed to raw dough at multiple locations of a restaurant chain. STEC isolated from five open leftover flour samples collected from case-patients' homes and additional product samples collected from the flour producer were analyzed by WGS and the outbreak strains were found to be closely related genetically.

CONCLUSIONS: This is the first investigation to definitively link an outbreak of STEC infections to raw flour. Nearly 250 products containing flour were recalled by the flour producer and companies that used the contaminated flour. This investigation demonstrates the risks associated with eating products made with raw flour, or playing with uncooked dough. Flour producers should consider adding prominent packaging labels to warn consumer not to eat undercooked or raw flour or play with uncooked dough. Foodborne illnesses associated with raw flour are likely preventable if appropriate control measures are taken in grain fields, production facilities, restaurants, and by consumers.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Foodborne Disease; Outbreaks; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) xmm8@cdc.gov

Presenting Author(s) Lyndsay Bottichio

Institution Centers for Disease Control and Prevention

Affiliation CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [8395](#)

Abstract Type Breakout

Abstract Title Multistate Outbreak of Shiga Toxin-Producing *Escherichia coli* O157 Associated with Ground Beef
Abstract

BACKGROUND: In July 2016, the New Hampshire (NH) Department of Health and Human Services investigated an outbreak of Shiga Toxin-Producing *Escherichia coli* (STEC). Fifteen cases were identified, including eight from a residential camp. Seven additional cases not associated with the camp were identified using pulsed field gel electrophoresis (PFGE).

METHODS: A case was defined as any individual with culture-confirmed STEC with illness onset after June 15, 2016 and indistinguishable PFGE patterns to the outbreak strain (Xbal: EXHX01.1107, BlnI: EXHA26.4626). Cases associated with the residential camp were interviewed using a camp-specific questionnaire, and cases not associated with the camp were interviewed using a standard enteric disease questionnaire. Environmental assessments of implicated food exposures were conducted to identify food service practices of concern and common food suppliers.

RESULTS: Fifteen cases were identified. Cases were residents of New Hampshire, California, Maine, Maryland, Massachusetts, New York, Vermont, and Canada. The most common symptoms among cases were diarrhea (100%), abdominal cramps (100%), and bloody diarrhea (87%). Five cases (33%) were hospitalized and one case developed hemolytic uremic syndrome. No cases died. Fourteen out of 15 food histories were obtained. Raw or undercooked ground beef exposure was documented in 87% of cases prior to onset of symptoms. Environmental assessment identified a common beef supplier in NH. USDA notified and a traceback investigation was initiated. USDA inspected the slaughter and processing facility associated with the beef and identified a single slaughter day as the possible source of contamination. Approximately 8,800 pounds of ground beef and other beef products were recalled as a result of the traceback. Two ground beef samples obtained from the camp both tested negative for STEC, but were not from the recalled lot.

CONCLUSIONS: Exposure to raw or undercooked ground beef from a common supplier was the source of this STEC outbreak. A multistate recall of ground beef and other beef products resulted in the cessation of the outbreak. In addition to assuring appropriate slaughter and processing procedures, consumers should ensure that all beef is cooked to an internal temperature of 160°F (71°C) using a meat thermometer, and that people preparing foods wash their hands frequently, particularly after working with raw food.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Enteric Infectious Diseases; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author zachary.mccormic@dhhs.nh.gov
Email Address(es)

Presenting Author(s) Zachary D. McCormic

Institution New Hampshire Department of Health and Human Services

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8488](#)

Abstract Type Breakout

Abstract Title Outbreak of *Listeria Monocytogenes* Linked to Frozen Vegetables, 2013-2016
Abstract

BACKGROUND: In March 2016, CDC PulseNet identified a cluster of *Listeria monocytogenes* infections with a rare pulsed-field gel electrophoresis (PFGE) pattern combination. The clinical isolates were highly related to one another by whole genome multi-locus sequence type (wgMLST) analysis and to two environmental isolates collected by FDA from a frozen fruit and vegetable processing facility in the same month. CDC, state public health and regulatory officials, and FDA initiated an investigation into the source of the illnesses.

METHODS: We defined a case as infection with an outbreak strain of *Listeria monocytogenes*, isolated from a normally sterile site from September 1, 2013 to May 15, 2016. The outbreak included two rare and distinct strains. Strain 1 included isolates with PFGE pattern combination GX6A16.0397/ GX6A12.1067 and highly related by wgMLST (range: 0-16 alleles, median: 6). Strain 2 included isolates with PFGE pattern combination GX6A16.0101/ GX6A12.0874 and highly related by wgMLST (range: 0-9 alleles, median: 7.5). We collected shopper card data when available and interviewed ill people using the *Listeria* Initiative case report form and a supplemental questionnaire focused on frozen foods, including vegetables and fruits.

RESULTS: We identified nine cases in four states: California (6), Connecticut (1), Maryland (1), and Washington (1). Isolation dates ranged from September 13, 2013 to May 3, 2016. Ill people ranged in age from 56 to 91 years (median: 76); 78% were female, and all nine were hospitalized; three died. Eight ill people were infected with Strain 1, and one with Strain 2. Of four ill people interviewed with the supplemental questionnaire and providing shopper card data, three ate frozen vegetables in the month prior to becoming ill. Open and unopened bags of one of the reported brands of frozen vegetables from one ill person's home and retail samples of another brand of frozen vegetables yielded the outbreak strains. Both brands of frozen vegetables were produced by a firm that received frozen vegetables from a processing facility in which an outbreak strain of *Listeria* was identified in the environment. An estimated 456 products sold under 42 brands were ultimately recalled as a result of the investigation.

CONCLUSIONS: This is the first outbreak of listeriosis linked to frozen vegetables identified in the United States. Further research is warranted on the prevalence and risk of *Listeria monocytogenes* contamination in frozen vegetables and fruits to guide food regulatory policy.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Food Safety; Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) uwj0@cdc.gov

Presenting Author(s) Katherine Heiman Marshall

Institution Centers for Disease Control and Prevention

Affiliation Federal Agency

Submission Type ID Breakout/Quick/Lightning/Poster
[8059](#)

Abstract Type Breakout

Abstract Title Abstract Shiga Toxin-Producing *Escherichia coli*. Convalescent Testing By Using Multiplex Polymerase Chain Reaction Panel and Culture Methods — Kansas, 2016

BACKGROUND: Kansas regulations exclude persons with Shiga toxin-producing *Escherichia coli* (STEC) infection from delivering health care, handling food, and providing or attending daycare until 2 consecutive negative convalescent stool culture results are obtained. Increasingly, laboratories use multiplex polymerase chain reaction (PCR) panels to detect presence of STEC instead of classic biochemical culture methods. Use of PCR to confirm absence of STEC in convalescent specimens has not been assessed. We compared culture with PCR for testing convalescent specimens to determine the potential effect of PCR use on persons excluded from work or daycare (“excluded persons”).

METHODS: Required convalescent stool specimens collected ≥48 hours after symptom resolution from excluded persons (previously diagnosed by any method) and submitted during August–November 2016 were evaluated. Specimens were tested for STEC using classic biochemical culture and PCR. Specimens from excluded persons were collected and tested until 2 consecutive negative cultures were obtained and the exclusion was lifted.

RESULTS: Seven excluded persons submitted 26 specimens; 46% (12/26) were culture and PCR positive; 19% (5/26) were culture and PCR negative; and 35% (9/26) were culture negative and PCR positive. Among each person’s last 2 culture-negative specimens, PCR test results were both negative (n=2), positive followed by negative (n=1), and both positive (n=4).

CONCLUSIONS: PCR detected Shiga toxin nucleic acid targets in a majority of culture-negative convalescent specimens. If PCR was used instead of culture, 5 of 7 exclusions would not have been lifted. PCR can detect Shiga toxin nucleic acid in non-viable bacteria, thus culture remains the preferred method for STEC testing on convalescent specimens in Kansas. As laboratory capacity for PCR increases further evaluation of PCR use for convalescent testing is warranted.

Submission Complete? Yes

Committee Infectious Disease
Topic Enteric Diseases
Keywords Public Health Law; Enteric Infectious Diseases; Epi / Lab Capacity (ELC)

Consider for Different Presentation? Yes

Presenting Author Email Address(es) jnadeau@cdc.gov

Presenting Author(s) Jessica Nadeau Tomov

Institution Affiliation Kansas Department of Health and Environment
 EIS/CEFO

Submission Type ID	Breakout/Quick/Lightning/Poster 7630
Abstract Type	Breakout
Abstract Title Abstract	The Changing Landscape of Diagnostic Testing for Bacterial Enteric Pathogens and Its Impact on the Surveillance and Epidemiology of These Pathogens — Foodborne Diseases Active Surveillance Network, USA, 2012–2015 BACKGROUND: Culture-based testing has been the mainstay of clinical diagnostics for bacterial enteric pathogens. However, increased availability and rapid adoption of culture-independent diagnostic tests (CIDT) is posing challenges to understanding the epidemiology of infections and determining incidence rates (IRs), which have historically been calculated using only culture (Cx)-confirmed cases. In 2011, the Foodborne Diseases Active Surveillance Network (FoodNet), an active population-based sentinel surveillance system for laboratory-confirmed enteric infections in ten sites, expanded surveillance to include both Cx and CIDT-positive reports. We describe the uptake of CIDTs, impact of CIDTs on IRs, and differences among persons diagnosed by Cx versus CIDT for five enteric bacterial pathogens. METHODS: We examined Cx and CIDT-diagnosed cases of <i>Campylobacter</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Vibrio</i> , and <i>Yersinia</i> reported to FoodNet during 2012–2015 and calculated IRs using US census data. RESULTS: Among infections reported during 2015 (n=20,173), the proportion diagnosed by Cx alone decreased (91% vs 80%), by Cx and CIDT increased (2% vs 4%), and by CIDT alone increased (6% vs 16%) compared with 2012 (n=18,199). The proportion of reported infections diagnosed by CIDT in 2015 compared with 2012 for <i>Campylobacter</i> increased by 40%, <i>Shigella</i> 24%, <i>Yersinia</i> 14%, <i>Salmonella</i> 9%, and <i>Vibrio</i> by 8%. Compared with 2012, among CIDT reports with test information reported during 2015 (n=4,037), the proportion of antigen-based tests decreased (76% vs 35%), locally-developed PCR tests increased (22% vs 49%), and DNA-based syndrome panels increased (0% vs 14%). Inclusion of CIDT-positive reports would result in increased IRs, for <i>Campylobacter</i> 39% (17.43 per 100,000 persons vs 12.49), <i>Shigella</i> 24% (6.50 vs 5.24), <i>Salmonella</i> 9% (16.71 vs 15.32), and <i>Vibrio</i> 8% (0.42 vs 0.39). <i>Campylobacter</i> had the largest proportion of CIDT reports among the five pathogens with CIDT-positive reports, accounting for 26% of <i>Campylobacter</i> reported in 2015; this allowed for comparison of cases diagnosed by Cx vs CIDT. Persons diagnosed with <i>Campylobacter</i> by CIDT vs Cx had a significantly higher median age (46 vs 38 years), were more likely to be female, more likely to die, but less likely to have travelled internationally, diarrhea, or fever. CONCLUSIONS: The percentage of bacterial enteric infections diagnosed by CIDTs is increasing; thus, data on species, subtype, and antimicrobial resistance of these pathogens are decreasing. Differences among persons with <i>Campylobacter</i> infection diagnosed by CIDT versus culture may reflect differences in test performance or in testing practices. Continued collection of CIDT information is important to accurately calculate incidence rates and trends.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Epidemiology; Surveillance; Enteric Infectious Diseases
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	ihq5@cdc.gov
Presenting Author(s)	Aimee Geissler
Institution Affiliation	Centers for Disease Control and Prevention CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [8005](#)

Abstract Type Breakout

Abstract Title Use of Multiplex Polymerase Chain Reaction-Based Diagnostic Testing for Enteric Infections in New York City, 2014–2016
Abstract

BACKGROUND: In 2014, some New York City (NYC)-area laboratories began adopting multiplex polymerase chain reaction (PCR) tests to detect enteric bacteria and protozoa. We sought to characterize multiplex PCR usage trends in NYC.

METHODS: We determined number of NYC residents with diagnosis in 2014–2016 and positive laboratory test(s) reported for selected routinely investigated diseases (*Cryptosporidium*, *Cyclospora*, *Salmonella*, Shiga toxin-producing *Escherichia coli* [STEC], and non-cholera *Vibrio*) and non-routinely investigated diseases (*Campylobacter*, *Entamoeba*, *Giardia*, *Shigella*, and *Yersinia*). We calculated how many laboratories performed multiplex PCR testing, frequency of multiplex versus standard testing, frequency of reflexive testing following multiplex testing, percentage of multiplex tests confirmed at public health laboratories, and delay between specimen collection and first positive result notification. Multivariable logistic regression was performed to determine whether age, sex, race, ethnicity, area-based poverty, and other factors were associated with multiplex test receipt.

RESULTS: Of 14,304 patients, 9% received a multiplex test, ranging from <1% conducted by two laboratories in 2014 to 19% by 12 laboratories in 2016. The proportion of patients with a positive multiplex PCR result receiving additional testing ranged from 11% (17/151) for *Giardia*-infected patients to 91% (164/181) for *Salmonella*. The percentage of patients with a positive multiplex PCR result receiving confirmatory testing at a public health laboratory was >75% for cases infected with all pathogens except *Giardia* and *Campylobacter*. The proportion of these patients with a positive confirmatory test ranged from 27% (33/123) for STEC-infected patients to 100% for *Entamoeba* (1), *Campylobacter* (4), and *Cyclospora* (13). Among patients with routinely investigated diseases who had specimens tested at laboratories conducting multiplex PCR testing, multiplex test receipt was strongly associated with diagnosis in 2016, hospitalization, Hispanic ethnicity, and residing in the boroughs of Bronx and Manhattan. The median time between specimen collection and first positive result notification was two days for multiplex tests, five days for other tests.

CONCLUSIONS: Multiplex PCR use increased over time in NYC, contributing to higher case counts and timelier laboratory reporting, but necessitating additional testing for public health action. The proportions of cases with reflexively tested specimens and with positive confirmatory test results varied by pathogen. Limitations include the inability to distinguish whether negative confirmatory test results were attributable to false positive multiplex tests or poor specimen handling. Recognizing that multiplex and other non-culture-based tests pose challenges to public health practice, in 2016 the NYC Board of Health mandated reflexive testing following positive non-culture test results.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Electronic Laboratory Reporting (ELR); Enteric Infectious Diseases; Surveillance

Consider for Different Presentation? Yes

Presenting Author Email Address(es) jlatash1@health.nyc.gov

Presenting Author(s) Julia Latash

Institution New York City Department of Health and Mental Hygiene

Affiliation CDC/CSTE Fellow

Submission Type ID	Breakout/Quick/Lightning/Poster 7567
Abstract Type	Breakout
Abstract Title Abstract	Use of Whole Genome Sequencing (WGS) during Investigation of Salmonella Enteritidis Pattern JEGX01.0004: Is WGS the Answer to an Egg's size in Futility?

BACKGROUND: *Salmonella* Enteritidis pattern JEGX01.0004 (SE 4) is one of the most common pulsed-field gel electrophoresis (PFGE) patterns in Tennessee (TN) and the United States. SE 4 clonality using PFGE methodology has limited the ability to detect outbreaks. In 2016, TN began conducting Whole Genome Sequencing (WGS) on selected isolates of SE to assist with cluster detection. We investigated a localized outbreak at Restaurant X in June 2016 and subsequently enhanced surveillance efforts using WGS throughout the summer.

METHODS: During the Restaurant X outbreak, a cohort study was conducted. Relative risks and chi-square p-values were calculated to identify foods associated with illness. Isolates or specimens from patients diagnosed with *Salmonella* infection were submitted to the TN Public Health Laboratory for confirmation, serotyping, PFGE, and WGS. Bioinformatic analysis was conducted at the Wadsworth Center (NYSDOH). Enhanced real-time surveillance for SE 4 cases with key demographic and geographic features and/or egg exposures was conducted. Inspections were conducted at an egg farm in TN by the Department of Agriculture and the US Food and Drug Administration.

RESULTS: The Restaurant X outbreak investigation identified an epidemiologically significant exposure of eating steak with raw egg Béarnaise sauce. Environmental Assessment at Restaurant X indicated that eggs were sourced from a local producer leading to enhanced surveillance using WGS for egg-associated cases. Two subsequent outbreaks at distinct restaurants were identified during the summer of 2016. Both sourced shell eggs from the previously implicated farm in TN. A total of 15 confirmed cases of SE 4 were identified between the two outbreaks. WGS conducted on all 15 SE 4 patient isolates were within 0-3 single nucleotide polymorphism's (SNPs) of each other. Two separate inspections of the farm yielded 6 *Salmonella* positive specimens including SE, although not within 0-3 SNPs of the human cases. Facilities who received eggs from this farm were provided education on safe egg handling and preparation.

CONCLUSIONS: An outbreak investigation implicating raw egg consumption led to enhanced surveillance for egg-associated SE 4 cases from a single egg producer. WGS was critical in the identification of a long-term SE 4 outbreak affecting multiple restaurants. While unable to identify the outbreak strain at the farm, the investigation led to identification of SE on the farm and implementation of public health actions to prevent additional illnesses. These outbreaks suggest that real-time sequencing of SE 4 in TN will identify outbreaks that previously were undetected using PFGE alone.

Submission Complete?	Yes
Committee Topic	Infectious Disease Enteric Diseases
Keywords	Enteric Infectious Diseases; Genomics; Foodborne Disease
Consider for Different Presentation?	Yes

Presenting Author Email Address(es) Steffany.Cavallo@tn.gov

Presenting Author(s) Steffany J. Cavallo

Institution Tennessee Department of Health
Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7763](#)

Abstract Type Lightning

Abstract Title Abstract
An Assessment of Culture Independent Diagnostic Tests for Enteric Diseases, New York State, 2015-2016

BACKGROUND: Culturing of organisms has been the principle clinical diagnostic test for enteric disease pathogens. The use of Culture Independent Diagnostic Tests (CIDT) represents a change in laboratory practice with important implications for public health surveillance and investigation. As the number of laboratories using CIDT increases, and the pathogens that can be tested through CIDT increase, we examine how this effects enteric disease surveillance in New York State (NYS), excluding New York City (NYC).

METHODS: NYS mandates electronic laboratory reporting for communicable diseases. Utilizing the Electronic Clinical Laboratory Reporting (ECLRS) system, we assessed changes in CIDT use for *Shigella* , *Campylobacter* and *Salmonella* between January 2015 and October 2016. Using LOINC codes and test descriptions when LOINC unavailable, we determined whether culture or CIDT was performed as the first diagnostic test and, assessed time from specimen collection to report to the state health department. Isolate submission to the state public health lab (PHL) is required for selected organisms including *Salmonella* , while not required for *Shigella* or *Campylobacter* . We assessed if an isolate was submitted to the PHL for *Salmonella* .

RESULTS: From January 2015 through October 2016, the number of CIDT reports received by ECLRS for *Shigella* increased from one report in 2015 to 14 reports from four laboratories in 2016. For *Campylobacter* , the number of CIDT reports increased from 57 from seven laboratories in 2015 to 174 from 11 laboratories in 2016. For *Salmonella* , the number of CIDT reports increased from 26 from five laboratories in 2015 to 93 from eleven laboratories in 2016. The median number of days between specimen collection and report to ECLRS was two for CIDT reports versus four for culture tests. Isolates from 19 of 26 (73.1%) CIDT positive *Salmonella* specimens in 2015 were submitted to the PHL for confirmation and serotyping; in 2016, 61 of 93 (65.6%) were sent.

CONCLUSIONS: There has been an increase in the use of CIDT testing among the enteric disease pathogens. The time from specimen collection to report receipt in ECLRS is less where CIDT is used. However, a decrease in *Salmonella* isolate submission to the PHL was noted, adversely affecting the ability to conduct additional molecular testing needed for cluster detection. Education for staff at local health departments on the interpretation of CIDT test results, and follow-up with clinical laboratories to ensure isolate submission to the PHL is a challenge that needs to be addressed to ensure complete and accurate investigation of enteric diseases.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Epi / Lab Capacity (ELC); Surveillance; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) candace.noonan-toly@health.ny.gov

Presenting Author(s) Candace M Noonan-Toly

Institution New York State Department of Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8582](#)

Abstract Type Lightning

Abstract Title Centralized *Salmonella* Case Investigation Identifies *Salmonella* Newport Outbreak Associated with 2016 Kansas State Fair
Abstract

BACKGROUND: Kansas implemented centralized interviewing for 96 local jurisdictions utilizing OutbreakNet Enhanced (OBNE) funding in January 2016. On September 30, 2016 an increase in *Salmonella* Newport cases reporting exposure to the Kansas State Fair was detected. Case interviews implicated a food vendor at the fair as the likely source. The local health department (LHD) and Kansas Department of Agriculture (KDA) were notified, and an outbreak investigation was initiated.

METHODS: Persons with laboratory-confirmed *Salmonella* infection were interviewed with a standard hypothesis-generating questionnaire (HGQ). Stool specimens from ill persons were stereotyped, and pulsed-field gel electrophoresis (PFGE) was performed. A case-control study was conducted to determine if any food items were associated with illness. The implicated food vendor, owned by a non-profit organization, was contacted for a list of their membership for case finding and to obtain controls for the study. A case was defined as illness consistent with salmonellosis in a person that reported eating food from the vendor. Confirmed cases had *Salmonella* Newport isolates with indistinguishable PFGE patterns, and probable cases were symptomatic or had laboratory evidence of salmonellosis without PFGE. Controls were persons who reported eating food from the vendor who were not symptomatic. Five controls were randomly selected per case. Inspection of the vendor and traceback identification of ingredients were conducted by KDA.

RESULTS: Ninety-five individuals were interviewed; 7 were confirmed and 3 were probable cases. Ten cases and 50 controls were used in the analysis. Both bean burritos (OR=5, 95%CI=0.91–26.85, p=0.05) and pork burritos (OR=7.4, 95%CI=1.65–33.12, p=0.01) were statistically associated with illness. Lettuce, tomatoes, and tortillas were common ingredients in both burritos. KDA's routine inspection revealed three violations that were corrected during inspection; ingredient traceback has been completed.

CONCLUSIONS: State fairs can foster environments where foodborne and zoonotic disease transmission can occur. This outbreak of *Salmonella* Newport was associated with eating two different types of burritos from a food vendor at the state fair. Centralized interviews were completed for the first 4 *Salmonella* cases within at least 3 weekdays of report. This led to the identification of the *Salmonella* Newport outbreak, 5 days before PFGE results were available to link the cases. Implementation of centralized interviewing has improved the quality and timeliness of *Salmonella* investigations resulting in the rapid detection of outbreaks leading to a faster more efficient outbreak response.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Epidemiologic Methods; Enteric Infectious Diseases; Epidemiology

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Mychal.Davis@ks.gov

Presenting Author(s) Mychal Christopher Davis

Institution Kansas Department of Health and Environment

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8692](#)

Abstract Type Lightning

Abstract Title Foodborne Botulism Associated with Store-Produced Tamales — Dallas County, Texas, 2016
Abstract

BACKGROUND: With improved prevention measures, foodborne botulism is an increasingly rare but still potentially fatal illness. An average of 17 cases are reported in the United States every year. In August 2016, a case of suspected foodborne botulism was reported in an 81 year-old female with compatible symptoms, prompting an intensive investigation into potential food sources.

METHODS: The patient, patient's family, and co-workers were interviewed to identify potential food sources and any other potentially exposed persons. Food samples were collected from the patient's home for laboratory testing. Epidemiologists and sanitarians conducted multiple site visits to the food establishment that prepared and sold the suspected food source. Syndromic surveillance data from area hospital emergency departments was reviewed as part of additional case-finding efforts.

RESULTS: *C. botulinum* toxin B was isolated from a stool specimen collected from the patient. The patient did not report consuming any home-canned goods or other food products typically associated with botulism. Of the multiple food items tested from the patient's home, one was positive for *C. botulinum*: beef tamales, which the case consumed approximately 12 hours before symptom onset. Prior to sale, the store-prepared tamales had been stored in sealed plastic bags and held in a food warmer below 135°F for up to 8-16 hours. Although botulism toxin was not directly detected in the tamales, *C. botulinum* isolated from the tamales produced toxin B. The *C. botulinum* isolates from the patient and the tamales were submitted for molecular analysis. No additional cases of botulism were identified.

CONCLUSIONS: Public health and healthcare providers should be aware that ready-to-eat tamales, prepared and held in conducive conditions, can be potential vehicles for foodborne botulism. Because of the difficulties in direct detection of botulism toxin in food products, molecular analysis of isolates could play an important role in definitively determining the food source of botulism outbreaks. Tamales, the suspected food vehicle, have not been reported in recent literature as a source of botulism. This investigation emphasizes the importance of proper food service management of pre-cooked foods and the importance of considering novel vehicles for foodborne botulism.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Epidemiology; Food Safety; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) michelle.ward@dallascounty.org

Presenting Author(s) Michelle Ward

Institution Dallas County Department of Health and Human Services

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8417](#)

Abstract Type Lightning

Abstract Title Investigation of a Norovirus Outbreak at a San Diego Elementary School
Abstract

BACKGROUND: On May 25, 2016, the San Diego County Epidemiology Program was notified of an outbreak of acute gastroenteritis at an elementary school. At least 60 students and 14 teachers were reported to be ill. Symptoms included vomiting and nausea. Duration of symptoms was unknown and diarrhea was not reported – suspected etiology was initially unclear. Food-borne transmission was not suspected. On May 26, additional students were reported with symptoms of diarrhea, nausea, and vomiting.

METHODS: Recommendations based on the California Department of Public Health guidance for prevention and controls of acute viral gastroenteritis outbreaks were provided. Specimen testing at the San Diego County Public Health Laboratory was performed. An online survey was developed for parents to report ill students, identify risk factors for infection, and to encourage stool specimen submission. A case was defined as a student or staff member who reported vomiting and/or diarrhea onset between May 17 and June 8, 2016. An epidemiologic curve was created based on absenteeism data, online survey results, and ill teacher interviews.

RESULTS: Of 760 students at the school, 74 (10%) were identified as cases. The estimated median age among students was 7 years (range: 5-12 years). Symptoms included vomiting (95%) and diarrhea (57%), with median illness duration of 13.6 hours (range: 1-96 hours). Specimens (2 vomitus and 2 stools) were tested for norovirus by real-time reverse transcription-polymerase chain reaction. Two specimens (1 vomitus and 1 stool) tested positive for norovirus genogroup I. Descriptive analysis showed that grade levels with the highest proportion of cases were the sixth (30%) and fifth (18%) grades. The grade level with the lowest proportion of cases was seventh grade (5.4%).

CONCLUSIONS: On May 23, a 5th grade student was reported to have vomited in the art classroom. Students from all grades (K-6) were rotated through the art classroom throughout the day. Additionally, 50% of teachers who were interviewed commented that illness among students and staff was likely due to contaminated environmental surfaces in the art classroom. Illness among students and staff decreased significantly after the school closed for 2 days and implemented appropriate control, prevention, and environmental disinfection measures.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Epidemiology; School Health

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Gabriela.Escutia@sdcounty.ca.gov

Presenting Author(s) Gabriela Escutia

Institution County of San Diego, Health and Human Services Agency
Affiliation CDC/CSTE Fellow

Submission Type Breakout/Quick/Lightning/Poster
ID [8254](#)

Abstract Type Lightning

Abstract Title Investigation of an Outbreak of Cryptosporidiosis Associated with a High School Football Team in Michigan
Abstract

BACKGROUND: In August 2016, the Kent County Health Department investigated an outbreak of cryptosporidiosis in which all symptomatic individuals (33 students and 7 adults) were associated with the varsity football team at a local high school.

METHODS: Environmental health and epidemiologic investigations were conducted to determine the source of the illness. Preliminary investigation identified a pre-season riverside camping retreat that players, coaches and parents attended prior to onset of illness. Once details of the retreat were obtained, a case control study was conducted to identify exposures associated with illness by calculating attack rates, odds ratios and confidence intervals. A case was defined as gastrointestinal illness occurring within 12 days of the retreat. Confirmed cases had a positive stool test for *Cryptosporidium*. Controls attended the retreat but reported no illness. Due to the large number of attendees and the difficulty of reaching them by phone, an on-line questionnaire was distributed via e-mail by the school superintendent to varsity football players and coaches.

RESULTS: Eighty-one online questionnaires were completed. The attack rate for primary cases was 49.4% (40/81). In addition to the 40 cases among retreat attendees, 7 cases occurred by secondary transmission among household members and team assistants. A statistical analysis of 28 water exposure variables and 32 food exposure variables determined that participating in a team mud fight was strongly associated with illness (OR=10.82, CI 3.5-33.6 p=.00003). Swimming in the river was also associated with illness (OR=4.39 CI 1.5-12.5, p=.008). A total of seven stool samples tested positive for the parasite *Cryptosporidium*.

CONCLUSIONS: *Cryptosporidium* is commonly found in river water and is introduced by human or animal sources. In the days leading up to the retreat, there were heavy rains in the area, which potentially introduced the parasite into the river from surrounding fields. Proper hygiene materials were not available at the rustic campsite and after the mud fight, most players simply rinsed themselves in the river prior to eating dinner. During this investigation, timely physician, school, and electronic surveillance reporting led to early identification of the parasite. Disease prevention interventions, including the cancellation of the team's first game, prevented further transmission. This outbreak was cited by the district superintendent as "an excellent example of a county health department and a public school district working together in the interests of students and families." This outbreak serves as a reminder about the pathogenic danger of exposure to river water.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Environmental Exposures; Epidemiology; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Julie.Payne@kentcountymi.gov

Presenting Author(s) Julie Payne

Institution Kent County Health Department

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8366](#)

Abstract Type Lightning

Abstract Title Abstract
Outbreak of *Salmonella* Javiana Associated with a Powwow – South Dakota, 2016

BACKGROUND: In July 2016, through routine case interviews, the South Dakota Department of Health (SDDOH) identified five cases of *Salmonella* that shared a common exposure at a powwow held on a Native American reservation from June 24-26. The local tribe and Indian Health Service (IHS) unit were contacted and a collaborative investigation was initiated.

METHODS: The tribe appointed IHS as the lead agency for the outbreak investigation. SDDOH provided support by offering outbreak investigation guidance, laboratory testing, data management, data analysis, and traceback. A case-control study was conducted to evaluate specific food items from the powwow that may have been associated with illness. A probable case was defined as a person who subsequently became ill with diarrhea after eating food from the powwow or who was epi-linked to another probable or confirmed case; confirmed cases had *Salmonella* Javiana isolated from a clinical specimen with the outbreak PFGE pattern (JGGX01.0172). Controls were persons who ate food served at the powwow and reported no subsequent illness.

RESULTS: A total of 112 cases (46 confirmed, 66 probable) were identified in the outbreak. Illness onset dates ranged from June 25 to August 11. Numerous food items served at the powwow were statistically associated with illness by univariate analysis, with macaroni salad demonstrating the highest odds ratio (OR = 10.2; 95% CI, 4.8 to 21.8; p = 0.000). By multivariate analysis using logistic regression, macaroni salad (adjusted OR = 4.2; 95% CI, 1.6 to 11.1; p = 0.004) and kool-aid (adjusted OR = 2.7; 95% CI, 1.1 to 7.4; p = 0.05) remained independently associated with illness. An environmental investigation found that food served during large evening meals was left outside of temperature control, some for more than 6 hours. No food was available for laboratory testing.

CONCLUSIONS: This was an outbreak of *Salmonella* Javiana associated with food served at a powwow, and the second largest outbreak of salmonellosis in South Dakota history. The ultimate source of the *Salmonella* contamination was not determined. However, the most plausible source was either an unidentified infected food worker or an infected powwow attendee who contaminated the food(s) and/or serving utensils. This investigation highlights the importance of leveraging and maintaining partnerships with local tribes and IHS.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Foodborne Disease; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Dustin.Ortbahn@state.sd.us

Presenting Author(s) Dustin Ortbahn

Institution South Dakota Department of Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8569](#)

Abstract Type Lightning

Abstract Title Restaurant-Associated Outbreak of Cyclosporiasis in Austin, Texas 2016
Abstract

BACKGROUND: In July 2016, the Austin Public Health Department (APH) started to receive an influx of laboratory confirmed cyclosporiasis cases from local laboratories. Travis County received the highest number of cases (n=27) reported by any county in Texas during a 3-month period for the second year in a row. This case study details a local health department's quick response to a another outbreak associated with a restaurant involving case interviews and initial traceback investigation utilizing lessons learned from the 2015 cyclosporiasis outbreak.

METHODS: An outbreak investigation was initiated to identify clusters of illness and potential food vehicles. All cases were interviewed using a state supplied case investigation form for cyclosporiasis and food histories were collected. Applying the same investigative approach as the 2015 outbreak, a restaurant line list was generated and common meal items were analyzed to identify a restaurant cluster of illness. Restaurant site visit with the manager helped hone in on specific fresh produce ingredients by reviewing recipes and supplier invoices.

RESULTS: Twenty-five confirmed cases and 2 probable cases of cyclosporiasis that had onsets of illness between June 13, 2016 and August 13, 2016 were investigated. A cluster of illness was identified at a local restaurant with 6 separate dining parties and 3 employees. Trace back investigation converged on two produce suppliers focusing in on carrots and green cabbage, ingredients in a coleslaw salad used in several dishes.

CONCLUSIONS: Through initial trace back investigation conducted by state agencies, it was determined the suspect food vehicles for this outbreak may have had Mexico origin. Though the FDA import ban placed on cilantro in 2015 significantly reduced the amount of cyclosporiasis cases nationally and statewide, this investigation potentially identified two new produce items that have not been linked to domestically acquired cyclosporiasis. This outbreak it is important reminder to remain vigilant for other sources of contamination for domestically acquired cyclosporiasis cases.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) laura.fox@austintexas.gov

Presenting Author(s) Laura C Fox

Institution Austin Public Health

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7840](#)

Abstract Type Lightning

Abstract Title Salmonella Potsdam Outbreak at a Restaurant in Connecticut
Abstract

BACKGROUND : In January 2016, the Connecticut (CT) Department of Public Health (DPH) identified five laboratory-confirmed *Salmonella* Potsdam cases, an unusual serotype in CT. Initial interviews identified eating at the same food service establishment (FSE) during December 2015 – January 2016 as a common exposure. Epidemiologic, laboratory, and environmental investigations were initiated to further categorize the extent of illness and pinpoint the source of exposure.

METHODS : Cases were first interviewed using a standard questionnaire. Once an epidemiologic link was made to a common FSE, cases were re-interviewed and asked specifically about the FSE and food items consumed. Cases were defined as individuals with laboratory-confirmed *S. Potsdam*, with onset of symptoms within 72 hours after dining at the FSE during December 2015 – January 2016. Probable cases were defined as dining companions of confirmed cases with onset of diarrhea within 72 hours after dining at the FSE who did not seek medical attention. Isolates of *S. Potsdam* were tested using Pulsed-field gel electrophoresis (PFGE) and whole genome sequencing (WGS) at the Katherine A. Kelley State Public Health Laboratory (PHL). Samples collected during the environmental investigation at the FSE were submitted to the PHL for testing and included food worker stool specimens, food, and environmental samples.

RESULTS : Four *S. Potsdam* isolates were indistinguishable by PFGE at the PHL; the fifth isolate differed by one band. Results from WGS indicated that when compared to each other, all five *S. Potsdam* isolates were genetically indistinguishable from one another, including the isolate that differed on PFGE by one band. All five cases reported eating a tongue and tripe appetizer at the same FSE during December 2015 – January 2016. An additional four probable cases were identified; all consumed the tongue and tripe appetizer. Nine food worker stool specimens, 7 food samples, and 9 environmental swabs tested negative for *Salmonella* at the PHL.

CONCLUSIONS: An outbreak of *Salmonella* Potsdam occurred at a FSE in New Haven County in late December 2015 and early January 2016. All five cases were epidemiologically linked not only to the same FSE but also to one common menu item. Serotyping and PFGE testing was critical in rapid identification of the outbreak. In addition, WGS results were able to definitively link to the outbreak one case that had differed based on PFGE. Routine use of WGS will enhance outbreak detection and investigation, in particular, with isolates for which PFGE is less discriminating.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Foodborne Disease; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) jaime.krasnitski@ct.gov

Presenting Author(s) Jaime Krasnitski

Institution Connecticut Department of Public Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8027](#)

Abstract Type Poster

Abstract Title Burden of Exclusion from Work and Child Care Associated with Enteric Diseases in New York City, 2013–2015
Abstract

BACKGROUND: The New York City (NYC) Department of Health and Mental Hygiene routinely investigates reported enteric diseases, often leading to public health action. Patients employed or engaged in activities with high risk for transmission, such as food handling, health care, or attendance at child care/preschool are excluded from high risk settings until asymptomatic or, when appropriate, until stool specimens are negative, and/or affected facilities are notified. Exclusion from work and child care can be burdensome to employees and parents.

METHODS: Reported, confirmed cases of *Salmonella* (including *S. Typhi* and *S. Paratyphi*), hepatitis A, *Campylobacter*, shiga toxin-producing *Escherichia coli*, and *Shigella* diagnosed during January 2013–December 2015 among NYC residents were analyzed. All cases are routinely investigated except for *Campylobacter*, for which only a sample of cases are investigated because of high volume. Patients are interviewed to collect data on employment or activities in high risk settings. Patients were summarized by demographic factors and length of exclusion.

RESULTS: During 2013–2015, 10,508 confirmed cases were reported, and 4,056 (39%) patients were interviewed. *Campylobacter* (5256, 50%) and *Salmonella* (3234, 31%) accounted for 81% of cases. Of interviewed patients, 448 (11%) worked at or attended a high-risk setting and required public health action; 193 (5%) required exclusion and 146 (4%) required negative stools. Patients were excluded for a median of 16 days, range: 2–196 days. Among 212 patients working in high-risk settings and requiring public health action, 96 were health care workers, 93 were food handlers, 27 were child care workers, and 32 worked in other high-risk settings (the categories are not mutually exclusive). Children <5 years-old accounted for 3,175 (30%) patients. Among 1,356 (43%) children whose parents or guardians were interviewed, 236 (17%) attended a child care/preschool, and 83 (6%) required exclusion.

CONCLUSIONS: To prevent outbreaks, patients with enteric infections must be excluded from high-risk settings. In NYC, a 2014 law requires employers to provide one hour of sick leave for every 30 hours worked, with a maximum accumulation of 40 hours of sick leave. The median length of exclusion might exceed available paid sick leave for workers. Minimizing the duration of exclusion for enteric diseases such as reassigning tasks for workers and isolating or cohorting ill children in child care setting and increasing the availability of paid sick leave or other compensation could reduce the burden of exclusions on affected persons.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) astoute@health.nyc.gov

Presenting Author(s) Alaina J. Stoute

Institution New York City Department of Health and Mental Hygiene

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8151](#)

Abstract Type Poster

Abstract Title Characterization of Salmonella Javiana Cases in Georgia, 2013-2015
Abstract

BACKGROUND: *Salmonella* represents a substantial public health burden in Georgia with approximately 2,000 cases yearly. The Georgia Department of Public Health interviews *Salmonella* cases to collect information on demographics, symptoms, and potential food and other exposures. In 2014, the interview form was standardized across all Foodborne Diseases Active Surveillance Network (FoodNet) sites. From 2009 to 2015, *Salmonella* Javiana has been the most common serotype in Georgia. A single Pulsed Field Gel Electrophoresis (PFGE) pattern comprises approximately 29% of *S. Javiana* isolates. This common pattern may have different demographic and exposure characteristics compared to other patterns.

METHODS: Demographic, symptom, and exposure data for *S. Javiana* cases from 2013-2015 were linked with PFGE results obtained from the Georgia Public Health Laboratory. The most common PFGE pattern was classified as endemic, patterns with three or fewer annual isolates as rare, and others as less common. Georgia Department of Natural Resources definitions were used to assign geographic regions. USDA urban/rural codes were used to define rurality. Eighteen exposures were selected based on a subset of FoodNet variables and common food and animal vehicles associated with *S. Javiana* during outbreak investigations. Analysis of exposure data was limited to cases for whom at least 90% of exposure variables were complete. Analysis was performed comparing endemic patterns to non-endemic (rare and less common) patterns using SAS version 9.4 using a p-value of 0.05 for significance.

RESULTS: There were 1,126 *S. Javiana* cases reported from 2013 to 2015. Three hundred twenty-nine isolates (29.3%) were the endemic pattern, 522 (46.5%) were less common, and 271 (24.2%) were rare; 548 (48.8%) of cases were female; 713 (72.8%) were White and 233 (23.8%) were Black; 695 (61.7%) were under the age of 18. Children were more likely to have an endemic pattern than adults ($p=0.009$). There were no significant racial or gender differences and no association by geographic region or rurality. Two hundred thirty-three (20.7%) cases were included in the exposure analysis. Drinking well water ($p=0.028$) and contact with live poultry ($p=0.039$) were associated with infection by the endemic pattern. Eating chicken prepared outside the home was negatively associated ($p=0.044$).

CONCLUSIONS: Children were significantly more likely to have infections with the endemic *S. Javiana* pattern than adults. The association with well water and live poultry contact implies an environmental source. The lack of an association with geographic regions or rurality makes it harder to determine which factors may be responsible.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Epidemiology; Enteric Infectious Diseases; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) mark.rosenthal@dph.ga.gov

Presenting Author(s) Mark Rosenthal

Institution Georgia Department of Public Health

Affiliation CDC/CSTE Fellow

Submission Type Breakout/Quick/Lightning/Poster
ID [7806](#)

Abstract Type Poster

Abstract Title Abstract
Cryptosporidiosis in the United States, 2011–2015

BACKGROUND: Cryptosporidiosis is a nationally notifiable gastrointestinal illness caused by protozoa of the genus *Cryptosporidium*. The parasite's extreme chlorine tolerance has facilitated its emergence as the leading cause of waterborne disease outbreaks, particularly those associated with aquatic venues (e.g., swimming pools). In the United States, an estimated 748,000 cryptosporidiosis cases occur annually. Previously reported analyses of case surveillance data, reported to CDC through the National Notifiable Diseases Surveillance System (NNDSS), found that after 2004 the annual incidence of cryptosporidiosis rose >3-fold (1995–2012). We analyzed cryptosporidiosis data from 2011–2015, the last 5 years for which data have been finalized, to characterize disease epidemiology.

METHODS: Descriptive analyses of 2011–2015 NNDSS cryptosporidiosis case surveillance data were conducted using SAS 9.3. Cases were categorized as confirmed or nonconfirmed (probable, suspect, or unknown) using the 2011 and 2012 national case definitions and by region (Northeast, Midwest, South, Northwest and West) as defined by the U.S. Census Bureau. The West region was further subdivided into Northwest and Southwest. Rates per 100,000 population were calculated using Bridged-Race Census population data, obtained via CDC WONDER (Wide-ranging Online Data for Epidemiologic Research).

RESULTS: A total of 44,852 cryptosporidiosis cases (64.2% confirmed and 35.8% nonconfirmed) were reported for 2011–2015. High percentages of missing data for race and ethnicity made the data unreliable. The 5-year average annual incidence rate was 2.8 cases/100,000 population. The incidence rate was nearly equivalent when stratified by sex (2.8 male, 2.9 female). The rate of cryptosporidiosis was highest in children ages 1–4 years (7.2) and adults ages >80 years (5.4). The Midwest region consistently had the highest annual incidence rate (4–6.3), the Southwest region the lowest (1–1.4). Cryptosporidiosis in the United States showed a marked seasonality, with 46.9% of symptom onset dates occurring in the summer months.

CONCLUSIONS: The proportion of confirmed cryptosporidiosis cases reported to CDC remained consistent during 2011–2015 despite 2011 and 2012 laboratory-focused changes to the national case definition. This likely reflects changes in the diagnostic landscape and challenges to classifying cases based on diagnostic test type. Higher rates in young children and marked seasonality might reflect increased use of communal recreational water and underscore the need for healthy swimming campaigns to target parents of young swimmers before the summer swim season. It is unclear why reporting in the Midwest and elderly adults is increased and warrants further study.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Waterborne Disease; Enteric Infectious Diseases; Surveillance

Consider for Different Presentation? Yes

Presenting Author Email Address(es) kgf9@cdc.gov

Presenting Author(s) Kathleen Fullerton

Institution Centers for Disease Control and Prevention

Affiliation CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [8610](#)

Abstract Type Poster

Abstract Title Abstract
Cryptosporidium Outbreak Associated with the Consumption of Unpasteurized Cow Milk, New Mexico

BACKGROUND: The dangers of consuming unpasteurized milk are well documented. Numerous pathogens can contaminate raw milk and may subsequently cause illness, disease, and death. The majority of outbreaks involving unpasteurized dairy products have been caused by *Campylobacter* spp. followed by Shiga toxin-producing *Escherichia coli* and *Salmonella* spp. Outbreaks of *Cryptosporidium* associated with unpasteurized cow milk have not been well described. Instead, *cryptosporidiosis* is most often associated with recreational water. We characterize a *Cryptosporidium* outbreak associated with the consumption of unpasteurized cow milk.

METHODS: The New Mexico Department of Health initiated a multi-agency investigation on September 13, 2016 after 3 laboratory-confirmed cases of cryptosporidiosis associated with raw cow milk consumption were identified from routine case investigations. A supplemental questionnaire was developed to collect detailed information on exposures to unpasteurized dairy products. Laboratory-confirmed *Cryptosporidium* and epidemiologically-linked cases identified from June to December 2016 were interviewed. Stool and milk specimens were collected and sent to the Centers for Disease Control and Prevention (CDC) for polymerase chain reaction (PCR) testing and/or microscopy and molecular typing by restriction fragment length polymorphism (RFLP) and DNA sequencing.

RESULTS: In total, 7 cases (6 laboratory-confirmed, 1 epidemiologically-linked) that consumed unpasteurized milk from a local New Mexico dairy were identified. One cluster of 6 cases was identified with illness onset ranging from August 28-September 2, 2016. One additional outbreak-associated case with illness onset of November 24, 2016 was also identified. The ages ranged from 1 year-60 years old (median=32 years); 5 cases were male. Of the 4 stool specimens submitted to CDC, 3 were positive for *Cryptosporidium parvum* by conventional PCR and RFLP testing, 2 of which were subtyped as IIaA18G3R1. Unpasteurized milk produced prior to illness onset was unavailable for testing. No *Cryptosporidium* was detected from milk specimens produced at the dairy after illness onset of cases.

CONCLUSIONS: Epidemiologic evidence indicated unpasteurized milk as the likely source of the *Cryptosporidium* outbreak. Potential sources of infection other than unpasteurized milk were not identified. Molecular typing of stool specimens further supported the evidence. As milk produced prior to illness onset dates was not available for testing, it was not possible to show evidence of a milk contamination. Nonetheless, considering the increase in the number of outbreaks associated with unpasteurized dairy products, *Cryptosporidium* should be considered as a potential source of contamination of raw milk and unpasteurized milk associated outbreaks.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Foodborne Disease; Outbreaks; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Brooke.Doman@state.nm.us

Presenting Author(s) Brooke Doman

Institution New Mexico Department of Health

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 8381
Abstract Type	Poster
Abstract Title Abstract	Epi Info Web Survey Aids in Multi-Jurisdictional Salmonellosis Foodborne Outbreak Investigation Associated with a Wedding Reception in Alabama BACKGROUND: On November 14, 2016, the Alabama Department of Public Health (ADPH), Infectious Disease & Outbreaks Division (ID&O) investigated a gastrointestinal illness outbreak following a wedding. The wedding reception was attended by 150 individuals. The food for the reception was prepared across jurisdictional lines in a separate county, and health area, than where the reception took place. METHODS: The investigation consisted of a surveillance line list to capture information on the individuals who reported eating at the wedding reception and their demographics. The menu from the wedding was used to create an Outbreak-Specific Questionnaire (OSQ) in Epi Info 7™ and disseminated via email. Stool specimens were requested from the ill to identify the etiologic agent(s) and submitted for laboratory testing by the State Laboratory, where pulsed-field gel electrophoresis (PFGE) was performed on isolates. Environmental Science was sent to the wedding venue and catering facility on November 14 to conduct an inspection and collect environmental specimens. A case was defined as an individual who ate food from the wedding on November 12, 2016, and became ill with diarrhea or vomiting within three days. A case was further defined as confirmed or probable. A confirmed case met the above criteria and had cultured laboratory confirmation of the identified organism <i>Salmonella enteritidis</i> . A probable case was defined as anyone who met the above criteria without cultured laboratory confirmation. RESULTS: Seventy-one OSQs were analyzed. According to the OSQs, the risk of illness was 3.88 times higher for those who consumed grilled chicken than those who did not (p<0.01). Individuals who consumed the parmesan mashed potatoes where 1.94 times more likely to become ill than those who did not (p<0.01). Sixty-four individuals were identified as part of this outbreak, meeting Confirmed or Probable case definitions. The BCL determined that 28 isolates from clinical specimens associated with this wedding outbreak had the <i>Salmonella enteritidis</i> PFGE pattern JEGX01.0021, which matched the PFGE patterns from 3 food samples associated with this outbreak. The OSQ showed a commonality of consumption of grilled chicken and mashed potatoes. CONCLUSIONS: Using Epi Info web-based survey for the OSQs allowed ID&O to quickly distribute and analyze surveys, which led to targeted testing and identification of contaminated food items. Epidemiologic and laboratory data suggest that the route of transmission was the result of cross contamination which highlights the importance of proper food preparation practices among food service providers.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Data Collection; Foodborne Disease; Enteric Infectious Diseases
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	Miranda.Daniels@adph.state.al.us
Presenting Author(s)	Miranda Daniels
Institution Affiliation	Alabama Department of Public Health State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7656](#)

Abstract Type Poster

Abstract Title
Abstract Giardiasis in the United States, 2011-2015

BACKGROUND: Giardiasis is a nationally notifiable gastrointestinal illness caused by the protozoan parasite *Giardia duodenalis*. In addition to acute gastrointestinal symptoms, it can cause chronic sequelae, leading to malnutrition and delayed physical and mental growth in children. An estimated 1.2 million cases occur yearly, with about one percent of cases reported. Case surveillance data is reported by 43 states to CDC through the National Notifiable Diseases Surveillance System (NNDSS). In this study, giardiasis case surveillance data from 2011-2015 are summarized.

METHODS: We aimed to describe the epidemiology of giardiasis in the US for 2011-2015 NNDSS data using SAS 9.3. Cases were categorized as confirmed or nonconfirmed (probable, suspect, or unknown) and by region (Northeast, Midwest, South, Northwest and West) as defined by the U.S. Census Bureau. The West region was further subdivided into Northwest and Southwest. Rates per 100,000 individuals were calculated using Bridged-Race Census population data obtained from CDC WONDER (Wide-ranging Online Data for Epidemiologic Research).

RESULTS: Between 2011 and 2015, giardiasis caused at least 76,734 (98.2% confirmed and 1.78% nonconfirmed) cases of illness. Incidence of giardiasis was higher in males (59.7%) than in females. High percentages of missing data for race and ethnicity made the data unreliable. The Northwest consistently had the highest rate of reported cases (8.2-9.4), while the South and Southwest shared the lowest rate of reported cases (4.6-5.2). The national five-year average annual incidence rate was 6.5 cases per 100,000 individuals, with cases most frequently reported in children under 10 years of age, with a peak in children 1-4 years (14.6). Giardiasis reported symptom onset was highest in summer months, with a peak in August (12.7%). In 2014, the number of state jurisdictions opting not to report increased from 6 to 7.

CONCLUSIONS: Giardiasis disproportionately affects young children, which highlights a continued need for safe water, sanitation, and hygiene education to both children and parents to reduce contamination risk and secondary transmission. The ability to interpret and understand national giardiasis epidemiology is affected by the number of states reporting cases as well as the completeness of the data reported by those states. To accurately characterize the national burden of giardiasis and introduce more effective public health prevention strategies, there is a need for more complete reporting of giardiasis among reporting jurisdictions.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Waterborne Disease; Surveillance

Consider for Different
Presentation? Yes

Presenting Author
Email Address(es) kgf9@cdc.gov

Presenting Author(s) Kathleen Fullerton

Institution Centers for Disease Control and Prevention
Affiliation CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [8264](#)

Abstract Type Poster

Abstract Title Impact of Culture-Independent Diagnostic Testing on Enteric Co-Infections—Georgia, 2014-2016
Abstract

BACKGROUND: In 2014, hospital and reference laboratories in Georgia began adopting culture-independent diagnostic testing (CIDT) methods to identify bacterial enteric pathogens. Based on the 2016 Georgia Foodborne Disease Active Surveillance Network (FoodNet) laboratory survey, more than 40% of laboratories use CIDT methods to identify enteric pathogens. The use of CIDTs creates challenges for public health surveillance due to limited understanding of their sensitivity and specificity, variations among test type and brand, and the possibility of false positives or multiple pathogens identified (co-infections). Co-infections are a clinical and epidemiologic issue because treatment and public health interventions vary among pathogens. We sought to understand the impact of CIDTs on the frequency and type of co-infections by testing methodology in Georgia.

METHODS: Active laboratory-based surveillance is conducted by the Georgia Department of Public Health (DPH) for seven bacterial enteric pathogens: *Campylobacter*, Shiga-Toxin Producing *E.coli* (STEC), *Salmonella*, *Shigella*, *Listeria*, *Yersinia*, and *Vibrio*. Detailed laboratory testing information is collected and entered into the State Electronic Notifiable Disease Surveillance System (SendSS); data from July 2014 to July 2016 were analyzed. A co-infection was defined as a person diagnosed with two enteric pathogens within a 30-day period. Classifications as confirmed or suspect/probable cases were based on the Council for State and Territorial Epidemiologist (CSTE) case definition (confirmed identified by culture, suspect/probable identified by CIDT). Variations among co-infections by case classification and testing methods were assessed using SAS 9.3.

RESULTS: Between July 2014 and July 2016, 10,748 bacterial enteric infections were reported to DPH. Among these, 224 (2.1%) individuals were positive for multiple pathogens; resulting in 112 paired co-infections. Paired co-infections with the highest frequency were *Campylobacter* and *Shigella* (27.7%), *Salmonella* and STEC (18.8%), *Campylobacter* and *Salmonella* (16.1%), *Campylobacter* and STEC (14.3%) and *Salmonella* and *Shigella* (14.3%). 54.5% of paired co-infections had one confirmed pathogen and one suspect/probable pathogen, 33.9% were both confirmed, and 11.6% were both suspect/probable. Among paired co-infections meeting the suspect/probable case definition for at least one pathogen (66.1%), 44.9% were identified by polymerase chain reaction (PCR) and 30.6% by enzyme immunoassay (EIA).

CONCLUSIONS: More than half of all co-infections were identified using a CIDT method. PCR-based enteric panels were the most common CIDT method to identify co-infections. Further research should focus on the relationship between co-infections and testing method to better understand the possibility of false positives and the effect on public health surveillance and the epidemiology of bacterial enteric pathogens.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Epidemiology; Surveillance

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Bethany.Laclair@dph.ga.gov

Presenting Author(s) Bethany LaClair

Institution Georgia Department of Public Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8228](#)

Abstract Type Poster

Abstract Title Abstract Increase in Sporadic Salmonellosis Cases, 2015-2016 - Central District Health Department, Idaho

BACKGROUND: In 2015, culture-confirmed, non-outbreak related cases of salmonellosis reported to Central District Health Department (CDHD) rose significantly as compared to prior years and this trend continued into 2016. A retrospective analysis was conducted in order to determine if personal or environmental risk factors for sporadic Salmonella infection have changed or if the higher case counts in 2015 and 2016 could be related to increased testing as a result of culture-independent diagnostic testing (CIDT) implementation within a local health system (Health System A).

METHODS: A retrospective analysis was conducted of all culture-confirmed, non-outbreak related salmonellosis cases reported to CDHD from January 1, 2010 to November 30, 2016. Cases were assigned to the 2010-2014 or 2015-2016 study periods based on calendar year of report to CDHD. Information including serotypes, relevant food history exposures, environmental exposures, and risk factors for illness were originally collected via standard epidemiologic interview and analyzed using Microsoft Excel and Epi Info 7.

RESULTS: A total of 283 culture-confirmed, non-outbreak related salmonellosis cases were identified during the full analysis period. There were 157 cases in the 2010-2014 group with a mean of 31.4 cases reported per year and with 12-17 different serotypes reported per year. In the 2015-2016 period there were 126 cases with a mean of 63 cases reported per year with 27 different serotypes reported in 2015 and 22 in 2016. Cases in the 2015-2016 time period were more likely to have been immunocompromised χ^2 (3, N=149)= 5.86, p=0.015 and were less likely to report exposure to animals χ^2 (3, N=243)= 7.72, p=0.005. There were no statistically significant differences in having traveled inside or out of the United States, recreational water exposure, or exposure to poultry or eggs between the two time periods. Additionally, there was no statistically significant difference in the proportion of cases tested through Health System A between the two time periods.

CONCLUSIONS: An increase in number and serotype diversity was seen among sporadic salmonellosis cases reported to CDHD in 2015 and 2016. People diagnosed during this time period were more likely to have been immunocompromised, however other common risk factors for illness did not differ from prior years. These results suggest that low-level food or environmental contamination may be increasing in prevalence although further analysis is warranted.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Local Epidemiology; Surveillance; Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) lhaskell@cdhd.idaho.gov

Presenting Author(s) Lindsay Haskell

Institution Central District Health Department

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8576](#)

Abstract Type Poster

Abstract Title Norovirus Outbreaks in Pennsylvania, National Outbreak Reporting System, 2009 – 2015
Abstract

BACKGROUND: Norovirus is a leading cause of acute gastroenteritis and enteric outbreaks in the United States. Surveillance of norovirus infection is challenging as testing for it is not widely performed. However, in Pennsylvania, persons in outbreaks occurring in institutional and other settings are routinely tested for norovirus at the state laboratory. We analyzed Pennsylvania data entered into the National Outbreak Reporting System (NORS) to better understand the epidemiology of norovirus outbreaks in the state.

METHODS: Since 2009, the Pennsylvania Department of Health has reported enteric outbreak data to CDC through the National Outbreak Reporting System (NORS). In this analysis, an outbreak was defined as ≥ 2 cases of a similar enteric illness associated with a common exposure, consistent with CDC guidelines for confirmation of etiologies in foodborne disease outbreaks. Datasets were downloaded from NORS and analyzed using SAS 9.3.

RESULTS: During 2009–2015, 758 outbreaks attributed to norovirus were reported to NORS. This represented 49.4% of all reported enteric outbreaks. The annual number of norovirus outbreaks increased 39% over the study period, from 99 in 2009 to 138 in 2015. There were 34,470 associated illnesses, with a median outbreak size of 35 persons. Most outbreaks (669 or 88.3%) were considered to be primarily transmitted by person-to-person contact; 25 (3.3%) were considered to be due to contaminated food. Most reported outbreaks (489 or 64.5%) occurred in long-term care facilities (LTCFs), 26 (3.4%) in private homes, 20 (2.6%) in hospital/health care facilities and 15 (2.0%) in day care centers. Among 615 outbreaks occurring in institutional settings with information regarding illness in residents and staff, 8,405 illnesses (28.6% of 29,413 total) occurred in staff members. Eighty-six percent of norovirus outbreaks occurred during the winter months from November to March.

CONCLUSIONS: Of norovirus outbreaks identified in and reported by Pennsylvania, most were associated with person-to-person transmission at LTCFs, as well other institutional settings such as health care facilities and day care centers. Norovirus is extremely contagious, making prevention and control challenging, and strict adherence to infection control practices necessary. There was a substantial number of ill institutional staff members. Although we could not determine from our data if ill staff members were exposed at work or brought norovirus into the facility, our findings reiterate the importance of ensuring that workers should not provide healthcare or prepare food while ill.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Outbreaks; NORS (National Outbreak Reporting System)

Consider for Different Presentation? Yes

Presenting Author Email Address(es) dchen@pa.gov

Presenting Author(s) Danyang Chen

Institution Pennsylvania Department of Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8093](#)

Abstract Type Poster

Abstract Title Outbreak of Salmonella Enteritidis Associated with a Restaurant in Kentucky, 2016
Abstract

BACKGROUND: In February 2016, the Kentucky Department for Public Health (KDPH) and a local health department (LHD) investigated an outbreak of *Salmonella* Enteritidis in east central Kentucky. The cases reported dining at a restaurant (Restaurant A) prior to becoming ill.

METHODS: A case was defined as: Any individual or close contact of an individual who ate at or visited Restaurant A from January 10 through February 6, 2016 and exhibited signs or symptoms consistent with *Salmonella* infection and/or tested positive for *Salmonella*. Initial cases were interviewed with the Kentucky Foodborne/Waterborne Illness Investigation Form. Once the link with the restaurant was established, cases were interviewed with an outbreak specific questionnaire focused on restaurant menu items. A case-control study was conducted with ill cases and well dining companions to identify a food vehicle. The Kentucky Division of Laboratory Services serotyped and performed pulsed-field gel electrophoresis (PFGE) analysis on all clinical isolates available. Several environmental assessments were conducted. All restaurant employees voluntarily submitted stool specimens for testing. Eight food samples were collected from the restaurant for laboratory analysis via polymerase chain reaction (PCR) and culture. Whole genome sequencing (WGS) was performed on eight clinical and two food isolates.

RESULTS: A total of eighty-five cases (fifty culture-confirmed, twenty-nine probable, six suspect) were identified as part of the outbreak, including two restaurant employees. All but one of the cases reported dining at Restaurant A prior to becoming ill. That case was a close contact of a probable case who had eaten at the restaurant. A total of seventy-one cases and sixty-two controls were included in the case-control study, but no food item was identified as the likely vehicle. Laboratory testing of the clinical isolates identified *Salmonella* Enteritidis, pattern JEGX01.0023 as the primary outbreak strain. Isolates with other PFGE patterns were confirmed to be part of the outbreak by WGS. Three of the food samples yielded *Salmonella*, but none were the outbreak strain.

CONCLUSIONS: Thorough epidemiologic, laboratory, and environmental investigations successfully linked this outbreak to Restaurant A, but were unable to identify the outbreak source. WGS helped link isolates with PFGE patterns differing from the outbreak strain. During the environmental investigation, no major violations were noted. It is unknown whether or not the ill employees were the cause or victims of the outbreak. The restaurant re-opened February 27, 2016 following a food handler's safety class provided by the KDPH and LHD.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Infectious Diseases; Outbreaks; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) carrell.rush@ky.gov

Presenting Author(s) Carrell Rush

Institution Kentucky Department for Public Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8115](#)

Abstract Type Poster

Abstract Title Outbreak of Salmonellosis Associated with Seaweed from a Local Aquaculture Farm—Oahu, 2016
Abstract

BACKGROUND: Raw seaweed is popular in Hawaiian and Asian cuisines; aquaculture farming of seaweed has not previously been implicated as a source for foodborne illness. In October 2016, the Hawaii Department of Health (HDOH) State Laboratories Division (SLD) identified a cluster of *Salmonella enterica*, serovar Weltevreden cases with a rare *Xba*I pulsed-field gel electrophoresis (PFGE) pattern. We present our investigation linking a salmonellosis outbreak to a single aquaculture farm on Oahu.

METHODS: A case was defined as a *S.* Weltevreden infection with isolate *Xba*I pattern JQPX01.0061 and illness onset in October 2016 or later. Cases were interviewed using a standardized questionnaire on possible exposures and foods consumed before infection. Product traceback was performed for suspect foods. Environmental and product samples, collected from an implicated producer, were screened for *Salmonella* using an enzyme-linked fluorescent assay. Organisms were then isolated, identified, serotyped, and analyzed by PFGE.

RESULTS: Fifteen cases were identified with onset dates ranging from October 15–31, 2016. Median case age was 37 years (range 8–88 years). Nine (60%) were female; four (27%) were hospitalized. Thirteen (87%) cases reported consuming limu poke—a dish comprising raw fish and seaweed—in the week before onset. The seaweed was traced back to one aquaculture farm on Oahu. One (8%) of 12 seaweed samples and 10/36 (28%) water samples collected from the farm were positive for *Salmonella* (9 *S.* Weltevreden, 2 *S.* Oslo); PFGE patterns from environmental *S.* Weltevreden isolates were closely related, but distinct from the clinical isolate pattern. Site assessment for potential risk factors for bacterial contamination revealed a neighboring wildlife refuge, lack of bathroom and handwashing facilities, and the harvesting of seaweed from uncontrolled streams. A cease and desist order was issued, and a product recall initiated. The farm was allowed to resume operations after remediation was complete and subsequent environmental screening was negative for *Salmonella*.

CONCLUSIONS: This outbreak demonstrates aquaculture products such as seaweed are potential vehicles for *Salmonella*; although the outbreak strain was distinct from environmental isolates, detection of multiple serotypes and clonal variants throughout the farm suggested conditions permitting *Salmonella* contamination and subsequent dissemination. Seaweed should be considered a potential foodborne risk because of its tendency to be consumed raw, and because aquaculture may be susceptible to environmental or human contamination, particularly when conditions are not well-controlled.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Food Safety; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Chelsea.nichols@doh.hawaii.gov

Presenting Author(s) Chelsea Nichols

Institution Hawaii State Department of Health

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 8476
Abstract Type	Poster
Abstract Title Abstract	Proposed Revisions to Enteric Disease Exclusion Regulations for Persons in Sensitive Situations – Revising Rule 64D-3.040, <i>Florida Administrative Code</i> BACKGROUND: Rule 64D-3.040 <i>Florida Administrative Code (F.A.C.)</i> provides regulations for the control of specific communicable diseases, including exclusion regulations for persons with select enteric infections in sensitive situations (e.g., child care, health care, food handling). As more is learned about enteric pathogens, regulations and recommendations set forth by public health to control the spread of these pathogens must be updated. To that end, the Florida Department of Health (DOH) is proposing revisions to enteric disease exclusion regulations in Rule 64D-3.040 <i>F.A.C.</i> METHODS: Development of proposed revisions was a collaborative process involving county, state, and federal partners. Revised exclusion regulations were based on analysis of Florida reportable disease data, literature reviews, comparisons to exclusion regulations or recommendations from other U.S. jurisdictions, and feedback solicited from involved partners. RESULTS: Exclusions were added for persons with vomiting or diarrhea in the absence of another known cause, persons with jaundice caused by hepatitis A, persons with laboratory evidence of norovirus infection, and persons meeting the surveillance case definition for paratyphoid fever or Shiga toxin-producing <i>Escherichia coli</i> infection. Revisions to existing exclusions included the following: • Salmonellosis • Currently: two consecutive negative stool cultures • Kept exclusion for food handlers • Removed exclusion for child care and health care settings Shigellosis • Currently: two consecutive negative stool cultures • Kept exclusion for food handlers • Revised exclusion for child care and health care settings: Exclude until • asymptomatic for 48 hours or • asymptomatic for 24 hours and one negative stool culture or • asymptomatic for 24 hours and completion of antibiotic therapy Typhoid fever • Currently: • Case: Exclude until three consecutive negative stool cultures • Contact: Exclude until three consecutive negative stool cultures • Revision: • Case/symptomatic contact: Exclude until three consecutive negative stool cultures • Asymptomatic contact that traveled with an imported case or has shared risk factors with a locally-acquired case: Submit one stool specimen for culture CONCLUSIONS: Proposed revisions to Rule 64D-3.040 <i>F.A.C.</i> would align DOH regulations with current evidence-based best practices for enteric disease control in sensitive situations and with external regulatory partners whose quality metrics rely heavily on consistent regulations between agencies. These revisions are also expected to improve consistency in implementation of exclusions across Florida county health departments. A subsequent evaluation of implementation of these revised exclusion practices will provide useful evidence on regulation effectiveness for future enteric disease control strategies in Florida.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Infection Control; Foodborne Disease; Enteric Infectious Diseases
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	Nicole.Kikuchi@flhealth.gov
Presenting Author(s)	Nicole Kikuchi
Institution Affiliation	Florida Department of Health State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8583](#)

Abstract Type Poster

Abstract Title Risk Factors Associated with Giardia Infection in Wisconsin, 2010-2015
Abstract

BACKGROUND: Giardiasis is a reportable condition in Wisconsin caused by the protozoan parasite *Giardia*. Infection occurs via consumption of infected cysts excreted in the stool of infected people and animals that have contaminated water, food, or soil. Wisconsin public health staff interview patients with enteric diseases using a standardized questionnaire to collect demographic, clinical, and exposure information.

METHODS: In order to hypothesize risk factors for giardiasis in Wisconsin, a case-case comparison was performed using surveillance data from 3,202 confirmed giardiasis cases and 4,932 confirmed salmonellosis cases with illness onset during 2010-2015. Cases involved in point-source outbreaks were excluded from analysis. Analysis of exposure frequencies between comparison groups was performed; odds ratios, 95% confidence intervals, and Pearson *p*-values were calculated using SAS v9.4. Significant associations (*p* < 0.05) of risk factors with giardiasis were reported.

RESULTS: During 2010 to 2015, incidence of giardiasis ranged from 8.3–11.2 cases per 100,000 persons. Case-patient age ranged from 0–96 years and had a bimodal distribution with peaks at ages 1–9 years (18.9%) and 50–59 years (15.9%). Symptom onset occurred most frequently during July–September. Compared to salmonellosis case-patients, giardiasis case-patients were more likely to be male, and reside in the northern region of the state. Giardiasis case-patients were also more likely to report exposure to standing water, a river, lake or pond, and drinking water from private or common/rural well systems. Individuals with giardiasis were more likely to buy organic food and consume food from farmer’s markets, their own gardens, and food obtained by hunting, fishing, or trapping. Exposure to adults or children in diapers and to manure or compost was also more likely among giardiasis case-patients. Attending daycare, living or working on a farm, and exposure to reptiles/amphibians and poultry were more likely among individuals with salmonellosis.

CONCLUSIONS: Annual incidence of giardiasis in Wisconsin during 2010-2015 was 1.5–1.9 times the national incidence. Compared to salmonellosis case-patients, giardiasis case-patients reported significantly higher rates of exposures associated with the outdoors, suggesting environmental reservoirs may be an important source of infection in Wisconsin. Wisconsin’s northern region contains a high concentration of surface water; water may facilitate transportation, survival, and transmission, of *Giardia* cysts. Findings suggest current national guidance emphasizing control of giardiasis in daycare settings should also address control of environmental exposures. Additional research into the relationships between giardiasis, surface water and land use is warranted.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Waterborne Disease; Enteric Infectious Diseases; Epidemiology

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Amanda.Koch@dhs.wisconsin.gov

Presenting Author(s) Amanda A Koch

Institution Wisconsin Department of Health Services

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7999](#)

Abstract Type Poster

Abstract Title Salmonella Javiana Outbreak Associated with a Local Restaurant in Kentucky, August 2016
Abstract

BACKGROUND: In September 2016, the Kentucky Department for Public Health and a local health department (LHD) investigated an outbreak of *Salmonella* Javiana cases. A LHD nurse alerted the regional epidemiologist of three lab-confirmed Salmonellosis cases who reported eating at the same restaurant prior to onset of symptoms on Kentucky's Foodborne/Waterborne Illness Investigation Form.

METHODS: A case was defined as, "A person who ate at Restaurant X with a confirmed *Salmonella* lab result with illness onset from August 20, 2016 through August 27, 2016." Area healthcare providers, including LHDs, were advised to test patients for *Salmonella* who presented with vomiting and diarrhea. Serotyping and pulsed-field gel electrophoresis (PFGE) analysis were performed for all specimens at the state public health laboratory. LHD employees conducted environmental inspections at the implicated restaurant. A nurse provided stool collection kits and instructions, and four of the seven restaurant staff submitted stool specimens to the LHD for testing at the state public health lab.

RESULTS: Six cases were identified in this outbreak. Three initial cases were observed by a LHD nurse, prompting the investigation, and three more were identified by other LHD nurses. All cases were female, aged 13 through 82 years, and were residents of four neighboring counties. All cases reported the same exposure, eating at Restaurant X prior to symptom onset, and having symptoms of vomiting and diarrhea. Two cases were hospitalized. No deaths occurred. Laboratory testing identified *Salmonella* Javiana with PFGE pattern JGGX01.2909 in all six cases. Environmental inspections identified several violations, including improper food storage, inappropriate storage of kitchen supplies, and insufficient hygiene practices, among others. Five restaurant employees, including the owner and kitchen manager, attended a food handler training provided in Spanish and English by the LHD. Stool specimens from restaurant employees were negative.

CONCLUSIONS: Although *Salmonella* Javiana is a common serotype in Kentucky, this outbreak was the first occurrence of PFGE pattern JGGX01.2909 in the PulseNet database. The common exposure, Restaurant X, provided a clear epidemiologic link in these cases. No particular food items were implicated by the cases' foodborne questionnaire responses; the three-week lag from exposure to reporting precluded food samples from testing. No food workers were implicated. However, the environmental investigation found several possibilities for cross-contamination. The facility was cooperative throughout the investigation and receptive to recommendations. Food handler training and site visit education emphasized the importance of proper cleaning and sanitation as well as proper food handling and storage practices.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Foodborne Disease; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) carrell.rush@ky.gov

Presenting Author(s) Carrell Rush

Institution Kentucky Department for Public Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7477](#)

Abstract Type Poster

Abstract Title Shiga-Toxin Producing E.coli Increase in Hidalgo County, Texas
Abstract

BACKGROUND: Hidalgo County experiences an increased burden of foodborne and waterborne illnesses. In 2015, approximately 68% of all infectious diseases investigated by epidemiologists at Hidalgo County Health and Human Services (excluding Tuberculosis and STD's) , comprised of foodborne and waterborne illnesses (about 1100 cases). There was a sharp increase in the number of cases of Shiga- toxin producing *E.coli* (STEC) that were being investigated by the surveillance division of Hidalgo County Health and Human Services. We attempted to analyze data to determine the cause of this increase, find relevant trends to ultimately reduce the burden of this illness, and recommend appropriate measures of intervention.

METHODS : The data that were analyzed ranged from case trends in the past five years, hospitalization rates, severity of symptoms, age, lab methods used to confirm the case, and gender analysis. Food exposure history was a variable that was identified as an important component to be analyzed. However, due the capacity issues, this component is pending analysis.

RESULTS : Data analysis of the variables revealed that there were geographical hot spots in the city of Mission. However, a more detailed analysis of case increase failed to reveal specific areas of case clusters. Age distribution of the cases was skewed towards children under 5, which was to be expected. The symptoms, for the most part were mild in most cases, with bloody diarrhea not occurring in over 80% of the cases and only 24% of the cases reported hospitalizations. Lab methods used to evaluate these cases have been slowly shifting from culture positive results to molecular methods, such as the use of a gastrointestinal panel. This panel often revealed multiple positive results in a single panel. Analysis of how many pathogens were identified in each case that was also positive for STEC needs to be done. There were only 5 culture positive results, with EIA results pending at the state laboratory.

CONCLUSIONS: These results indicate that at least one potential cause of increase in cases is simply the shift from the use of culture positives to the G.I panel. An analysis of the duration of illnesses also needs to occur to determine if the cases were mirroring other gastrointestinal illnesses such as norovirus. A food exposure analysis, along with re-interviewing of cases with similar food history needs to be performed in order to determine any additional potential contributors to this case increase.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Epidemiology; Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) sakshi.puri05@gmail.com

Presenting Author(s) Sakshi Puri

Institution Hidalgo County Health and Human Services

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7818](#)

Abstract Type Poster

Abstract Title Team Approach in the Investigation Of Salmonella Outbreak
Abstract

BACKGROUND: Between Sep 5th and Sep 14th 2016 there have been 4 cases of Salmonellosis reported to Franklin County Health Department from a day care center in Franklin County. 4 out of 4 cases were laboratory confirmed by Kentucky State laboratory. Hence on Sep 7th 2016 KDPH (Kentucky Department for Public Health) assigned an outbreak number (KY16-098) to investigate this outbreak.

METHODS: All laboratory confirmed cases are phone interviewed using the standard enteric disease investigation forms and entered in National Electronic Surveillance System. Epidemic Rapid response Team constructed the Line list and case definition and epidemic curve through excel spreadsheet. Patients were informed about modes of Salmonella transmission and prevention through fact sheets; letter from Health department and social media. Health department ensured prompt investigation of all new cases and any Epi linked cases for this outbreak. Full Kitchen inspection was performed on 9/13/16 by environmental team and was closed till re-inspection. Students were encouraged to bring lunch from home. Site visit was performed by Epidemic Rapid response Team on 9/15/16. The team watched for possible contact between cases and involved cook and any connection of cases in other counties or venue. Team also looked for any clues like pets or afterschool use of the kitchen. Child Care Health Consultant of the county was involved and performed a site visit on 9/26/2016.

RESULTS: LIMITATIONS: Recall bias was a major problem as the investigation team was dependent on patients enteric history and date of onset of system. No food item could be submitted for analysis. All 4 cases were confirmed by stool culture at state lab. Symptoms primarily include: diarrhea, nausea, vomiting, fever, anorexia and abdominal cramps. The cases were treated by a provider. The cook required to follow the protocol of state health department for return to work and was recently cleared. Pulse field Gel Electrophoresis pattern showed 97% similarity but the genomic sequencing depicts highly related results of the specimens.

CONCLUSIONS: Regional Epidemiologist along with Epidemic Rapid Response investigated the outbreak with advice and support from Kentucky Department For Public Health. **TEAM effort** is the key in these kind of investigations. The outbreak was reported in **NORS** (National Outbreak Reporting System) and all the case investigations were entered in **NEDSS** (National Electronic Disease Surveillance System). The food worker might be a chronic carrier for Salmonella ,hence prompt coordinated investigation helped in containing this outbreak.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Epi / Lab Capacity (ELC); Foodborne Disease; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) rudrani.ghosh@ky.gov

Presenting Author(s) Rudrani Ghosh

Institution Jessamine County Health Department

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8267](#)

Abstract Type Poster

Abstract Title Tenacious Thompson: A Recurring Outbreak of Salmonella Thompson Associated with a Georgia Restaurant
Abstract

BACKGROUND: Approximately eight of 2000 *Salmonella* infections reported annually in Georgia are serotype Thompson. During April 2016, the Georgia Public Health Laboratory (GPHL) reported a cluster of 12 *S. Thompson* isolates. An outbreak investigation was initiated (Outbreak 1). During October 2016, three illnesses (one confirmed salmonellosis) were associated with Restaurant A. Another outbreak investigation was initiated (Outbreak 2).

METHODS: Epidemiologists attempted to interview all Georgia *S. Thompson* case-patients reported from April 2016 forward using standard *Salmonella* and restaurant questionnaires. Outbreak 1 included a case-control study to associate Restaurant A with illness. Cohort studies were performed for both outbreaks. Cobb County Environmental Health (EH) performed environmental assessments, implemented control measures, and collected environmental and employee specimens during both investigations. Food samples were collected for Outbreak 2. Monthly testing of all employee and environmental samples began following Outbreak 2. GPHL performed culture, serotyping, and pulsed-field gel electrophoresis (PFGE) on clinical and food specimens and isolates; whole genome sequencing (WGS) is ongoing. GPHL and the Georgia Department of Agriculture Laboratory tested environmental samples.

RESULTS: Outbreak 1 included 51 cases, 11 hospitalizations, and no deaths. Outbreak 2 included 47 cases, six hospitalizations, and no deaths. Salmonellosis was associated with Restaurant A in the Outbreak 1 case-control study ($p < 0.05$). Chicken consumption was epidemiologically associated with illness in Outbreak 2 ($p < 0.05$). During Outbreak 1, EH documented improper cooling procedures, inadequate sanitization records, and preparation surfaces used for both raw meat and vegetables. The facility underwent functional and structural changes. The facility closed during Outbreak 2. New standard operating procedures were implemented. *Salmonella*-positive employees were excluded from work pending two negative stool cultures. PFGE patterns from Outbreaks 1 and 2 were distinct. WGS results are pending. Environmental samples were negative for *Salmonella*. One food specimen (raw chicken) was *S. Thompson*-positive. Three of 12 and eight of 13 employees were *S. Thompson*-positive in Outbreaks 1 and 2, respectively. Employee A tested positive during both outbreaks. Employee B was intermittently positive during and after Outbreak 2. Employee C wasn't tested during Outbreak 1 and persistently tested positive over 2 months after Outbreak 2.

CONCLUSIONS: In 2016, two *Salmonella Thompson* outbreaks associated with Restaurant A resulted in almost 100 illnesses. While a food vehicle was identified, we cannot rule out a role for food worker carriage as a contributing factor. Non-traditional control measures, including employee and environmental testing for 3 months or more may be needed for persistent foodborne outbreaks.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Environmental Health; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) hope.dishman@dph.ga.gov

Presenting Author(s) Hope Dishman

Institution Georgia Department of Public Health

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 8598
Abstract Type	Poster
Abstract Title Abstract	Use of a Web Forum & Social Media in the Investigation of a 2016 Multi-Jurisdictional Norovirus Outbreak Associated with an Off Road Race in Laughlin, Nevada BACKGROUND: Following a 4 day national off-road race, 26 individuals reported gastrointestinal illness (GE) to the Southern Nevada Health District (SNHD) via a web-based event forum in December 2016. Upon identification of the possible outbreak among 328 competitors, 110 volunteers, and 4,000 spectators an investigation was initiated to identify cases, evaluate risk factors, identify potential sources of infection and implement control measures. METHODS: A web forum consisting of 26 GE related posts associated with the event aided in outbreak detection and provided insights into hypothesis generation and questionnaire development. An online survey enabled rapid identification of cases and collection of demographic, medical, and risk factor information. Links to the survey were posted on the web forum and two Facebook pages. Descriptive statistics and chi-square tests were performed using SAS 9.4. Microbiological testing of four stool specimens was conducted by SNHD (N=2) and the County of San Diego Health & Human Services Agency (N=2). RESULTS: There were 122 survey respondents and 81 met the probable case definition and two met the laboratory-confirmed case definition. Residents from 8 U.S. states were affected, and most ill individuals were California residents (77%). Adults aged 30-49 years were the largest affected group (64%). Symptoms were predominantly diarrhea (90.4%) and vomiting (84.3%). Symptoms onset ranged from December 7th to December 13th with a peak on December 11th (53% of cases). The median incubation period was 48 hours. Symptoms lasted 24-72 hours. The investigation did not identify a common source of infection. Most ill participants (N=46, 87%) stayed at one hotel. The risk of being ill was higher (RR 3.1, 95% CI 1.5-6.2) in individuals who stayed at that particular hotel. The same hotel was also the focal point for registration events which occurred over a 7 hour period of time on December 8th. The implicated hotel was in the process of performing corrective measures after GE illness was reported by guests and before SNHD inspection. Of the four specimens collected for testing, two were positive for Norovirus genogroup I, one from Clark County and the other from San Diego County. CONCLUSIONS: The use of the web forum, social media (facebook postings) and a web-based survey was instrumental in completing this outbreak investigation. Based on these findings and past investigations for similar popular events, SNHD recommends that organizers of such events raise awareness among participants of the risk of GE infections through educational collaboration with the local health department.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Outbreaks; Informatics; Enteric Infectious Diseases
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	pancholy@snhdmail.org
Presenting Author(s)	Ruchi Pancholy
Institution Affiliation	Southern Nevada Health District Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7657](#)

Abstract Type Quick

Abstract Title *Salmonella* Typhimurium Outbreak at a Fire Department Fish Fry Fundraiser, Tennessee, 2016
Abstract

BACKGROUND: On September 19, 2016, the Rutherford County Health Department and the Mid-Cumberland Regional Office (MCRO) were notified of seven *Salmonella* cases at a local hospital. Concurrently, the Tennessee Department of Health (TDH) received a report of illnesses after a community fundraiser. Preliminary interviews of hospitalized cases identified the common exposure as the monthly fish fry hosted by the volunteer fire department. MCRO and TDH launched a joint investigation.

METHODS: A volunteer contact list and TDH Facebook post were utilized for initial case and control finding. Local news coverage encouraged attendees to contact TDH. A case-control study was conducted using a meal-specific questionnaire to capture food and exposure history. Unadjusted and adjusted odds ratios (OR) and confidence intervals (CI) were calculated in EpiInfo 7. An environmental assessment was conducted at the fire station.

RESULTS: A total of 117 (24%) interviews were completed among an estimated 480 attendees. Among these, 74 cases and 43 controls were identified. Fifty-one percent of cases were male with median age of 57 years (range: 1 – 97). Eighteen persons (24%) were hospitalized. Common symptoms included diarrhea (99%), cramps (85%), fever (69%), and fatigue (69%). In unadjusted analyses, illness was associated with eating white beans (OR 13.2), fish (3.1), and coleslaw (2.6). After adjustment, the odds of eating white beans were 11 times higher among cases than controls (OR 11.3 [CI 3.9 – 33.2]) and the only statistically significant exposure reported. In considering only cases with laboratory evidence (22 cases), odds of eating white beans were even stronger (OR 13.9 [CI 2.9 – 67.1]). The venue was not a regulated food establishment, however, the environmental assessment identified that the preparation of white beans was altered from the standard practice, potentially allowing for inadequate cooking and holding temperatures.

CONCLUSIONS: This was a large *S. Typhimurium* outbreak in a small community, sickening at least 74 persons and hospitalizing 18. Community and fire department cooperation were essential to the successful investigation of this outbreak. Although a prepared food sample was unavailable for testing, the epidemiologic evidence strongly implicated white beans and was supported by the environmental assessment. The outbreak team presented findings and food safety recommendations to fire department staff. This outbreak highlighted the importance of adhering to established food handling practices in unregulated settings and fostered communication between the health department and community to ensure long-standing events can safely continue in the future.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) jane.yackley@tn.gov

Presenting Author(s) Jane Yackley

Institution Tennessee Department of Health

Affiliation CDC/CSTE Fellow

Submission Type Breakout/Quick/Lightning/Poster
ID [7945](#)

Abstract Type Quick

Abstract Title Beyond Hominis and Parvum: An Increase in Rare Species of *Cryptosporidium*
Abstract

BACKGROUND: Cryptosporidiosis is an acute diarrheal illness caused by the protozoan *Cryptosporidium*. Numerous species/genotypes have been identified, but *C. hominis* and *C. parvum* are by far the most commonly associated with human illness. Risk factors for infection vary by species/genotype. Molecular methods are necessary to distinguish species of *Cryptosporidium*. In 1999, the Minnesota Department of Health (MDH) began developing molecular subtyping for *Cryptosporidium* to enhance outbreak detection and strengthen understanding of the pathogen.

METHODS: Since 2006, clinical laboratories in Minnesota have been required to submit clinical materials from *Cryptosporidium*-positive specimens to MDH. Genotyping was performed by PCR followed by restriction fragment length polymorphism analysis of either the dihydrofolate reductase gene or the small-subunit rRNA gene. We examined the epidemiology of cases of cryptosporidiosis caused by species/genotypes other than *C. hominis* or *C. parvum* (rare species) in Minnesota from 2007-2016.

RESULTS: From 2007-2016, 96 cases of eight rare species of *Cryptosporidium* were identified from human clinical specimens in Minnesota; *C. ubiquitum* (n=45), *C. sp.* chipmunk genotype I (n=25), *C. felis* (n=10), and *C. sp.* deer mouse genotype III (n=8) were most commonly identified. Cases of rare species increased >1200% in the 10-year period, with a median of 7.5 cases identified annually (range, 3 to 38). Demographic and illness characteristics of rare species cases were similar to *C. hominis* and *C. parvum* cases; however, *C. sp.* chipmunk genotype I and *C. felis* cases were more likely to be male (p=0.01; p=0.04) and *C. ubiquitum* cases female (p=0.03). *C. felis* cases also tended to be older (p=0.01). Eight (8.4%) rare species cases reported an immunocompromising condition. Most (85%) specimens were collected during July-October. Specimens identified as rare species at MDH were initially tested using a variety of methods at the clinical laboratory; of specimens that tested positive by multiplex PCR, 13.1% yielded rare species (compared to 4.7% for other tests). Two outbreaks due to rare species were identified (*C. ubiquitum* and *C. sp.* chipmunk genotype I), both associated with swimming pools.

CONCLUSIONS: The identification of species/genotypes other than *C. hominis* or *C. parvum* increased dramatically during the past 10 years in Minnesota, predominantly in healthy individuals. The use of multiplex PCR panels appears to be escalating the increase. This study further emphasizes the value of performing molecular characterization of *Cryptosporidium* specimens, which may better inform case follow-up.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Waterborne Disease; Surveillance

Consider for Different Presentation? Yes

Presenting Author Email Address(es) trisha.robinson@state.mn.us

Presenting Author(s) Trisha Robinson

Institution Minnesota Department of Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7893](#)

Abstract Type Quick

Abstract Title Chicken Liver–Associated Illness Outbreaks, United States, 2000–2015—Identifying Opportunities for Prevention
Abstract

BACKGROUND: Chicken livers are regulated by the United States Department of Agriculture, Food Safety and Inspection Service (FSIS). Though pathogens have been shown to contaminate both the external and internal tissues of chicken livers, recipes recommending only partial cooking of chicken livers before consumption are widely available. Several recent illness outbreaks in the United States associated with chicken livers have been reported; however, limited data exist on the frequency and characteristics of such outbreaks. Common factors among chicken liver–associated outbreaks can inform foodborne illness prevention policy.

METHODS: Outbreaks during 2000–2015 associated with chicken livers were identified by reviewing data reported to FSIS’s Office of Public Health Science and the Centers for Disease Control and Prevention’s National Outbreak Reporting System to assess reported outbreak frequency and characteristics, including etiology, case-patient demographics and outcome, food preparation settings, and contributing factors.

RESULTS: During 2000–2015, 22 outbreaks of confirmed foodborne infection associated with chicken liver were reported in the United States. The average outbreak rate per year increased from 0.4 during 2000–2010 to 3.6 during 2011–2015; over half (12) of the outbreaks occurred during 2014–2015. Nineteen (86%) of the outbreaks were caused by *Campylobacter* and 4 (18%) by *Salmonella* (one was caused by both). The outbreaks resulted in a total of 331 reported illnesses (median of 6 illnesses/outbreak), 45 (14%) hospitalizations, and 0 deaths. Four (18%) outbreaks involved residents of >1 state. Undercooking of chicken liver was identified as a contributing factor in nearly all (20 [91%]) of the outbreaks. Most (19 [86%]) outbreaks were associated with food prepared in a food-service establishment (restaurant, residential care facility, religious facility, or school). Details about specific chicken liver dishes were reported for 16 outbreaks; comminuted chicken liver (pâté, mousse, or spread) was identified as a causative vehicle in all of these. In the largest outbreak (2011; *Salmonella* Heidelberg; 190 illnesses), the product was labeled “broiled” but was not fully cooked.

CONCLUSIONS: Outbreaks associated with chicken livers have been reported more frequently in recent years. Undercooked chicken liver pâté (and similar dishes) prepared at food-service establishments is a common feature of these outbreaks. Misleading labeling played a role in one large outbreak. Food preparers and consumers should be educated regarding the risks associated with consumption of undercooked chicken liver. Additionally, guidance should be given to chicken liver–producing establishments to reduce pathogen contamination and ensure proper labeling.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Environmental Health; Foodborne Disease; NORS (National Outbreak Reporting System)

Consider for Different Presentation? Yes

Presenting Author Email Address(es) william.lanier@fsis.usda.gov

Presenting Author(s) William A. Lanier

Institution U.S. Public Health Service

Affiliation Federal Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7668](#)

Abstract Type Quick

Abstract Title Abstract
Community-Wide Outbreak of Cryptosporidiosis in Maricopa County, Arizona

BACKGROUND: In August of 2016, the Maricopa County Department of Public Health (MCDPH) investigated a cluster of cryptosporidiosis (crypto) cases with a common exposure to a high-volume recreational water venue. MCDPH, in collaboration with Maricopa County Environmental Services Department (MCESD), sought to define the scope of the outbreak and develop strategies to prevent further spread of disease.

METHODS: MCDPH interviewed laboratory-confirmed crypto cases using an outbreak-specific questionnaire that focused on identifying public recreational water facilities where cases had visited both before and after illness onset. Names of exposed facilities were provided to MCESD, which guided each identified facility through CDC recommended remediation processes to prevent additional illness. Healthcare providers were informed of the outbreak via a "Surveillance Alert" and the public was informed through the media with recommendations not to swim with diarrhea. Clinical specimens were tested by the Centers for Disease Control and Prevention (CDC) to determine the species and subtype and the relatedness of cases that visited different facilities.

RESULTS: From July 1 to December 7, 2016, MCDPH identified 440 confirmed and probable crypto cases based on the Council for State and Territorial Epidemiology case definition. Onset dates ranged from 7/1 to 12/7. The median age of cases was 12 (range <1 – 75) years. Fifty-two (20%) of interviewed cases were hospitalized; no deaths were associated with this outbreak. Seventy-five public recreational water facilities were identified from interviews and reported to MCESD. Few of these had secondary disinfection measures in place (e.g. ozone and/or UV) and required repeated remediation. CDC crypto hyperchlorination guidance changed without notification in July, complicating remediation efforts. One of four clinical samples submitted to CDC was identified as *C. hominis* species.

CONCLUSIONS: This is the largest crypto outbreak reported to date in Maricopa County. Due to the high volume of cases reported, prolonged swimming season and number of facilities affected county wide, a robust response from public health, environmental services, and aquatic facility managers was required. Challenges with the detection of cryptosporidium (in clinical and environmental samples), the absence of secondary disinfection measures at public aquatic facilities, and changes in remediation guidelines for facility operators contributed to the complexity of this investigation and response. This outbreak highlights the importance of rapid identification of exposed sites in a community-wide crypto outbreak to implement control measures and the critical roles of cross-departmental communication, data sharing, and timely notification and risk communication to the public.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Waterborne Disease; Outbreaks; Epidemiology

Consider for Different Presentation? Yes

Presenting Author Email Address(es) nicolefowle@mail.maricopa.gov

Presenting Author(s) Nicole Fowle

Institution Maricopa County Department of Public Health

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7847](#)

Abstract Type Quick

Abstract Title Abstract Culture-Independent Diagnostic Testing of Enteric Pathogens: Managing the Impact in Colorado

BACKGROUND: The use of culture-independent diagnostic tests (CIDTs), specifically multiplex PCR gastrointestinal panels for stool specimens is increasing rapidly. We summarize Colorado's experience with the changing diagnostic testing practices and the impact on surveillance for enteric pathogens. We also discuss challenges in interpretation of results and case reporting, isolate recovery, and adapting case investigation and exclusion.

METHODS: Colorado regularly surveys clinical laboratories on the use of CIDTs and collects information about the type and brands of tests performed. We also conduct ongoing surveillance to detect changes in laboratory practices and perform outreach to ensure correct case reporting. Colorado encourages clinical laboratories to perform reflex culture for all bacterial enteric pathogens, and requires submission of isolates or clinical material for Salmonella, Shigella, Shiga toxin-producing E. coli (STEC), Vibrio and Yersinia. Two data sources were examined: a survey of clinical laboratories conducted during spring 2016 and surveillance data from 2014–2016.

RESULTS: Prior to 2014, one clinical laboratory in Colorado was using a multiplex PCR panel to identify enteric pathogens. By spring 2016, 15 (of 50) clinical laboratories adopted multiplex PCR panels. Eight clinical laboratories perform reflex culture for Salmonella and Shigella, 2 culture for STEC, 2 culture for Campylobacter, 1 cultures for Vibrio, and 0 culture for Yersinia. During 2014-2015, 16% (569/3623) of Campylobacter, Salmonella, Shigella, STEC, Vibrio, and Yersinia cases reported were tested using PCR. In 2016, the percent of cases tested using PCR for those same pathogens increased to 42% (1003/2404). During 2016, reflex culture was performed for 90% of PCR-positive cases of Salmonella, Shigella, and STEC. Of those, isolates were recovered from 92% of PCR-positive Salmonella cases, 66% of PCR-positive Shigella cases and 62% of PCR-positive STEC cases. Reflex culture was performed for 16% of PCR-positive Campylobacter cases at clinical laboratories.

CONCLUSIONS: The percent of bacterial enteric infections detected by CIDTs is increasing. We continually perform outreach to ensure correct interpretation of results and accurate case reporting; some panels report results for multiple pathogens with similar names, but not all are reportable. Although we encourage labs to perform reflex culture, a large burden falls to the SPHL. We continue to adapt our case investigation and exclusion guidance to account for the detection of multiple pathogens and non-viable organisms. Outreach with hospital infection preventionists, laboratories, and local public health partners has been key in addressing many of the challenges posed by the rapid adoption of CIDTs in Colorado.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Surveillance; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) elisha.wilson@state.co.us

Presenting Author(s) Elisha Wilson

Institution Colorado Department of Public Health and Environment

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 7878
Abstract Type	Quick
Abstract Title Abstract	Fluoroquinolone-Resistant <i>Campylobacter jejuni</i> Infections Associated with Unpasteurized Milk from a Dairy Cow Herdshare — Colorado, 2016 BACKGROUND: On August 23, 2016, the Colorado Department of Public Health and Environment (CDPHE) was notified of <i>Campylobacter jejuni</i> isolation in 2 persons who reported consuming unpasteurized milk from the same herdshare dairy. Sale of unpasteurized milk is illegal in Colorado, but it can be legally distributed through a herdshare without regulatory oversight. Increased from past years, in 2014, ~27% of U.S. <i>Campylobacter</i> isolates were resistant to ciprofloxacin, a fluoroquinolone. We sought to describe outbreak magnitude and prevent additional cases. METHODS: Probable cases were defined as having diarrhea lasting ≥ 1 day with onset during August 1–October 7 and known consumption of herdshare unpasteurized milk or an epidemiologic link to a confirmed case; confirmed cases had <i>Campylobacter</i> isolation. Cases were identified through passive surveillance and by contacting herdshareholder households. The CDPHE laboratory cultured stool specimens from ill persons and 4 milk samples, and performed pulsed-field gel electrophoresis (PFGE) on 10 patient and 2 milk isolates. CDC performed antimicrobial susceptibility testing on 3 patient isolates. RESULTS: Ninety-one (53%) of 171 shareholder households responded to telephone interviews. We identified 5 probable and 12 confirmed cases; 1 patient was hospitalized. Confirmed cases were among patients aged 12–68 years (median: 58 years); 9 (75%) were male. <i>C. jejuni</i> with the outbreak PFGE pattern was confirmed in 10 patient isolates and 2 milk samples. All 3 isolates tested for antibiotic resistance were resistant to ciprofloxacin. CONCLUSIONS: This fluoroquinolone-resistant <i>Campylobacter</i> outbreak was caused by unpasteurized milk from a dairy herdshare. CDPHE notified herdshareholders and cautioned against consuming unpasteurized milk on 3 occasions. Because unpasteurized milk remains available, public health’s role is ongoing education about risks associated with unpasteurized milk consumption.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Antimicrobial Resistance; Epidemiology; Foodborne Disease
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	alexis.burakoff@state.co.us
Presenting Author(s)	Alexis W Burakoff
Institution Affiliation	Centers for Disease Control and Prevention EIS/CEFO

Submission Type Breakout/Quick/Lightning/Poster
ID [8030](#)

Abstract Type Quick

Abstract Title Food-Related Anaphylactic Deaths — New York City, 2000–2014
Abstract

BACKGROUND: Food-induced anaphylaxis is potentially fatal, but preventable. Considerable public health attention has been given to preventing anaphylaxis from nut exposure among school-aged children. We characterized food-related anaphylactic fatalities in New York City (NYC) and examined changes in incidence during 2000–2014, beginning four years before NYC started supplying epinephrine auto-injectors to schools in 2004.

METHODS: We identified food-related anaphylaxis deaths by using death certificates. A case was defined as a death in a NYC resident during 2000–2014 with an ICD-10 code or literal text indicating mortality attributable to food. To obtain further details regarding circumstances leading to death, we reviewed medical examiner reports. Rates were calculated by using U.S. Census Bureau annual population estimates and compared by using Poisson regression.

RESULTS: Twenty-four food-related deaths were reported among NYC residents during 2000–2014, an average of 1.6/year (range: 0–5); rate of 2.0/10 million person-years. Seafood was the most common cause (9 deaths), followed by nuts (5). Other foods were milk, eggs, chickpeas, and chocolate (1 death each); food was unknown in 6 reports. All seafood-related deaths occurred among persons aged ≥18 years (median age 65 years). Of 5 nut-related deaths, 3 were among persons aged <18 years, including 1 where exposure occurred at school. Rates of fatal anaphylaxis did not differ with regard to time period, age, sex, race/ethnicity, or nativity (U.S. versus non-U.S.).

CONCLUSIONS: Preliminary results indicate that deaths from food-related anaphylaxis in NYC are rare, with no substantial rate change during the 15-year span studied. In NYC, prevention of anaphylaxis deaths in adults with seafood allergies should become a focus of public health efforts to help further reduce food-related anaphylaxis deaths.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Food Safety; Epidemiology

Consider for Different Presentation? Yes

Presenting Author Email Address(es) irh9@cdc.gov

Presenting Author(s) Eugenie A Poirot

Institution Centers for Disease Control and Prevention

Affiliation Local Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8563](#)

Abstract Type Quick

Abstract Title Outbreak of Salmonella Serotypes Reading and Abony Associated with Alfalfa Sprouts, Colorado, 2016
Abstract

BACKGROUND: Sprouts are often implicated in *Salmonella* outbreaks. In 2016, Colorado noted an increase in cases of two rare Salmonella serotypes (*S* . Reading and *S* . Abony), prompting a public health investigation.

METHODS: Cases were defined as Colorado residents with laboratory confirmed *S* . Reading or *S* . Abony infection with the outbreak pulsed-field gel electrophoresis (PFGE) patterns and symptom onset in June-August 2016. We conducted case finding via passive surveillance and PulseNet. We conducted a case-control study by assessing food exposures among cases and controls who dined at Chain A; online order records with phone numbers were used to recruit controls who consumed food from the same Chain A locations on the same dates as cases. We conducted environmental investigations at all implicated Chain A and B locations and the common alfalfa sprout distributor. Records were obtained from the sandwich chains and food distributors to conduct a traceback. The CDPHE laboratory tested food samples.

RESULTS: Seventeen Colorado cases were identified with onset dates from June 16 to August 5. Three cases had co-infection with *S* . Reading and *S* . Abony, and a variety of specimen sources were seen among cases, including stool (12), urine (3), stool and urine (1), and urine and blood (1). Additional PFGE-matched cases were identified in eight states. Eight Colorado cases ate sandwiches prepared at one of four Chain A locations in June 2016. Three Colorado cases ate sandwiches prepared at one of two Chain B locations in June-August 2016. We enrolled 7 cases and 43 controls. Cases were more likely than controls to have consumed deli turkey (odds ratio undefined, $p=0.004$), and 19 times more likely than controls to have consumed alfalfa sprouts ($p=0.003$). Environmental investigations and traceback activities indicated a common Colorado-based supplier of alfalfa sprouts to both chains, resulting in a product recall in August 2016. No other food products were common among both chains. Sprouts collected from one of the implicated locations were tested by the CDPHE laboratory and tested negative for *Salmonella* .

CONCLUSIONS: The likely cause of this outbreak was alfalfa sprouts produced by a Colorado firm and served at multiple sandwich chain restaurants. Sprout-associated *Salmonella* outbreaks involving multiple serotypes are uncommon. Consuming raw sprouts are a known risk factor for foodborne illness, and outbreaks linked to these products continue to be reported. Public health and food safety agencies should continue efforts to promote sprout food safety messages and actions.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Foodborne Disease; Food Safety

Consider for Different Presentation? Yes

Presenting Author Email Address(es) nicole.comstock@state.co.us

Presenting Author(s) Nicole Comstock

Institution Colorado Department of Public Health and Environment

Affiliation State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster 8193
Abstract Type	Quick
Abstract Title Abstract	Outbreaks of Salmonella Enterica Linked to Animal Contact: Demographic and Outbreak Characteristics and Comparison to Food Outbreaks — United States, 2009–2014
	BACKGROUND: Each year in the United States, infections resulting from <i>Salmonella enterica</i> cause an estimated 1.2 million illnesses resulting in 19,000 hospitalizations and 390 deaths. Illnesses occur sporadically throughout the year, but might also occur as part of an outbreak. In the US, <i>Salmonella</i> illness outbreaks are most commonly linked to a food source; however, contact with live animals can also result in outbreaks of human illness. We sought to characterize zoonotic <i>Salmonella</i> outbreaks and examine differences compared to foodborne outbreaks. METHODS: Data reported to the Centers for Disease Control and Prevention through the National Outbreak Reporting System (NORS) from 2009–2014 with a primary mode of transmission listed as animal contact or food were analyzed. Missing data for age or sex categories were recoded as age or sex unknown. Chi-square tests were conducted to compare proportions of categorical variables. Logistic regression was used to calculate odds ratios for age, sex, health outcomes and multistate exposure. Wilcoxon rank-sum tests were used to compare medians for outbreak size and duration. P-values of <0.05 were considered statistically significant. Analyses were conducted using SAS 9.3. RESULTS: From 2009–2014, a total of 484 outbreaks with an implicated food or animal contact source were reported through NORS; of these, 99 (20.5%) resulted from <i>Salmonella</i> transmission through animal contact and 385 (79.5%) resulted from foodborne transmission, resulting in 3,604 (19.8%) and 13,568 (80.2%) illnesses, respectively. A significantly higher proportion of outbreak-associated illnesses among children aged <1 year and children aged 1–4 years resulted from animal contact transmission compared to foodborne transmission (15.2% vs. 1.4%, $p<0.01$ and 24.5% vs 5.6%, $p<0.01$, respectively). Outbreak-associated illnesses resulting in hospitalizations (OR 1.81, 95% CI: 1.62, 2.02), emergency room visits (OR 1.58, 95% CI: 1.14, 2.18), or healthcare provider visits (OR 2.67, 95% CI: 2.07, 3.43) were more likely to be associated with animal contact compared to food. Animal contact outbreaks reported to NORS were more likely to be multistate compared to foodborne outbreaks (OR 5.43, 95% CI: 3.37, 8.76) and had a longer median duration in days (98 days vs. 8 days, $p<0.01$). CONCLUSIONS: Outbreaks of <i>Salmonella</i> infections resulting from animal contact frequently have characteristics that are distinct from food outbreaks. Characterizing the differences between outbreaks linked to animal contact and outbreaks linked to food might help investigators distinguish between the two outbreaks when a vehicle isn't initially clear and can provide useful information to improve public health responses.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Outbreaks; Zoonotic Disease; Enteric Infectious Diseases
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	kse1@cdc.gov
Presenting Author(s)	Jessica R. Marus
Institution Affiliation	Centers for Disease Control and Prevention CDC

Submission Type Breakout/Quick/Lightning/Poster
ID [7927](#)

Abstract Type Quick

Abstract Title Retrospective Assessment of Salmonella Enteritidis: Cluster Analyses Using Whole Genome Sequencing
Abstract

BACKGROUND: Salmonellosis is the number one cause of foodborne illnesses in Tennessee. Each year approximately 1000 cases are reported to the Tennessee Department of Health (TDH), resulting in an average of 300 hospitalizations and 5 deaths. Salmonella Enteritidis (SE) is the Salmonella serotype most commonly identified in outbreaks and accounts for approximately 20% of reported cases. The current gold standard for cluster identification is pulsed-field gel electrophoresis (PFGE), however, the majority of SE isolates share one of two common PFGE patterns, JEGX01.0004 and JEGX01.0005, limiting the utility of PFGE fingerprinting for outbreak identification. Whole-genome sequencing (WGS) is replacing PFGE in state public health laboratories with the potential to identify more epidemiologically relevant SE clusters and outbreaks. We used WGS to conduct a retrospective analysis of SE pattern JEGX01.0004 and JEGX01.0005 from 2014-2015.

METHODS: Whole-genome sequencing was performed at the Tennessee Department of Health in collaboration with the Wadsworth Center/New York State Department of Health bioinformatics core. Sequence data was assembled and single nucleotide polymorphisms (SNPs) were identified between sequenced isolates and a reference genome, SE sequence P125109. These data were used to construct a maximum-likelihood phylogenetic tree and heat map denoting pairwise SNP differences between each isolate in the dataset. Identified clusters were then compared with epidemiological data collected through routine interviewing for exposure ascertainment.

RESULTS: Sequences for 213 unique SE pattern JEGX01.0004 or JEGX01.0005 isolates were analyzed. Potential cluster definitions ranging from ≤ 15 SNPs to ≤ 5 SNPs were tested. A cluster definition of ≤ 15 SNPs grouped 143 isolates into thirty-two (32) potential clusters, often without obvious epidemiological connections. A cluster definition of ≤ 5 SNP differences, however, identified thirty-five (35) potential clusters involving 107 patient samples, a marked increase from the six (6) clusters and sixteen (16) patient samples identified by PFGE alone. Twenty-one (21) of these clusters featured geographical, temporal, or shared-exposure linkages that strengthened suspicion of a common infectious source.

CONCLUSIONS: Our unbiased retrospective analyses of SE identified benefits and gaps with the implementation of WGS. The benefits of WGS are twofold. First, these data demonstrate that the increased resolution afforded by WGS will increase the number of clusters identified for SE in comparison with PFGE subtyping alone. Second, as WGS becomes the standard subtyping method, the results will assist epidemiologists to respond to previously unrecognized outbreaks. Increased capacity is needed to routinely conduct WGS data analyses and triage the increasing number of clusters which will be identified.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Epidemiology; Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) Lisha.Constantine-Renna@tn.gov

Presenting Author(s) Lisha Constantine-Renna

Institution Tennessee Department of Health

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7577](#)

Abstract Type Quick

Abstract Title Salmonella Serotype I 4,[5],12:I:- Infections at a Summer Camp — California, July 2016
Abstract

BACKGROUND: Since 2015, U.S. outbreaks of *Salmonella* serotype I 4,[5],12:i:- with pulsed-field gel electrophoresis pattern JPXX01.1314 have been associated with pork consumption. During July 2016, the San Bernardino County and California Departments of Public Health detected an outbreak of this strain with two illness waves at a kosher summer camp, making pork an unlikely source. We investigated to identify infection source and prevent further illness.

METHODS: Case-patients were defined as campers with diarrhea onset or outbreak strain infection with stool collection during June 27–July 21, 2016. A case-control study compared food and environmental exposures of case-patients aged 12–14 years with onsets during the first illness wave with non-ill campers (control subjects) in the same aged bunks. Ten of 15 case-patients and 10 of 33 control subjects were interviewed for the study. An environmental assessment of the camp and off-site campground used for overnight trips July 4–8 was performed.

RESULTS: Twenty-seven of 165 campers became ill during two waves, July 1–4 (n = 15) and July 6–12 (n = 12). No statistically significant exposures were identified, although campers reported cooking raw beef and chicken and soap being absent during overnight trips. The pump handle of a well, the only campground water source, tested positive for the outbreak strain. Of 19 food samples collected, nine had lactose-fermenting bacterial growth, indicating fecal contamination; none grew *Salmonella*.

CONCLUSIONS: No vehicle was identified, but consumption of contaminated food and person-to-person transmission might have contributed to illness. The well-pump handle and food testing results highlight the need for food preparation and hygiene education. On July 13–14, the camp was sanitized; no additional cases were reported.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Foodborne Disease; Outbreaks; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) hgh4@cdc.gov

Presenting Author(s) Hope H. Biswas

Institution Centers for Disease Control and Prevention

Affiliation EIS/CEFO

Submission Type Breakout/Quick/Lightning/Poster
ID [8529](#)

Abstract Type Quick

Abstract Title Salmonella Typhimurium Outbreak Associated with Cheese from a Local Creamery — North Carolina, 2016
Abstract

BACKGROUND: Contaminated dairy products are common sources of foodborne outbreaks. In June 2016, the North Carolina Division of Public Health detected a cluster of *Salmonella* Typhimurium isolates with indistinguishable pulsed-field gel electrophoresis (PFGE) patterns. In July, a routine sample of raw milk from a local creamery (Creamery A) yielded *Salmonella* Typhimurium with an indistinguishable PFGE pattern. We investigated to identify opportunities for product contamination and prevent further illnesses.

METHODS: We defined a case as isolation of the outbreak strain from a specimen collected during April 24–August 15, 2016, from a North Carolina resident or visitor. We completed outbreak questionnaires for cases identified before August and conducted an on-site visit and product sampling with the North Carolina Department of Agriculture.

RESULTS: We identified 109 cases; 16 (15%) were hospitalized. Median patient age was 29 years (range: 1–92). We interviewed 46 of 61 (75%) patients identified before August; 26 (57%) respondents reported eating ≥1 Creamery A cheese. The creamery produced raw-milk cheeses aged ≥60 days and pasteurized cheeses in a 3-room, on-site facility. Few physical barriers existed between milking, production, and processing rooms; the same staff handled unfinished and finished products. The outbreak strain was isolated from a sample of a raw-milk cheese commonly consumed by patients (n = 21; 46%). Creamery A recalled all products on July 27 and began working with food safety experts to remediate and re-open.

CONCLUSIONS: Consumption of cheeses produced from contaminated raw milk resulted in a substantial *Salmonella* outbreak. Contamination likely resulted from a cheese aging-process failure or cross-contamination at the creamery. Physical barriers and adherence to good hygiene practices are necessary to reduce the risk for product contamination.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Outbreaks; Enteric Infectious Diseases; Foodborne Disease

Consider for Different Presentation? Yes

Presenting Author Email Address(es) jess.rinsky@dhhs.nc.gov

Presenting Author(s) Jessica Rinsky

Institution Centers for Disease Control and Prevention

Affiliation EIS/CEFO

Submission Type ID	Breakout/Quick/Lightning/Poster 8645
Abstract Type	Quick
Abstract Title Abstract	State Public Health Policies and Procedures on Screening and Exclusion for Shiga Toxin-Producing <i>Escherichia coli</i> Infections in Childcare Settings BACKGROUND: Infection with shiga toxin-producing <i>Escherichia coli</i> (STEC) can cause severe illness and is highly contagious. STEC serotype O157:H7 results in severe illness, including hemolytic uremic syndrome. Many public health jurisdictions have childcare exclusion policies for STEC infection often based on O157 infections. Increased sensitivity of rapid tests for shiga toxin has resulted in an increased burden of non-O157 infections. METHODS: A standard questionnaire in SurveyMonkey™ was emailed to each state health program. The survey addressed childcare attendee and caregiver illness screening practices, restrictions and exclusion practices, and childcare STEC outbreak investigation. In addition, we asked if these practices vary by serogroup (O157 versus other). RESULTS: Thirty-eight (76%) states responded. Twenty-two (53%) states reported STEC case exclusion from childcare, sixteen do not. Only two states reported these were based on O157 serotyping. Thirty-four (89%) require negative stools for re-entry and nine only require negative stools for serotype O157. Thirty-five (92%) required these be collected > 24 hours apart, and 50% reported variation if on antibiotics. Eighteen states accept culture independent diagnostic tests for clearance, 74% accept shiga toxin testing. However, type of testing typically is generally not specified by law. Twenty-eight (74%) reported that asymptomatic positive children would not be allowed to return to care while 10 states would allow them to return. Definition of an outbreak varied across states; most states reported they use two incubation periods between cases to define an outbreak, others specified a range of days from 10-60. The majority (87%) of states screen any symptomatic children at the childcare with a case, while 7 states screen all attendees regardless of symptoms. Seventy-six percent screen symptomatic caregivers, and 6 states screen all caregivers in a childcare outbreak. Twenty states reported that these policies do not vary depending on the age of the child or if the child was in diapers, whereas 11 states vary their policies based on age. CONCLUSIONS: Childcare exclusion policies for STEC cases vary among states. Newer, non-specific shiga toxin tests have increased the number of positive results, creating the need to re-evaluate exclusionary practices. Active screening and exclusion of symptomatic or asymptomatic shedders in childcare settings can be resource-intensive and burdensome to families. Public health control measures require a balance between preventing disease transmission and adding excessive burden to families while taxing public health resources. Research is needed to evaluate how these practices effect the overall STEC disease burden.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Enteric Infectious Diseases; Public Health Law; Infection Control
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	june.e.bancroft@state.or.us
Presenting Author(s)	June Bancroft
Institution Affiliation	Oregon Health Authority State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [7949](#)

Abstract Type Quick

Abstract Title Surveillance of Shiga Toxin-Producing *Escherichia coli* in an Era of Changing Diagnostic Practices, Tennessee, 2006 - 2016
Abstract

BACKGROUND: Clinical laboratories are rapidly adopting culture-independent diagnostic tests (CIDTs) for the detection of Shiga toxin-producing *Escherichia coli* (STEC), an important cause of foodborne illness. STEC incidence and clinical laboratory testing practices over an 11 year period were analyzed to describe the evolution and impact of CIDT adoption.

METHODS: The Tennessee Department of Health (TDH) conducted active surveillance for STEC through the Foodborne Diseases Active Surveillance Network. STEC-positive specimens were serogrouped to characterize O157 and non-O157 STEC. Surveys of clinical laboratory practices were conducted with laboratories reporting to TDH in 2007, 2012, and 2014 - 2016. Data on clinical laboratory practices and serogroup of reported STEC cases identified from 2006 - 2016 were compared temporally.

RESULTS: During 2006 - 2016, the number of laboratory-positive STEC cases steadily increased, ranging from 88 cases (2009) to 257 cases (2016). The number of cases diagnosed only by CIDT without culture confirmation (CIDT-only) nearly tripled from 2006 (38 cases) to 2016 (107). The proportion of CIDT-only cases varied from 24% to 42% annually, with 31% of cases tested only by CIDT in 2015. Among culture-confirmed cases, the proportion of non-O157 infections increased from 12% (2006) to 60% (2015). In 2015, 18 distinct non-O157 serogroups were identified, increasing from 4 serogroups in 2006. The most common non-O157 serogroups in 2015 were O103 (29 cases), O111 (20), O26 (20), O145 (6) and O118 (6). The number of STEC testing laboratories reporting any CIDT testing increased from 9 (16%) in 2007 to 44 (90%) in 2016. The percentages of laboratories using CIDT-only methods for testing were 1%, 10%, 14%, 15% and 22% in 2007, 2012, and 2014 - 2016, respectively.

CONCLUSIONS: In Tennessee, increasing adoption of CIDTs over the past decade has mirrored an increasing incidence of reported STEC infections, most notably in non-O157 serogroups and cases identified by CIDTs only. Increases in non-O157 STEC infections and uncommon O serogroups have highlighted the importance of non-O157 STEC, which have overtaken O157 infections. Understanding the risk factors for non-O157 infections is critical, especially as an increasing number of cases are identified without culture confirmation. Approximately one third of STEC cases annually were not culture-confirmed, preventing serotyping and molecular fingerprinting, which are instrumental in outbreak investigation. With 90% of STEC testing laboratories reporting CIDT use in 2016, it is crucial to stress the importance of culture confirmation for surveillance and outbreak investigation and to enhance understanding of non-O157 risk factors.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Enteric Infectious Diseases; Surveillance

Consider for Different Presentation? Yes

Presenting Author Email Address(es) jane.yackley@tn.gov

Presenting Author(s) Jane Yackley

Institution Tennessee Department of Health

Affiliation CDC/CSTE Fellow

Submission Type Breakout/Quick/Lightning/Poster
ID [7886](#)

Abstract Type Quick

Abstract Title Tracing a Group of Hepatitis A Cases in Nebraska to a National Outbreak Involving Egyptian Strawberries
Abstract

BACKGROUND: Nebraska experiences isolated cases of Hepatitis A that average about one per month and the last outbreak occurred at a fast food restaurant in 1998. In the summer of 2016, 10 epidemiologically linked cases were identified within a group of people associated with an assisted living facility in North Platte, NE. Despite the first cases being restricted in their travel and interactions with the community, initial efforts to identify the source of infection were unsuccessful. CDC questionnaires were administered in August after smoothies were linked to an outbreak in Virginia and surrounding states. However, caregiver responses did not indicate that any Nebraska cases had consumed smoothies from regional fast food chains. In October, Egyptian strawberries distributed by The International Company for Agricultural Production & Processing (ICAPP) were recalled after being identified as having caused the national outbreak. Further follow-up in Nebraska found that these strawberries were also distributed to the cafeteria of a nearby hospital in June. The index case became symptomatic roughly one incubation period later in July.

METHODS: The Nebraska Department of Health and Human Services and the West Central District Health Department responded to this outbreak and implemented appropriate public health measures to control disease transmission. The first cases were identified through passive, laboratory-based surveillance before active surveillance and vaccination campaigns were organized in the community.

RESULTS: Contact tracing identified 451 contacts and 198 exposed persons received post-exposure vaccinations. Cases who experienced hepatitis symptoms after being recently vaccinated were tested using PCR methods at the CDC virology lab to confirm the Hepatitis A diagnosis. Of the 10 cases, three were hospitalized and one died from complications relating to the illness.

CONCLUSIONS: Recalled strawberries implicated in a national Hepatitis A outbreak were delivered to a hospital in North Platte, NE in June of 2016. Ten cases of Hepatitis A were later identified amongst a close group of vulnerable adults and caretakers from July to September of 2016. Given the close proximity and lack of other likely sources, it is presumed that the virus came from the recalled strawberries. However, a definitive connection between the hospital cafeteria and the adult living facility could not be confirmed because of difficulties in obtaining accurate histories from persons with development disorders and the length of time between initial investigation and final interviews.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Hepatitis; Outbreaks; Vaccine-Preventable Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) blake.hendrickson@nebraska.gov

Presenting Author(s) Blake E Hendrickson

Institution Nebraska Department of Health and Human Services

Affiliation State Public Health Agency

Submission Type Breakout/Quick/Lightning/Poster
ID [8587](#)

Abstract Type Quick

Abstract Title Abstract
Vibriosis in a Land-Locked State: Assessing the Impact of Culture-Independent Diagnostic Testing in Colorado

BACKGROUND: Vibriosis incidence in the US is increasing. Illness is more commonly reported among residents of coastal areas where shellfish consumption and seawater exposure is more common. In 2016, *Vibrio* case reports in Colorado increased substantially, prompting an assessment of the impact of culture-independent diagnostic tests (CIDTs) on surveillance. *Vibrio* culture requires selective media and often has not been included in standard stool testing, whereas CIDT panels most often adopted by clinical laboratories in Colorado include *Vibrio*. In Colorado, *Vibrio*-positive CIDT results (where reflex culture was negative or not performed) have been classified as suspect cases and investigated since 2014.

METHODS: We analyzed demographic, exposure, and laboratory data of *Vibrio* cases reported 2012-2016 and compared culture-confirmed with CIDT-positive suspect cases. We compared culture-confirmed cases reported from laboratories that continue to culture with those that have switched to CIDTs.

RESULTS: During 2012–2016, 65 culture-confirmed and 12 CIDT-positive suspect cases were reported. The incidence of confirmed cases per 100,000 increased from 0.19 in 2012-2013 to 0.24 in 2014-2015 to 0.35 in 2016 and the incidence of suspect cases increased from 0 in 2012-2013, to 0.02 in 2014 to 0.05 in 2015 to 0.15 in 2016. The mean age of culture-confirmed and CIDT-positive suspect cases was similar (45 and 52, respectively, $p=0.24$), while confirmed cases were more often male as compared to suspect cases (77% vs. 25%, $p<0.001$). Among cases with a positive stool specimen ($n=60$), culture-confirmed cases were more likely than CIDT-positive suspect cases to report exposure to raw shellfish (89% vs. 25%, $p<0.001$). Culture-confirmed cases from clinical laboratories that have adopted CIDTs have increased from 1 per year in 2012-2013 to 4 per year in 2014-2015 to 12 in 2016. In contrast, culture-confirmed cases from clinical laboratories that continue to perform culture have been stable, with an average of 9 cases reported per year. Reflex culture was performed for 21 (91%) CIDT-positive results; *Vibrio* isolates were recovered from 11 (52%).

CONCLUSIONS: In Colorado, culture-confirmed *Vibrio* cases are increasing. This is likely due to an increase in testing associated with CIDTs. Isolate recovery for *Vibrio* is low and could be due to inadequate use of specialized media, organisms dying in transit, and/or the detection of non-viable organisms. Suspect cases reported less raw shellfish exposure. Additional information is needed to assess the value of complete case and environmental health investigations of CIDT-positive *Vibrio* cases given competing public health priorities.

Submission Complete? Yes

Committee Infectious Disease
Topic Enteric Diseases
Keywords Surveillance; Foodborne Disease; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) elisha.wilson@state.co.us

Presenting Author(s) Elisha Wilson

Institution Colorado Department of Public Health and Environment
Affiliation State Public Health Agency

Submission Type Roundtable
ID [8308](#)

Abstract Type Roundtable

Abstract Title Addressing Major Challenges to the Prevention and Control of Shigellosis: Working with CDC to Leverage New Resources
Abstract

Key Objectives:

To explore how CDC can support state and local health departments to meet two major challenges in the prevention and control of shigellosis: 1) identifying and containing outbreaks of antibiotic-resistant *Shigella* among men who have sex with men, and 2) assessing the role of exclusion policies in managing childcare-associated outbreaks.

Brief Summary:

CDC is poised to expand and strengthen molecular-based *Shigella* surveillance and outbreak detection nationwide, which will inform new prevention and control strategies. By leveraging this enhanced laboratory and epidemiologic capability, CDC will support health departments to address both emerging and longstanding public health challenges in shigellosis, including the development and spread of antibiotic-resistant infections, the rising incidence of shigellosis among men who have sex with men (MSM), and the difficulty of containing outbreaks, particularly those in childcare settings. According to WHO and CDC, the prevention and control of antibiotic-resistant shigellosis is a public health priority. Outbreaks of shigellosis among MSM are increasingly reported in the United States and are often due to strains that are resistant to clinically important antibiotics. Antibiotic-resistant shigellosis is not limited to MSM, however. The potential for outbreaks of antibiotic-resistant *Shigella* in childcare settings is especially worrisome because a rising proportion of strains are resistant to azithromycin, the first-line treatment for children. Exclusion policies are commonly used to mitigate childcare-associated shigellosis outbreaks, but data gaps preclude an evaluation of their effectiveness in relation to social and economic impacts. The heterogeneity of at least five different childcare exclusion policies across states further reflects the challenge of evaluating and standardizing recommendations. This roundtable will provide a forum for state and local health departments to discuss how CDC can help them address major challenges to preventing and controlling shigellosis. Topics may include: developing questionnaires for MSM-associated outbreaks; identifying risk factors for transmission among MSM, for antibiotic-resistant infection, and for spread to vulnerable populations; creating targeted prevention messages; and building an evidence base to guide interventions such as childcare exclusion policies.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Antimicrobial Resistance; Enteric Infectious Diseases; Outbreaks

Consider for Different
Presentation? No

Presenting Author
Email Address(es) ydh4@cdc.gov

Presenting Author(s) Mateusz P. Karwowski

Institution Centers for Disease Control and Prevention
Affiliation CDC

Submission Type ID	Roundtable 7620
Abstract Type	Roundtable
Abstract Title Abstract	Identifying Strategies to Address the Challenges of Culture-Independent Diagnostic Testing on Enteric Disease Surveillance and Investigation
	Key Objectives: The objective of this roundtable is to identify strategies to address the challenges of culture-independent diagnostic tests (CIDTs) on surveillance activities at state health departments in the United States. We will discuss protocols state health departments have implemented for prioritization of case investigations, classification of cases when multiple pathogens have been detected from a single patient specimen, acquisition of specimens for subtyping (e.g., pulsed field gel electrophoresis [PFGE] and whole genome sequencing [WGS]), and detection of outbreaks when CIDT-only positive cases are reported. Representatives from state health departments and CDC will share their experiences with CIDT issues, from surveillance challenges to reflex culture of positive CIDTs. We will assess surveillance challenges due to the introduction of CIDTs and successful strategies to address them, identify gaps in knowledge, and discuss how the Foodborne Diseases Active Surveillance Network (FoodNet) and other public health agencies can help address these gaps. Brief Summary: In the past four years, the proportion of clinical laboratories using CIDT methods to detect enteric pathogens has increased. In FoodNet, the annual percentage of enteric bacterial (<i>Campylobacter</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Vibrio</i> , and <i>Yersinia</i>) infections diagnosed with only a CIDT increased from 7% during 2012–2014 to 16% in 2015, and only 63% of laboratories are continuing to confirm positive CIDTs with reflex culture. To accurately count and monitor incidence of infections, national case definitions were recently modified to incorporate CIDT results into case classification protocols for <i>Campylobacter</i> , <i>Salmonella</i> , <i>Shigella</i> , and <i>Vibrio</i> . However, the increasing use of CIDTs creates many challenges to public health surveillance and disease investigation beyond case classification. Unlike culture-based methods, CIDTs do not produce an isolate, which is necessary for subtyping, including PFGE and WGS, and antimicrobial susceptibility testing. Cluster and outbreak detection rely on these subtyping methods, so state health departments or clinical laboratories are burdened with performing reflex culture to obtain this information. In addition, the majority of CIDTs used are syndrome panels that use nucleic acid to detect multiple pathogens with a single test. Identification of multiple pathogens in a single specimen complicates case classification, cluster detection, and interpretation of exposures, symptoms, and patient outcome. This roundtable will facilitate discussion among state health departments and CDC to better understand the challenges of CIDTs and identify strategies to best address them.
Submission Complete?	Yes
Committee Topic Keywords	Infectious Disease Enteric Diseases Surveillance; Foodborne Disease; Outbreaks
Consider for Different Presentation?	Yes
Presenting Author Email Address(es)	emarder1@cdc.gov; ihq5@cdc.gov
Presenting Author(s)	Ellyn Marder; Aimee Geissler
Institution Affiliation	Centers for Disease Control and Prevention CDC

Submission Type Roundtable
ID [8577](#)

Abstract Type Roundtable

Abstract Title Let Me Tell You a Story about CIDT You Don't Want to Hear
Abstract

Key Objectives:

At the end of this session, participants will be able to:

- Describe the impact of culture independent diagnostic testing on laboratory and epidemiology surveillance systems.

- Understand the value of syndrome panels for identifying co-detections.
- Apply the experience of Tennessee with CIDTs to assist in their jurisdictions.
- Understand the implications of improper data reporting from CIDT.
- Summarize the resources available to assist with CIDT.

Brief Summary:

Culture Independent Diagnostic Tests, most recently syndrome panels, have had an impact on both public health laboratory and epidemiology surveillance systems. This new technology has offered diagnostic opportunities never before available, but at a cost to public health surveillance. In this roundtable, the impact of CIDTs will be discussed from both the laboratory and epidemiology perspectives. Study data will be presented for discussion from three years of CIDT experience in Tennessee. Additionally, a pilot study will be discussed where the retrospective syndrome testing of specimens resulted in the identification of co-detected pathogens. From the epidemiology perspective, errors involving interpretation of syndrome panels and entry in surveillance databases have led to educational opportunities with clinical facilities. The impact of CIDT testing on larger trend data will be brought up for discussion. Speakers will discuss resources that are available and ongoing that assist with CIDT issues. This is intended to be an interactive session and time will be allotted for discussion and questions.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Foodborne Disease; Epidemiology; Enteric Infectious Diseases

Consider for Different Presentation? Yes

Presenting Author Email Address(es) amy.woron@tn.gov; john.dunn@tn.gov

Presenting Author(s) Amy M. Woron; John Dunn

Institution Tennessee Department of Health

Affiliation State Public Health Agency

Submission Type Roundtable
ID [7778](#)

Abstract Type Roundtable

Abstract Title Abstract New Development Teams and Projects from C I F O R, the Council to Improve Foodborne Outbreak Response

Key Objectives:

--Explain the new CIFOR 5-Year Strategic Plan with an emphasis on functions of the four CIFOR Development Teams --Obtain feedback from CSTE conference attendees on the current and planned projects of the CIFOR Development Teams

Brief Summary:

The Council to Improve Foodborne Outbreak Response (CIFOR) is a multidisciplinary collaboration of eight diverse national associations and three federal agencies whose goal is to improve epidemiologic, laboratory and environmental health methods at the local, state, and federal levels to detect, investigate, control, and prevent foodborne disease. The food industry is represented on the CIFOR Industry Workgroup. In 2016 CIFOR adopted a new 5-yr strategic plan that created four Development Teams to more effectively identify barriers and develop appropriate projects. The Identify Development Team is conducting an overall gap analysis of foodborne disease outbreak detection and investigation systems and conducting focus groups of physicians about their knowledge, attitudes and practices related to stool testing and culture independent diagnostic tests. The Lead Development Team is producing guidelines on foodborne illness complaint systems, finalizing the *Outbreaks of Undetermined Etiology Guidelines* and beginning the production of the *CIFOR Guidelines 3rd Edition*. The Promote Development Team is revising the CIFOR Clearinghouse, the CIFOR website and producing a formal Marketing Plan for CIFOR products. The Evaluate Development Team is comparing metrics across many foodborne disease programs to update CIFOR metrics and is developing a framework for outbreak After Action Review (AAR) which will be used at CIFOR meetings and other settings.

Submission Complete? Yes

Committee Infectious Disease

Topic Enteric Diseases

Keywords Food Safety; Foodborne Disease; Outbreaks

Consider for Different Presentation? Yes

Presenting Author Email Address(es) kirk.smith@state.mn.us; das8@cdc.gov

Presenting Author(s) Kirk Smith; Donald J. Sharp

Institution Minnesota Department of Health

Affiliation State Public Health Agency