



Oklahoma State
Department of Health

Oklahoma State Department of Health

Epidemiological Investigation of Restaurant-Associated
Escherichia coli O111:NM Outbreak--Mayes County,
Oklahoma, 2008

FINAL REPORT

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Final Report: Epidemiological Investigation of Restaurant-Associated *Escherichia coli* O111:NM Outbreak-- Mayes County, Oklahoma, 2008

EXECUTIVE SUMMARY

This report is presented as a summary of the public health response and investigation of what is believed to be the largest *E. coli* O111 outbreak in the United States to date. The outbreak occurred in northeastern Oklahoma during late August and early September 2008. Within 48 hours of public health notification of increased cases of bloody diarrhea being admitted to Tulsa area hospitals, a restaurant was identified as the common source of transmission and closing the restaurant contained the outbreak. The complex investigation involved extensive case finding (including laboratory testing of numerous clinical specimens from exposed persons) and restaurant patron and employee interviews, coupled with an in-depth environmental investigation that consisted of restaurant, food, water, and animal feces specimen testing. A total of 6,481 hours have been dedicated to this investigation by the Oklahoma State Department of Health thus far.

The findings of the epidemiologic investigation indicate:

- 1) This was a point source outbreak originating from the Country Cottage restaurant in Locust Grove, Oklahoma.
- 2) Because the outbreak organism was not isolated from any environmental specimen, it could not be conclusively determined how *E. coli* O111 was introduced into the restaurant.
- 3) The exact mode of spread within the restaurant was not established, however, the epidemiological analyses suggests there was ongoing foodborne transmission of *E. coli* O111:NM to Country Cottage restaurant patrons between August 15 and August 24, 2008.

Enterohemorrhagic *E. coli* can cause serious illness and pathology because of its ability to produce potent cytotoxins called Shiga toxins 1 and 2. Persons who ingest Shiga toxin-producing *E. coli* (STEC) may have a diarrheal illness ranging from very mild and non-bloody to severe with very bloody stools. Cattle and other ruminant animals such as sheep, goats, and deer are considered the primary reservoir of STEC bacteria. The infectious dose is very small and STEC are often spread by ingesting food items contaminated with ruminant feces that are not subsequently cooked. Person-to-person transmission, direct animal contact, and waterborne transmission, either from contaminated drinking water or recreational water, are other exposure routes.

OUTBREAK FACTS

Source of Outbreak	Country Cottage Restaurant
Organism	<i>E. coli</i> O111:NM
Confirmed Outbreak Period	August 15, 2008 – August 24, 2008
Total Number of Cases	341
Total Number Hospitalized	70
Total Number of Deaths	1
Introduction into Restaurant	Unknown
Spread of the Organism within the Restaurant	Foodborne transmission likely

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BACKGROUND

Enterohemorrhagic strains of *Escherichia coli* were first recognized as a foodborne health threat in 1982 when two outbreaks of hemorrhagic colitis associated with eating undercooked hamburgers occurred in Oregon and Michigan.¹ The outbreak agent was identified as a novel serotype of *E. coli* bacteria, now familiar to many as O157:H7 due to the numerous outbreaks of this organism that have followed.² Enterohemorrhagic *E. coli* can cause more serious illness and pathology because of its ability to produce potent cytotoxins called Shiga toxins 1 and 2. Persons who ingest Shiga toxin-producing *E. coli* (STEC) may have a diarrheal illness ranging from very mild and non bloody to severe with very bloody stools. The incubation period is relatively long with a range of 2-10 days and a median of 3-4 days. About 8% of persons with *E. coli* O157:H7 infection develop post-diarrheal hemolytic uremic syndrome (HUS) as a medical complication. HUS is characterized by acute microangiopathic hemolytic anemia, thrombocytopenia and loss of kidney function and may be life-threatening.³ Besides *E. coli* O157:H7, there are 6 additional serotypes often implicated in STEC infections in the U.S., including O26, O111, O121, O103, O45, and O145.⁴ Unlike O157:H7, these organisms cannot be detected by traditional laboratory screening methods such as plating on sorbitol-MacConkey agar since they are all sorbitol fermenters. Therefore, it is likely that the true incidence of non-O157 sporadic disease and case clusters is much higher than that determined by routine public health surveillance. In fact, it is estimated that as many as 37,000 cases of illness due to non-O157 STEC occur annually in the United States.⁵ Cattle and other ruminant animals such as sheep, goats, and deer are considered the primary reservoir of STEC bacteria. The infectious dose is very small and STEC are often spread by ingesting food items contaminated with ruminant feces that are not subsequently cooked. Person-to-person transmission, direct animal contact, and waterborne transmission, either from contaminated drinking water or recreational water, are other exposure routes.³

Infection with *E. coli* O157:H7 became a nationally notifiable disease in 1994 although non-O157 STEC surveillance was not established nationally until 2001. In Oklahoma, STEC infections were added to the list of reportable diseases in 2000. Since that time, the number of reported cases has steadily increased, ranging from three cases in 2005 to eleven in 2007. In 2008, the number of cases greatly exceeded historical levels due to a large *E. coli* O111 foodborne outbreak that occurred in northeastern Oklahoma during late August and early September. According to the Centers for Disease Control and Prevention (CDC), only 10 outbreaks involving *E. coli* O111 had been reported nationally prior to Oklahoma's outbreak (Table 1). This report summarizes all aspects of the epidemiological investigation and response conducted by the Oklahoma State Department of Health (OSDH) in collaboration with several public health partners, namely the Tulsa Health Department (THD), Mayes County Health Department, CDC, Oklahoma Department of Environmental Quality (DEQ), and the Oklahoma Department of Agriculture, Food and Forestry (ODAFF) Food Laboratory.

INTRODUCTION

On Friday, August 22, 2008, Kelly Deal, Director of the Tulsa EMSA/Metropolitan Medical Response system notified Dr. Kristy Bradley, OSDH State Epidemiologist, Scott Sproat, Chief of OSDH Emergency Preparedness Response Service, and Dave Cox, THD around 6:00 p.m. by

high priority electronic mail of an unusual increase in admits for severe hemorrhagic diarrhea among children to St. Francis Hospital in Tulsa. Dr. Bradley personally notified Laurence Burnsed, Director of the OSDH Communicable Disease Division, of the report and requested call-down notification of the THD epidemiologist-on-call and Lauri Smithee, Chief of the OSDH Acute Disease Service (ADS). Christie McDonald, the ADS epidemiologist-on-call was subsequently contacted by Dr. Charles Stewart, emergency department (ED) physician at Saint Francis Hospital in Tulsa, Oklahoma with medical information on three children that were recently hospitalized with bloody diarrhea and severe abdominal cramping. A hypothesis-generating questionnaire was created on Friday evening and telephone interviews of family members of hospitalized patients began that night. The St. Francis Hospital laboratory was contacted to assess status of patient specimen testing by type and initial results.

ADS epidemiologists also began contacting hospitals in the northeastern quadrant of the state to conduct active surveillance for additional cases and to determine if there was a point source. Hospitals were requested to provide demographic and clinical information of patients who presented to the ED and/or were hospitalized with severe gastroenteritis. When six of the first eight patient interviews indicated they had recently eaten at the Country Cottage restaurant, a popular buffet-style eatery, in Locust Grove, Oklahoma, the Mayes County Health Department sanitarian conducted an unannounced inspection of the restaurant on August 23, 2008. Daily briefings for the public health investigation team via conference call began Saturday evening, August 23. By August 25, the restaurant had closed but case reports of bloody diarrhea and HUS were mounting. As the scope of the outbreak increased rapidly, an Incident Command Structure (ICS) was implemented at the OSDH on August 26 to manage and coordinate the outbreak investigation and public health response. The ICS organizational chart is included in Appendix A of this report.

The OSDH began a series of conference calls with medical epidemiologists in the CDC Enteric Diseases Epidemiology Branch on August 28. An invitation was issued to the CDC on September 4 to deploy a three-member "Epi-Aid" team to assist with some aspects of the epidemiologic investigation.

MATERIALS AND METHODS

Epidemiologic Investigation

Case Finding

Active surveillance (case finding) was initiated very early in the investigation to rapidly determine the scope and source of the outbreak, and continued until there was confidence that the outbreak was controlled. The initial surveillance case definition captured any person presenting with acute bloody diarrhea, HUS, or diarrhea (≥ 3 loose stools/ 24 hrs) with severe abdominal cramping and an onset of symptoms beginning on or after August 9, 2008. Persons with a history of chronic diarrhea or colitis were excluded as suspect case-patients. Several methods were used to identify potential outbreak-related cases:

1. ED/Hospital Surveillance

Active surveillance for outbreak-associated cases began with telephone inquiries to hospitals located in northeastern Oklahoma on August 22, 2008. Hospital surveillance was later performed with survey forms posted electronically to EMSystems® and faxed to infection preventionists at hospitals in northeastern Oklahoma.

2. Oklahoma Health Alert Network (OK-HAN) Notifications

The first OK-HAN Advisory was sent by fax on August 24, 2008, to all primary care physicians, hospital EDs, infection preventionists, and laboratories in Tulsa, Washington, Mayes, Creek, Muskogee, Wagoner, Rogers, Cherokee, Delaware, Ottawa, and Craig counties and to key state and local public health personnel. Healthcare providers were alerted about the outbreak and requested to report cases of hemorrhagic diarrhea, HUS, thrombotic thrombocytopenic purpura (TTP), and acute renal failure to the ADS epidemiologist-on-call. The advisory also communicated that a STEC agent was suspected. A second OK-HAN Advisory was issued on August 27, 2008, statewide to similar professional groups again urging reporting of patients who presented with bloody diarrhea since August 15. A third OK-HAN Advisory was issued statewide on August 29 providing guidance on collection and laboratory testing of specimens from patients with diarrheal illness or HUS potentially associated with the *E. coli* O111 outbreak, and reporting of cases to the OSDH. A final OK-HAN Update was issued on September 15, 2008, to inform reporting sources that active surveillance for the outbreak had ceased. [Appendix B]

3. Reference/Hospital Laboratory Surveillance

In addition to the OK-HAN advisories, hospital laboratories throughout northeastern Oklahoma were contacted by fax on September 10, 2008 to verify all Shiga toxin-positive reports recently received by the ADS and to report any newly identified Shiga toxin-positive clinical specimens. Laboratories in northeastern Oklahoma were notified to return to normal communicable disease reporting procedures on September 15. [Appendix C]

4. Epidemic Information Exchange (Epi-X) Postings

An Epi-X notification to all states and US territories was posted on August 28, 2008. OSDH requested that state and territorial health departments report any identified cases of bloody diarrhea, HUS, or STEC infection in persons with a travel history to northeastern Oklahoma during August 15 - 24 to the ADS. The national pulsed field gel electrophoresis (PFGE) pattern numbers associated with the outbreak were referenced. Upon notification of suspect cases within their public health jurisdictions, ADS epidemiologists worked specifically with Arkansas, Kansas, and Texas state health departments and the County of Los Angeles Department of Public Health to administer the outbreak questionnaire, and obtain medical records and laboratory test results from hospitals or their respective state public health laboratories. [Appendix D]

5. Record identification from the Tulsa Area Syndromic Surveillance System (TASSS)

The THD operates the TASSS which daily receives file transfers of chief complaint data of patients presenting to EDs at all Tulsa hospitals. On Sunday, August 24, the THD conducted a query for patients who had a diarrheal illness syndrome recorded during hospital ED visits from August 15 through August 23, 2008. TASSS patient identification numbers were used to identify medical records needing review at each hospital. ADS and THD epidemiologists conducted medical record reviews of patients with diarrhea listed as a syndrome at St. John Medical Center and St. Francis Hospital.

6. Additional case finding through case interviews

An outbreak questionnaire was used to interview all potential cases as well as persons calling directly to the OSDH emergency phone bank and self-reporting diarrheal illness. Each suspect case was asked to provide names and contact information of all dining companions and any other known persons who were seen eating at the restaurant. These named individuals were later interviewed by OSDH personnel and volunteers to determine illness status and restaurant exposures.

7. Restaurant employee interviews

As part of the standard employee interview questionnaire, employees of the Country Cottage restaurant were questioned regarding symptoms of diarrheal illness as well as close contacts known to be ill or who may have consumed food from the restaurant.

8. Media Release – Call for additional cases and controls

The OSDH released outbreak situational reports to various media outlets beginning August 25, 2008, and posted them on the agency website. Situation Update No. 10 requested that persons who ate at the Country Cottage restaurant in Locust Grove, OK on August 15, 16 and 17 and who had not already been contacted for an interview to call a published toll-free number. In Situation Update No. 12 released on September 9, families with children who ate at the restaurant during that same time frame were urged to call the toll-free number for interview. [Appendix E]

Case Control Study

To confirm the source of the outbreak and to identify potential food vehicles and other risk factors for *E. coli* O111 illness, a retrospective case control study was conducted.

- 1) A **confirmed case** was defined as a person with diarrheal illness from whom *E. coli* O111:NM with an outbreak PFGE pattern was isolated, or Shiga toxin 1 and 2 was detected in a stool specimen by PCR without bacterial isolation AND who reported eating Country Cottage food between August 10 and August 24, 2008 with illness onset after date of Country Cottage exposure.
- 2) A **probable case** was defined as a person having the same sequence of Country Cottage food exposure and illness onset as a confirmed case with one of the following clinical and laboratory outcomes:
 - a. post-diarrheal **HUS** with or without a positive enzyme immunoassay (EIA) for Shiga toxin;
 - b. diarrheal illness (≥ 3 loose stools in a 24 hour time period) and abdominal cramping with a positive EIA test for Shiga toxin without confirmatory culture; or
 - c. acute bloody diarrhea with negative test results or absence of laboratory testing for STEC and no other alternate explanatory diagnosis.
- 3) A **suspect case** was defined as a person with diarrheal illness and abdominal cramping with no laboratory evidence of STEC infection or infection with other gastrointestinal pathogens (such as *Salmonella* species or *Campylobacter*) who had onset of illness after eating Country Cottage food between August 10 and August 24, 2008.
- 4) A **secondary case** was defined as a person with close contact to a confirmed, probable, or suspect case with onset of diarrheal illness meeting one of the definitions above within one incubation period of the index case.

A **confirmed case of HUS** was defined as an individual with renal injury (evidence of uremia, proteinuria or hematuria), thrombocytopenia, and anemia with red blood cell (RBC) fragments, such as schistocytes, burr cells or helmet cells observed during microscopic examination of a peripheral blood smear. Persons with all of the components of a confirmed HUS case but lacking testing for, or documentation of the presence of RBC fragments on a peripheral blood smear were defined as **probable HUS cases**. Uremia was defined as having a serum creatinine level greater than or equal to 1.0 mg/dL in children less than 13 years of age, or a serum creatinine level greater than or equal to 1.5 mg/dL in individuals 13 years or older. Anemia for males was defined as having at least one hemoglobin level less than 13.5 mg/dL, or a hematocrit less than 41%; for females, the cut off values included hemoglobin < 12.0 mg/dL, or a hematocrit < 36%. Thrombocytopenia was defined as a platelet count less than $150,000 \times 10^9/L$.

Controls for the epidemiologic analysis were dining companions of cases who did not report diarrheal illness, or restaurant patrons who contacted the OSDH phone bank or were identified by credit card or check receipts and did not report having diarrheal illness. To obtain an adequate number of control subjects among all age groups and enhance statistical power for an analysis of food exposures, copies of credit card receipts and checks received as payment from customers that dined at the Country Cottage restaurant from August 15 through August 17, 2008, were requested from the restaurant owners on Wednesday, September 3. Copies of 320 credit card receipts were provided to ADS on the following day; 245 (77%) were individuals not yet identified by other methods and with a full name available from the receipt. The ADS then obtained contact information for credit card account holders by conducting computer searches on multiple phone directory search engines using the first and last name listed on receipts. Reliable contact information was identified for 146 (60%) of the 245 restaurant patrons to be interviewed. Copies of personal checks used to pay for restaurant meals were received from the Bank of Locust Grove on Friday, September 5. Of these, 73% (29/40) were individuals not yet identified by other methods. ADS staff located contact information for 27 (93%) of 29 check account holders by using the same process of phone directory searches. Phone bank personnel attempted to complete interviews of individuals identified from credit card receipts and check statements using the standard outbreak questionnaire.

Cases and controls were interviewed using the same questionnaire tools. In analyses where more than four controls per case were available, controls were randomly selected and limited to four per case.

Statistical Methods

All data were entered into a Microsoft Access 2000 database utilizing numerous personnel working through a centralized data entry bank established specifically for this outbreak investigation. To ensure data entry quality and completeness, a quality assurance team was assembled and reviewed data entry of all questionnaires using a predetermined systematic process. Epidemiologic analyses were performed with SAS version 9.1 (SAS Institute). Descriptive statistics were first evaluated for all cases and controls. Odds ratios and 95% confidence intervals were calculated for each exposure variable. Due to statistical power constraints, further analysis of food items was restricted to confirmed and probable cases compared to controls who reported only one dining exposure throughout lunch and dinner hours at the Country Cottage restaurant during the weekend of August 15 through August 17, 2008. Multivariate logistic regression was performed in a backward stepwise fashion including all statistically significant variables identified during univariate analysis of exposures for persons aged 13 years or older. For all statistical tests, a p-value < 0.05 was considered significant.

Catered Event Cohort Study

During the initial interviews with Country Cottage restaurant management, OSDH investigators learned that the restaurant catered a "Ladies Tea" fundraising event for the Bethany Free Will Baptist Church in Broken Arrow, Oklahoma, on Saturday, August 16, 2008. Investigators obtained the catered event menu along with a brief description of ingredients for food selections at the catered event, timing and location of various food item preparation, names of employees involved in food preparation and serving, and method of food transport to the event location.

The Bethany Free Will Baptist Church was contacted by OSDH on August 25 to gather additional details regarding the catered event. The church staff compiled a list of event hostesses/ticket purchasers and emailed the list to the ADS on August 28. Since this list was not inclusive of all

attendees, each hostess was asked to provide the names and contact information for their guests and other individuals they knew who also attended the event.

A questionnaire tailored for the “Ladies Tea” was developed by OSDH. The questionnaire included sections to collect information on demographics, clinical information, food exposures at the church event, and any exposures to the Country Cottage restaurant between August 16 and August 24, 2008. If the interviewee had dined at the Country Cottage restaurant during this time period, the food exposure questions from the general outbreak questionnaire were also asked. The OSDH, THD, and CDC Epi-Aid team attempted to contact all attendees of the catered event and administer the questionnaire by phone. The THD and CDC Epi-Aid team organized an on-site visit on September 10 to continue interviews, provide information on the outbreak investigation and collect blood specimens from volunteer participants for *E. coli* O111 antibody testing. Analysis of the questionnaire data from the Church Tea retrospective cohort study was performed by the CDC Epi-Aid team.

Environmental Investigation

Restaurant Inspection and Employee Interviews

On August 23, 2008, Ben May, RPS, Mayes County Health Department, conducted an environmental investigation of the Country Cottage restaurant. The environmental investigation consisted of a standard foodservice establishment inspection and interviews of restaurant management regarding knowledge of employee illnesses or history of complaints received from customers. The foodservice inspection included a review of food storage, preparation and service; and employee food handling and observation of hand hygiene. A list of foods served on the buffet and foods available for ordering from the menu were obtained for development of the outbreak questionnaire. Facility operation records were reviewed to determine the number of customers served daily from August 15, 2008.

Employee rosters and contact information were obtained from Country Cottage management for 60 employees. The investigation team conducted interviews of restaurant employees using a standard questionnaire to elicit information regarding their work schedule and specific job responsibilities from August 15 through August 24, 2008. Employees were interviewed regarding hours worked each day, position and responsibilities for each shift (i.e., grill cook, salad preparation, hostess, or waitress), and a detailed description of duties and foods handled. Employees were also surveyed regarding the number of times they washed their hands for every 10 trips to the bathroom. Work schedules were obtained from Country Cottage management to confirm employees accurately provided their work dates and hours.

Restaurant employees were also interviewed regarding recent history of gastrointestinal illness, onset and duration of diarrhea, medical evaluation and treatment, history of foods consumed at the restaurant, and presence of illness among household members and other close contacts. Stool specimens were requested from all employees reporting recent diarrheal illness. They were asked to obtain a minimum of two enteric kits from their local county health departments to submit two stool specimens collected at least 24 hours apart for Shiga toxin testing and bacterial culture and isolation at the OSDH Public Health Laboratory (PHL). Restaurant employees who self-reported diarrheal illness but refused to voluntarily comply with the request for two stool specimen submissions were served with an administrative order pursuant to 63 Oklahoma Statute (O.S.) Supp.2007, § 1-106(B)(1), 75 O.S. 2001, § 314.1, Oklahoma Administrative Code (OAC) 310:2-21-23 and 310:257-15-37 compelling them to provide the two consecutive stool specimens. [Appendix F]

Two employees (3%) who were identified as symptomatic by restaurant management were interviewed in-person by ADS epidemiologists on Sunday, August 24, 2008. The investigation team conducted in-person interviews for 42 (70%) employees on Monday, August 25 at the Country Cottage restaurant. Subsequent interviews of 16 (27%) employees were conducted from August 26-30, 2008. In-person interviews were conducted at a local county health department or by scheduling a visit at the employee's place of residence. Interpreters completed interviews for 5 (8%) employees who required a Spanish-speaking interpreter and for 2 (3%) employees who required a Russian-speaking interpreter.

On September 4, Laurence Burnsed, MPH, and Emily Piercefield, MD, DVM, CDC Epidemic Intelligence Service Officer assigned to OSDH, traveled to Locust Grove and interviewed restaurant management with more detailed questions regarding storage, preparation, and ingredients of certain food items of interest coupled with inquiries about environmental cleaning practices. Information was gathered concerning which employees had cleaning responsibilities for the kitchen, buffet service area, dining rooms, and bathrooms; what cleaning products were used; and availability & use of cleaning protocols. The team also verified previously obtained information about placement of food items on the buffet area.

Following review of employees' schedules and work duties, a subset of Country Cottage food handlers were re-interviewed with a second standardized questionnaire from September 16 – September 19, 2008, to elicit additional information regarding contact with animals or animal manure, consumption of unpasteurized dairy or fruit juice products, and to further characterize employee food handling duties. Three of 16 Country Cottage food handlers interviewed regarding animal contact history reported frequent direct contact with animals; two allowed OSDH to collect fecal samples from their animals.

Food and Restaurant Surface Testing

On August 28, 2008, Travis Brown, RPS, Consumer Health Service, collected environmental swabs of various surface areas in the Country Cottage restaurant. Dacron swabs stored in gram negative (GN) enrichment broth were used to obtain surface samples. Environmental swabs were collected from: (1) under a cutting board in the grill preparation area; (2) the grill preparation area cutting board; (3) the vegetable preparation sink; (4) the buffalo chopper; (5) a large mixing bowl with casters; (6) the smoker racks; (7) the mechanical dishwashing machine; (8) the lettuce holder; (9) the interior of the mechanical ice machine; (10) a tea container and fountain nozzle; (11) refrigerator shelves in the meat walk-in area; (12) the door handle for the grill preparation reach-in area; (13) the vegetable/bakery preparation table; (14) various vegetable countertop cutting boards; (15) the vegetable walk-in refrigerator shelves; and (16) the buffet table surface.

On September 2, 2008, Mr. Brown collected samples from five different food items remaining at the Country Cottage restaurant. These food samples consisted of (1) raw chicken; (2) milk used for creating tres leche cakes; (3) soft serve ice cream mix; (4) raisin cobbler; and (5) cantaloupe. In addition to collecting food samples, ingredients and food preparation steps were reviewed for the fried chicken, cheesecake, tres leche milk, soft serve ice cream, raisin cobbler, pies, and whipped cream "fluff" that was placed as a topping on several desserts. Water filters were also collected from the restaurant's tea dispenser and a tap water filter for testing at the CDC.

On September 17, 2008, Mr. Brown and the CDC Epi-Aid team collected additional food samples and environmental swabs from the Country Cottage restaurant. Surface swabs of three watermelons and 30 environmental swabs were collected from surfaces in the men and women's restrooms including door handles, toilet handles, toilet bowls, faucet handles and soap dispensers. Two environmental swabs were also collected from the overflow buffet surface

where hot items were placed for service and the overflow buffet surface where cold items were placed. Dacron swabs stored in GN enrichment broth were used to obtain and transport surface samples.

On November 12, 2008, Mr. Brown and Larry Bergner, RPS, OSDH Northeast Quadrant Supervisor, conducted an inspection of the Country Cottage restaurant as required by the "Agreement to Reopen Country Cottage Restaurant." The foodservice inspection included a review of food storage, preparation and service areas; adequacy of hand hygiene stations for personnel; approval of water supply and sewage disposal systems; and evaluation of equipment for cleaning by mechanical washing and sanitizing. Thirty-five environmental surface swabs were collected by Travis Brown from kitchen equipment surfaces, food processing equipment surfaces, and restroom handles. Similar to previous environmental surface sampling efforts, Dacron swabs stored in GN enrichment broth were used.

Chain of custody forms were completed and signed by Travis Brown and a restaurant owner for all environmental samples collected by OSDH. Food and environmental swabs collected on August 28, September 2, and September 17 were transported to the ODAFF Food Laboratory in Tulsa, Oklahoma, for bacterial culture and isolation. Specimen plates were later forwarded to the OSDH PHL for isolation and identification of any pathogenic organisms. The tea container and tap water filters collected on September 2 were shipped to CDC for testing. Environmental swabs collected on November 12 were transported to the PHL for bacterial culture and isolation.

Water Specimen Collection and Testing

The Oklahoma DEQ collected four water samples on August 25, 2008, based on complaints received from Locust Grove residents regarding the quality of the community water supply. Two water samples were collected from the Locust Grove water plant (public water service identification number 1021668). Two water samples were also collected from the Country Cottage restaurant: one filtered sample and one unfiltered sample from the employee hand hygiene sink. Water samples were transported to the Oklahoma DEQ laboratory and tested for live colony growth and the presence of total coliforms and *E. coli* using the total coliform membrane filtration Standard Method (SM) 9222B.

On August 27, DEQ officials collected eight samples from a well water system that supplemented the water supply for the Country Cottage restaurant. Environmental samples were transported to the DEQ laboratory and tested for the presence of total coliforms and *E. coli* using the total coliform membrane filtration Standard Method (SM) 9222B and the *Escherichia coli*/most probable number (EC/MPN) SM 9221F. One well water sample was collected and tested for *Shigella* using the SM 9260E method.

On August 29, four additional water samples were collected from the restaurant well water system by Oklahoma DEQ personnel and tested for the presence of total coliforms and *E. coli*. Water specimens were plated for bacterial culture; plates containing bacterial growth were forwarded to the PHL for subculture, isolation and identification.

On November 5, DEQ personnel, upon request by the OSDH, collected two 10-liter water samples from the Country Cottage restaurant well water system and shipped the samples by overnight courier to the CDC Waterborne Diseases Laboratory. Bacterial culture and polymerase chain reaction (PCR) testing for *E. coli* O111 were performed at the CDC Laboratory.

Microbiologic Investigation

Shiga Toxin Testing and Bacterial Culture of Clinical Specimens and Animal Fecal Specimens

All clinical stool specimens received by the PHL as well as the animal fecal specimens collected as part of the outbreak investigation were screened for the presence of Shiga toxin (stx) with an EIA using a commercial kit (Premier EHEC®, Meridian Bioscience). The specimens were simultaneously inoculated into a standard clinical set-up, which included the following medias (all produced by Remel, Lenexa, KS): MacConkey agar, Hektoen agar; sheep-blood agar; sorbitol-MacConkey agar (SMAC); cephalorazine-vancomycin-amphotericin B (CVA) agar, and GN broth.

The GN Broth was incubated at room temperature for 18-24 hours. The agar plate media were incubated under standard atmospheric conditions at 35-37°C for 18-24 hours. The plates were then removed from the incubator and examined visually for the following pathogens: *Salmonella* species, *Shigella* species, *Escherichia coli* O157:H7, *Campylobacter* species, *Yersinia* species, *Vibrio* species, *Bacillus cereus*, and *Staphylococcus aureus*. The MacConkey agar plates and the blood agar plates were held an additional 18-24 hours at room temperature and reexamined for the presence of *Yersinia* species. GN broths were then set up on MacConkey agar plate(s) and blood agar plate(s). These were incubated in standard atmosphere at 35-37°C for 18-24 hours. The plates were then removed from the incubator and examined visually for *Salmonella* species, *Shigella* species, and *E. coli* O157:H7.

All stx-positive specimens had individual colony types picked and biochemically identified by API 20E (Biomérieux Inc.). Testing for stx was not performed on samples that were screened by the submitting laboratory using the Premier EHEC or STAT EHEC commercial kits (Meridian Bioscience). All of these specimens were directly plated on SMAC and blood agar. These were incubated in standard atmosphere at 35-37°C for 18-24 hours. The plates were then examined visually and well-isolated colonies were identified by API 20E. Colonies that were not well isolated were streaked for purity on blood agar plate(s). These were incubated in standard atmosphere at 35-37°C for 18-24 hours. These isolates were then identified by API 20E.

Water Samples

The Oklahoma DEQ performed the initial analysis on all water samples collected during this outbreak. The PHL received two sets of plates streaked from water samples at the DEQ Laboratory for additional subculture and identification of bacterial isolates. For both sets of plates, a single colony of each isolate was picked and streaked for isolation on a blood agar plate. These were incubated in standard atmosphere at 35-37°C for 18-24 hours. The plates were then examined visually for purity and biochemically identified by API 20E. Shiga toxin screening by PCR was performed on any isolates identified as *E. coli*.

Environmental Swabs

Both the ODAFF Food Laboratory and the PHL received and processed environmental specimens collected during this outbreak investigation. All environmental swab specimens of restaurant and food surfaces were collected using sterile Dacron swabs and placed in GN Broth on site. The GN Broths were incubated in standard atmosphere at 35-37°C for 18-24 hours. The GN Broths were then streaked on SMAC, Hektoen agar and sheep blood agar plates. These were incubated in standard atmosphere at 35-37°C for 18-24 hours. Bacterial isolation and identification were performed as previously described for clinical specimens.

Isolate Characterization

Isolates from all specimen types that were identified as *Escherichia coli* were then tested by real time PCR for the presence of stx I and/or stx II genes. All isolates positive for stx I and/or stx II genes were forwarded to CDC for serotyping and analyzed by PFGE at the OSDH PHL. Standard CDC PulseNet protocols were followed. Agarose plugs were lysed in a lysis buffer followed by washing in TRIS EDTA buffer. Plugs were restricted with XbaI as the primary restriction endonuclease followed by BlnI as the secondary enzyme. PFGE gels ran 18 hours. After run gels were stained and analyzed, then dendrograms were created in BioNumerics (Applied Maths, Austin Texas) to determine relatedness of isolates.

Specimens that tested positive for the presence of Shiga toxin, but the stx-producing organism was not isolated, were forwarded to CDC for further analysis. Isolates from all sample types that were not identified as *E. coli* had no further testing performed. Isolates that were identified as *E. coli* but tested negative for stx I and stx II genes also had no further testing performed.

Laboratory Results Reporting

Electronic mail, phone, and exports of read-only files from the PHL laboratory information management system (LIMS) were methods used by surveillance personnel to share PHL test results throughout the outbreak. The exported files were then imported into the outbreak database once or twice a day and manually linked to individuals associated with the outbreak. The PFGE patterns of the outbreak organism were uploaded to the national PulseNet database beginning August 28, 2008.

Serologic Investigation

In order to provide additional diagnostic testing and potentially enhance case finding in our outbreak investigation, the CDC Enteric Diseases Laboratory developed a serologic test to detect the presence of immunoglobulin M (IgM) antibodies to the *E. coli* O111 lipopolysaccharide (LPS) antigen. In most persons who have experienced recent and first-time exposure to *E. coli* O111 bacteria, their immune system will produce IgM antibodies within 7 days of exposure. Individual host factors such as age, immune status, and treatment modalities may interfere with the body's response and ability to produce detectable levels of IgM antibody. In these situations, a false negative test result may occur. Among persons who do mount an IgM antibody response to the *E. coli* O111 LPS antigen, antibodies persist up to six weeks or longer. Antibodies produced in response to infections with bacteria that have similar surface antigens as *E. coli* O111 may cross-react in the test giving a false positive result.

Serum and plasma specimens were collected from a variety of sources for *E. coli* O111 IgM antibody testing. A convenience sample of patient specimens stored or remaining at hospital and commercial reference laboratories was gathered and forwarded to the PHL. Case-patients with atypically short (< 2 days) or long (>10 days) incubation periods for STEC illness were contacted by ADS epidemiologists and requested to consent to a blood draw at their local county health department. During follow-up interviews with a subset of Country Cottage food handlers from September 16-19, 2008, these restaurant employees were asked to participate in serological testing to measure their potential exposure to *E. coli* O111. The ADS coordinated blood collection with public health nurses by scheduling appointments at the consenting employees' nearest health department. As previously mentioned, personnel from the THD and the CDC Epi-Aid Team organized a site visit at the Bethany Free Will Baptist Church on September 10 and offered serological testing to Ladies Tea event attendees to expand case finding. Finally, the Oklahoma Blood Institute provided de-identified sera and plasma specimens remaining from blood donor standard testing screens following a blood drive event in Tahlequah, Oklahoma, during September 2008 to serve as control specimens. All collected sera and plasma were processed

through the PHL, frozen, and shipped to the CDC Enteric Diseases Laboratory for determination of the presence of *E. coli* O111 LPS IgM antibodies.

RESULTS

Epidemiological Investigation

Overall Outbreak Summary

During the investigation, interviews were completed on 1,823 persons who were captured by active and passive case finding. A total of 341 persons met the outbreak case definition, including 60 confirmed, 94 probable and 187 suspect cases (Table 2). Of the 341 cases, 21 attended the catered Ladies Tea and did not dine at the Country Cottage restaurant (Table 3). There were no persons classified as a primary outbreak case who attended both the catered event and ate at the restaurant.

Seventy case-patients (20.5%) were hospitalized and 25 (7.3%) developed HUS, of which 19 required hemodialysis or plasmapheresis treatment (Table 4). One death occurred in a 26 year-old male who developed HUS. Among hospitalized cases, the length of hospitalization ranged from one to 55 days with a median of five days. More than half of all cases (56%) saw a healthcare provider for evaluation of their illness. Symptoms reported by case-patients in addition to those stated in the case definition consisted of fatigue (74%), nausea (72%), headache (50%), myalgia (45%), bloody diarrhea (41%), chills (41%), fever (36%), and vomiting (35%). The duration of diarrhea ranged from less than one day to 45 days with a median of four days.

An additional 264 individuals who ate at the Country Cottage restaurant during the specified outbreak period or attended the catered Ladies Tea reported illness not meeting one of the outbreak case classifications. Symptoms of illness for these individuals included diarrhea characterized as less than three loose stools in a 24-hour period (73%), nausea (46%), myalgia (23%), fever (18%), vomiting (16%), and blood in stool (5%). The frequency of these illnesses was similar to that of the outbreak cases for age distribution and gender.

The median incubation period was three days (range: < 1 hour - 14 days). Sixty-three probable and suspect cases reported an interval between Country Cottage food consumption and onset of illness of less than two days; ten cases had an incubation period longer than ten days. The shortest incubation period was revealed in a suspect case who reported onset of abdominal cramping only 30 minutes after dining at the restaurant with diarrhea onset several hours later. Among confirmed cases, the shortest incubation periods calculated were 2.5 and 5.5 hours. The longest incubation period of 14 days was determined for two suspect cases; among confirmed cases, the longest incubation period was 13 days.

The distribution of Country Cottage dining dates reported by case-patients are represented graphically in Figure 1. The weekend beginning Friday, August 15, represented the time period during the outbreak in which the largest number of cases reported restaurant exposure (Table 5). Moreover, the highest daily attack rate (AR) of the outbreak occurred on Friday, August 15, (AR=9.03%), followed by Saturday, August 16, (AR=8.33%) and Sunday, August 17, (AR=6.75%). The overall AR for August 15-24 was 4.86%. Case finding captured 21 probable and suspect cases with restaurant exposures prior to August 15, but culture-confirmed cases had restaurant exposures beginning August 15 continuing until August 24 when the restaurant closed. Illness onsets of all cases extended from August 10 through September 5; the earliest onset date of a confirmed case was August 18 (Figure 2).

Female cases comprised two-thirds of all outbreak cases (Table 6). Upon exclusion of the church tea cohort cases, this gender difference was still observed in all case classification groups. The largest proportion of females occurred among probable cases with 71% in this case category compared to 53% among the confirmed cases. Additionally, the tendency for females to be ill as compared to males was noted in the older adolescent and adult population that reached statistical significance (OR=1.75, 95% CI 1.01-3.03, p-value=0.04) when the cases were stratified into three age groups (Table 7). Fifty-four percent of controls were female, which was comparable to the gender frequency among confirmed outbreak cases.

The ages of cases ranged from less than 3 months to 89 years with a median of 51 years. Among cases, 75.7% reported race as white, 21.1% as Native American and less than one percent as black. Hispanic ethnicity was only reported by 0.6% of cases. Although the majority of cases (95.3%) were Oklahoma residents, seven additional states of residence (Arkansas, Kansas, Louisiana, Mississippi, Missouri, Tennessee and Texas) were represented among the cases. Oklahoma cases lived in 22 counties, with 67% of cases living in Tulsa, Mayes and Rogers counties in northeastern Oklahoma (Table 6).

Case Control Study

Because buffet food preferences and number of selected food items tended to vary between children and adults, cases and controls were placed into three age groupings for analyses. Age groups were children 4 years or younger, children 5 to 12 years, and all persons older than 12 years. Upon univariate analysis within each age group, a gender difference was not seen among children < 4 years or 5 – 12 years old. Therefore, stratification by gender was not done for these age groups; however, a significant difference (OR=1.75, 95% CI 1.01 – 3.03) was revealed between men and women in the > 12 years age group making it necessary to stratify by gender for univariate and multivariate analysis of food exposures.

Initial univariate analysis of all confirmed and probable cases (N=96) and controls (N=384) who dined at the Country Cottage restaurant during the weekend of August 15-17, 2008, indicated that 8 of 87 food exposures were statistically significantly associated with illness. Three of those food exposures, namely fried chicken, mashed potatoes, and any dessert were consumed by 55% or more of the cases (Table 8). In children less than 5 years of age, mashed potatoes (OR=15.00, 95% CI 1.30 – 864.97; p-value = 0.024) and macaroni and cheese (OR=37.30, 95% CI 2.96 – >999; p-value = 0.001) were statistically associated with illness and accounted for over 90% of illnesses in very young children (Table 9). Eating any type of dessert was reported by 100% of the cases less than 5 years old compared to 67% of controls (OR=2.20, 95% CI 1.26 – 3.99, p-value = 0.004). Among children 5 to 12 years of age, 11 cases and 25 controls were available for analysis; however, no food items were statistically associated with illness (Table 10). Findings from univariate analysis of persons older than 12 years of age and stratified by gender are summarized in Table 11. Among men, eating ham was significantly associated with illness (OR=3.25, 95% CI 1.14 – 9.29; p-value = 0.03) although ham was only consumed by 36% of cases. Cream gravy and mashed potatoes accounted for over 72% of food exposures in this group, but did not statistically differ compared to food exposures for male controls over 12 years of age. Among female teens and adults, 12 individual food items were statistically significantly associated with illness, and all of the items fell into the categories of desserts, salads or salad toppings. However, eight of the food items were consumed by less than 30% of cases. Desserts accounted for 84% of exposures among ill female teens and adults (OR=3.19, 95% CI 1.43 -7.13, p-value = 0.003). More specifically, eating a cold dessert was somewhat more likely to be associated with illness compared to eating a warm dessert. Drinking water or iced tea or having ice in drinks was not associated with illness.

Each food exposure that showed statistical significance in the univariate analysis of females over 12 years of age was included in multivariate analysis. Several multivariate logistic regression models were constructed to evaluate these food items. In the final model, only spinach salad (adjusted OR [AOR]=6.6; 95% CI, 1.74 – 25.15) and desserts (AOR=2.90; 95% CI, 1.28 – 6.59) remained independently and significantly associated with illness. Despite spinach salad having the strongest statistical association with illness, only 12.2% of women reported eating this food item. Upon analysis of specific desserts, the only individual cold dessert that remained statistically associated with illness in the logistic regression model was cheesecake; however, the proportion of cases consuming cheesecake was less than 10%.

Secondary Cases / Community Transmission

Three cases attributable to secondary transmission were identified as a result of this outbreak. These individuals had *E. coli* O111:NM isolated with an outbreak PFGE pattern and were household or household-like contacts to a case who ate at the Country Cottage. Two of the three are younger siblings to one case. Transmission to one child likely occurred when a parent observed him playing in the toilet shortly after use by his sibling with diarrhea. The other child in this home that is also considered a secondary case did eat at the Country Cottage restaurant, but illness onset did not occur until 15 days after the Country Cottage dining date suggesting person-to-person transmission within the household. The third secondary case was a child who had contact with a symptomatic cousin who was classified as an outbreak case and an asymptomatic mother who ate at the Country Cottage restaurant.

Two additional persons were identified who had *E. coli* O111:NM with an outbreak PFGE pattern isolated from their stool, but did not have recognized contact with an outbreak-related case. One was a child whose mother and sibling dined at the Country Cottage restaurant yet did not develop illness. Of note, the child's father and another sibling who did not dine at the restaurant also developed diarrheal illness, but stool cultures were not obtained. No Country Cottage food was taken home from the restaurant. Neither stool nor serum specimens were collected from the two family members who did not get sick to assess the possibility of either of them being asymptomatic reservoirs for secondary transmission. The second person with isolation of *E. coli* O111:NM with an outbreak pattern and no exposure to Country Cottage was not aware of any social contacts who had dined at the Country Cottage restaurant during the outbreak period. However, she resided in Mayes County and was a patron at another restaurant in Locust Grove on August 15, 2008.

Catered Event Cohort Study

One hundred ninety-six persons were interviewed of the estimated 232-280 attendees at the catered church event. Twenty-four cases were identified using the case definition criteria established by CDC for the nested cohort study. Of these, two met the confirmed case definition, four were probable cases, and 18 were classified as suspect cases. Ill persons did not significantly differ from other event attendees according to age and gender. Dates of illness onset ranged from August 18 to August 29 with a peak between August 19 and 22. One case-patient was hospitalized. Sixteen of the 196 people interviewed were excluded from food exposure analysis based on exclusion criteria: seven reported dining at the Country Cottage restaurant after August 16, and nine had mild gastrointestinal illness not meeting case criteria.

Upon univariate analysis of all 24 cases and 156 controls, four food items were associated with diarrheal illness, including any chicken (OR=4.0, 95% CI=1.1-28.9), any melon (OR=2.6, 95% CI=1.0-7.3), tabouli salad (OR=3.1, 95% CI=1.2-8.4), and watermelon (OR=2.8, 95% CI=1.1-7.6). When analysis of food exposures was restricted to 6 confirmed and probable cases and 156 controls, only watermelon was significantly associated with illness (RR=26.63, 95% CI=3.72 - ∞).

All 6 (100%) confirmed and probable cases in the church tea cohort reported eating watermelon compared to only 33 (23%) of 145 controls.

Environmental Investigation

Restaurant Inspection and Employee Interviews

The establishment was found to be out of compliance for five criteria associated with hot and cold holding of foods, food storage requirements, labeling and storage of toxic items, and cleanliness of food contact surfaces. Several foods were found to be at temperatures greater than 50 °F. in the “red” cooler, including corn muffin mix, bologna, and cheese. Chicken was observed in a warmer held at a temperature of 115 degrees Fahrenheit. All food items identified outside of required storage temperatures were discarded. The inspection report with the list of observed violations is located in Appendix G.

An evaluation of cleaning practices on September 4, 2008, indicated the restaurant did not have written protocols or schedules for cleaning of the kitchen, buffet, dining, and bathroom areas. Employees were provided on-the-job training, but a standardized training program was not used and employees did not document receipt of the training. The restaurant used Ecolab Oasis 146 Multi-Quat Sanitizer™ solution for sanitizing of food contact surfaces in the kitchen and dining areas. The solution was placed in sanitizer buckets for employees to access when wiping down surfaces with cleaning towels; however, the sanitizer was only replaced when the solution “looked too dirty for continued use”. There was no established uniform method for monitoring the sanitizer solution concentration to ensure the concentration was within the recommended range for continued use as required by OAC 310:257-5-33 (wiping cloths, use limitation), OAC 310:257-7-75 (chemical sanitizing solution – temperature, pH, concentration, and hardness), and OAC 310:257-7-95 (hot water and chemicals – measure). Buffet surfaces were reportedly cleaned on a regular basis upon switching of buffet serving pans, occurrence of food spills, and at the close of the day when all pans were removed. A diluted bleach solution was used to clean surfaces and food spills, but again, there was no established method for monitoring the concentration with employees largely making a subjective and visual determination that the solution was too dirty to continue using.

Of 60 Country Cottage employees, 16 reported some symptoms of illness immediately preceding or during the outbreak period resulting in a crude employee AR of 26.7%. However, upon application of the outbreak case definition criteria, only 5 employees (8.3%) reported symptoms that met the probable or suspect case definitions. One of the employees reported seeking medical attention for their illness, and a stool specimen was collected at the healthcare facility, which was forwarded to the OSDH PHL for bacterial culture and isolation. Symptom onset dates among employees ranged from August 9 through August 27, 2008 (Table 12). Thirteen (81%) of 16 symptomatic employees reported beverage and food handling duties during their shifts worked from August 15 through August 24 (see Figure 3 and Table 13). Food handling duties among ill employees included preparation of all hot foods served by the restaurant; preparation of cooked vegetables; assembly of salads for menu orders; preparation of various desserts such as cobblers, pies, cheesecakes, and sliced strawberries; and cleaning of food preparation equipment. All four employees that met the suspect case criteria had food handling duties. The employee that was classified as a probable case only described pouring and serving of drinks as their food handling duty. Four (25%) of 16 ill employees reported working with diarrhea: one hostess with no food handling duties; one employee who’s only described food handling duty was preparation of salads for table orders; one employee who prepared salads for menu orders and cut bread for table service; and one employee who cooked and handled all hot foods except fried items, and replenished hot foods on the buffet.

Sixteen stool specimens were collected from nine Country Cottage employees during August 28 through September 2, 2008, and submitted to the PHL. All stool specimens were culture negative for pathogenic organisms and tested negative for the presence of Shiga toxin. Attempts were made to contact 25 employees for further interview and to request participation in *E. coli* O111 IgM antibody testing at the CDC Enteric Diseases Laboratory. Sixteen (64%) of these 25 employees were accessible for re-interview and eight (32%) complied with providing a blood specimen for serological testing, including the employee that met the probable case definition and one employee that met the suspect case definition; all eight samples were serologically negative. A brief summary of the reported symptoms and type of laboratory specimens provided by the 16 restaurant employees who self-reported any symptoms of illness are provided in Table 12.

Animal Specimens

On October 13, 2008, Rick Garner, Region 2 Public Health Preparedness Nurse, collected fecal samples from five animals owned by one Country Cottage restaurant employee including a hog, chicken, dog, cow and goat. On October 20, two fecal samples from a horse owned by a second employee and three samples of fresh cattle manure from a pasture located next to the restaurant were obtained. All specimens tested negative for the presence of Shiga toxin. No bacterial pathogens were isolated from these specimens.

Water Specimen Collection and Testing at Non-OSDH Laboratories

Upon interview with the restaurant owners, it was learned that a private well on the premises had been accessed and used to supply water for the restaurant for approximately two hours on August 10 when a sudden interruption of the municipal water system occurred. Subsequent to this finding, a notice of violation was served to Linda and Dale Moore by DEQ for failure to permit the well as a non-transient non-community public water supply system. They were also found to be in violation with DEQ regulations by having a cross connection constructed between the Town of Locust Grove public water system and the private well. Two Country Cottage well water samples tested by the DEQ laboratory were positive for the presence of total coliforms and fecal coliforms; sample number 744733 (TC/MPN>200.5 and EC/MPN>200.5) collected on August 27 and sample number 744850 (PA/MPN>2,419.2 and EC/MPN=34.1) collected on August 29. A third well water sample (# 744849) collected on August 29 was positive for the presence of total coliforms (TC/MF=400).

PCR testing by the CDC Waterborne Diseases Laboratory of two 10-liter samples of well water collected from the Country Cottage restaurant on November 5 failed to detect the presence of *E. coli* O111. Numerous types of *E. coli* were cultured from the well water samples, but none were found to be Shiga toxin-producing or typed as O111.

Food Testing

Bacterial culture of samples of raw chicken in marinade, tres leche milk, soft serve ice cream mix, raisin cobbler, and cantaloupe collected on September 2 did not yield *E. coli* O111. *Serratia liquefaciens* was isolated from tres leche milk and soft serve ice cream mix. Surface swabs of three watermelon on September 17 were also culture negative for *E. coli* O111; isolated bacteria consisted of *Enterobacter* and *Pantoea* species.

Microbiological

Clinical Specimens

The ADS epidemiology field team retrieved clinical specimens from ten patients that were in enrichment broth at Tulsa area hospital laboratories and delivered them to the PHL late on the evening of August 24. The PHL reported on August 25 that three specimens tested Shiga toxin-positive by EIA providing the first diagnostic evidence that the outbreak agent was a STEC organism. On August 27 the PHL reported culture of a non-O157 Shiga toxin-producing *E. coli*; serotyping at the CDC two days later revealed the outbreak organism to be *E. coli* O111:NM. At the close of the investigation, the PHL had tested a total of 166 clinical specimens, 60 (36.1%) were stx I and/or stx II positive isolates. Subsequent serotyping by the CDC indicated that all isolates were O111:NM. Eight specimens (0.6%) tested positive for the presence of stx, however neither the PHL nor the CDC could isolate the Shiga toxin-producing organism.

Six XbaI PFGE patterns (EXDX01.0001OK - EXDX01.0006OK) were identified among the 62 *E. coli* O111:NM isolates molecularly characterized during the outbreak period. Isolates from 58 individual case-patients were obtained and PFGE typed at the OSDH PHL; four cases had culture of *E. coli* O111:NM and PFGE analysis performed at other state public health laboratories (Appendix H). The primary XbaI outbreak pattern was EXDX01.0001OK with 50 (81%) patient isolates being indistinguishable from this pattern (Table 14). Three other XbaI patterns (0002, 0004-05) displayed only subtle differences and were considered to be closely related to the primary outbreak pattern. One isolate had additional variations from the primary outbreak pattern (EXDX01.0006OK); nonetheless, the source patient did have restaurant exposure and was considered to be outbreak-associated. Pattern EXDX01.0003OK displayed a 7-8 band difference from the other *E. coli* O111 PFGE patterns and was determined to be distinguishable from the other outbreak strains. Furthermore, the patient with this isolate, a Tulsa County resident with daycare association, had no epidemiologic link to the outbreak. Laboratory surveillance also captured one patient who had *E. coli* O111:NM of the predominant outbreak pattern .0001OK isolated from stool who did not have reported exposure to the Country Cottage restaurant or an outbreak-related case. This person resided in Mayes County and reported dining at another restaurant in Locust Grove on August 15, 2008.

All but one of the national PulseNet postings of *E. coli* O111 PFGE patterns were determined to be isolates related to the Locust Grove outbreak (EXDX01.0050). One isolate from the Texas Department of State Health Services (TDSHS) Laboratory with a date of collection during the time frame of the outbreak was investigated. An epidemiologist with the TDSHS Infectious Disease Service administered the Oklahoma outbreak questionnaire and found the case did not have any travel to Oklahoma, or known exposure to persons associated with the outbreak.

Water Specimens

Plated bacterial specimens that were direct cultures from well water samples collected by the DEQ were received by the OSDH PHL on August 28 and September 2, 2008. All plates tested negative for STEC. Although the specimens did contain a mix of several different types of bacteria, none of the isolates were common enteric pathogens. A summary of the total and fecal coliform testing results provided by the DEQ and isolated bacteria identified by the PHL by specimen ID number are further described in Tables 15 and 16.

Environmental Samples

All surface swabs collected from food preparation, storage, and service areas were negative for bacterial pathogenic organisms and for the presence of Shiga toxin. The samples received by the OSDH Laboratory from the ODAFF Laboratory on September 5 were negative for STEC. The isolates were identified as follows: *Enterobacter cloacae*, *Enterobacter amnigenus*, *Enterobacter*

species, *E. coli* non-toxigenic, and *Kluyvera* species (Table 17). Non-toxigenic *E. coli* was cultured from shelves within the walk-in refrigerators used for vegetables and meats, and from counter top cutting boards. Surface swabs collected on September 17 by the CDC Epi-Aid team from bathroom surfaces within the restaurant also failed to yield culture of *E. coli* O111 or other STEC bacteria (Table 18). A non-toxigenic *E. coli* isolate was obtained from the women's overflow restroom.

Serological Investigation

Serum or plasma specimens were obtained from 135 persons for *E. coli* O111 IgM antibody testing; multiple serial specimens were obtained for hospitalized case patients. Of the 135 persons evaluated for presence of IgM antibodies, 66 (49%) were asymptomatic, 8 (6%) described mild illness not qualifying for outbreak case classification, 12 (9%) were suspect cases, 22 (16%) met probable case definition, 26 (19%) were confirmed cases, and 1 was a secondary case. Overall, 29 (21.5%) persons had detectable *E. coli* IgM antibodies ranging from 50% of confirmed cases demonstrating seroreactivity to none of the suspect case specimens (Table 19). Interestingly, six specimens from persons not classified as outbreak-related cases were seropositive for *E. coli* O111 IgM antibodies. All 73 blood donor reference specimens tested seronegative.

Outbreak-associated cases identified with a short (< 2 days) or long incubation (> 10 days) were re-interviewed to confirm the date of symptom onset and Country Cottage dining date. In addition to the second interview, probable and suspect cases were asked to provide serum for *E. coli* O111 IgM antibody testing. Sixty-three probable and suspect cases reported an incubation period less than two days and ten cases longer than ten days. Sixteen cases (12 with < 2 days incubation and four with an incubation period > 10 days) provided a serum sample either through the county health department or while hospitalized. Three of the 16 case-patients tested had a positive *E. coli* O111 IgM serologic result. All three individuals with *E. coli* O111 seroreactivity were among cases with an incubation period less than two days.

DISCUSSION

Based on a review of published reports and communication with the CDC, this was the largest community outbreak of *E. coli* O111 on record. **When responding to any infectious disease outbreak, the primary objective is to rapidly identify the source of the infections to contain the outbreak and prevent any further spread.** Within 48 hours of the first reported cases of bloody diarrhea being admitted to a Tulsa hospital, the Country Cottage restaurant in Locust Grove, Oklahoma, was pinpointed as the source of the outbreak. An agreement was reached with the restaurant owners on August 25 to close the business for an extended time period pending an epidemiologic investigation to determine the vehicle of transmission within the restaurant. The scope of the outbreak required a complex and sizeable public health response involving the activation of an Incident Command Structure, reassignment of OSDH employees from other programs, and recruitment of volunteers to assist with interviewing and data entry. As of March 16, 2009, 6,481 hours of total accrued time and effort dedicated to the *E. coli* O111 outbreak have been reported to the T&E reporting system by OSDH personnel. This does not take into account the time and effort provided to the public health investigation by THD personnel, student volunteers, or medical staff at various hospitals and clinics who provided surveillance information.

In a comprehensive review of 350 *E. coli* O157:H7 outbreaks occurring in the U.S. between 1982 and 2002, the transmission route for 52% was foodborne, 14% were spread person-to-person, 9% were waterborne, and 3% resulted from direct animal contact. For over 20% of the *E. coli*

O157:H7 outbreaks in which there was a common exposure determined, the major transmission route was not determined.² Since few outbreaks of non-O157 *E. coli* have been detected, less is known about the type and frequency of modes of spread of these uncommon STEC. Characteristics of STEC bacteria such as their low infectious dose and long survivability in certain foods or in the environment under favorable conditions⁶⁻⁷ make them ideal candidates for an outbreak, but the bacteria can be elusive to public health investigators. In 1999, the Texas Department of Health investigated an outbreak of 55 *E. coli* O111:H8 infections among attendees of a high school cheerleading camp. Epidemiologic analysis suggested foodborne transmission via a salad bar or ice distributed in open barrels, but the outbreak organism was not cultured from ice, environmental surfaces, or foodhandler specimens. It was also theorized in the Texas outbreak that risk-associated exposures varied over time.⁸ A food vehicle for *E. coli* O111 has only been conclusively determined in two previous outbreaks, dried fermented beef sausage⁹ and unpasteurized apple cider¹⁰. Other outbreaks of *E. coli* O111 have been attributed to person-to-person spread,¹¹ contaminated water,¹² and contact with calf feces.¹³

In this outbreak, several potential vehicles of introduction and spread within the restaurant were explored, including a primary contaminated food item, an infected foodhandler, contaminated well water, and cross-contamination from restaurant surfaces or equipment harboring the organism. Multiple specimens representing these potential vehicles were obtained for laboratory testing, but *E. coli* O111 was not isolated by bacterial culture methods or identified by molecular methods in any of them. In the absence of finding the outbreak organism in any foodhandler or environmental specimen, how *E. coli* O111 entered the restaurant and was spread over numerous consecutive days is unclear. Apart from whatever mode the bacteria was introduced into the restaurant, the epidemiologic findings suggest that foodborne transmission of *E. coli* O111 through various food items -- either contaminated with the bacteria by foodhandlers or by cross-contamination from food preparation equipment, counter surfaces, or storage areas -- occurred at Country Cottage from August 15 – 24.

Univariate and multivariate analyses of food exposures did not indicate one common food vehicle, but rather several food items that showed association with illness suggesting secondary contamination of different foods on various days. Cross-contamination of restaurant food from an infected foodhandler's hands or food preparation equipment or surfaces is the most plausible way that this may have occurred. It is also possible that some food exposure associations were spurious or had coincident association with illness. When analyzing multiple food exposures using repetitive statistical tests, it is probable that one or a few exposure variables will achieve statistical significance by chance alone. Independent coincidental associations could have occurred with foods that were more likely to be touched by bare hands during preparation or placed in a particular location of the buffet serving line. Also problematic is the nature of a high volume buffet-style restaurant where the risk of bacterial cross-contamination is increased as hundreds of customers touch common serving utensils and buffet table surfaces throughout the day. With the exception of the 5-12 year old age group, consumption of desserts accounted for the highest frequency of exposure and was statistically associated with illness. However, there is no obvious common denominator to readily explain how dessert consumption may have led to *E. coli* O111 infection. Different employees prepared various dessert items and no specific foodhandler, especially one who reported diarrheal illness and concentrated on dessert preparation was elucidated. Although there was a slight association with cold desserts compared to warm desserts, such as baked cobblers, cakes and pies, a common ingredient such as a fruit, chocolate, or cream topping or filling was not discernible.

A risk factor for illness among teenage and adult restaurant customers was female gender. A correlate finding is that females who became ill were more likely to eat dessert than males.

Among cases older than 12 years, 85% of women consumed desserts compared to 64% of male cases. This gender difference was not observed within our control group with slightly more men (68%) reporting eating a dessert item than women (66%). Another possible explanation for increased risk of exposure for females was exposure to bacteria-containing surfaces within the women's restroom. This hypothesis could not be explored because persons were not asked whether they had used the restaurant bathroom facilities, or whether they had washed their hands before eating. Multiple environmental swabs of doorknobs, toilets, and other surfaces within both the men's and women's restrooms were obtained for culture, but *E. coli* O111 was not isolated. A delay in testing these areas decreased our ability to detect the presence of the bacteria. Cleaning of the bathrooms likely occurred between closure of the restaurant and the surface testing.

The catered event on August 16, 2008, provided an opportunity for enhanced understanding of how *E. coli* O111 was transmitted during this outbreak. Some food items served at the Church Tea were prepared at the Country Cottage restaurant on the day before the event, while other foods and ingredients were transported to the church for onsite preparation and service. Five restaurant employees were identified as principal foodhandlers for the event. Findings of the retrospective cohort study conducted by the CDC Epi-Aid team implicated watermelon as the most likely food vehicle that led to exposures at the Church Tea. It is clear that *E. coli* O111 exposure did occur at the catered event because two culture-confirmed cases were identified among the Church Tea attendees and five attendees had detectable IgM antibodies to *E. coli* O111. In their summary report, CDC investigators stated that it remains unclear how cross-contamination of foods occurred at the catered event, but surmised that contamination of food items, especially melons was likely caused by foodhandlers who sliced and prepared the fruits for the catered event and were also present for the event. Three foodhandlers were reported to have sliced watermelon and assembled fruit trays. Of these, two denied any diarrheal illness, but did provide serum specimens for IgM antibody testing and these tests were negative. The third foodhandler did report gastrointestinal illness during this time frame upon her first interview, although she provided conflicting information on subsequent interviews. Stool specimens obtained from this employee were negative, but by the time of specimen collection, her symptoms had resolved. She declined to provide a blood sample for *E. coli* O111 LPS antibody testing.

The report that the restaurant's private well had been used temporarily for a two-hour time period prior to the outbreak was of interest and well water samples were collected for bacterial testing early in the investigation. Findings of the water testing indicated environmental contamination and water quality that did not meet safe drinking water standards. Nonetheless, *E. coli* O111 was not cultured from serial water specimens nor was *E. coli* O111 DNA detected by PCR testing at the CDC Laboratory. Analysis of in-line water filters also failed to detect remnants of *E. coli* O111. Although STEC outbreaks have been linked to contaminated water, in this outbreak, more cases of illness would be expected to have restaurant exposure on the date that the well was used, i.e. August 10 if the well was the principal way the bacteria entered the restaurant. Our epidemiologic data suggest that the outbreak began on August 15, the same day that the first laboratory-confirmed cases of *E. coli* O111:NM infections reported restaurant exposure. Conceivably, short-term use of the well on August 10 could have introduced a low inoculum of *E. coli* O111 into the restaurant setting leading to illness of a restaurant employee(s), which then initiated a chain of transmission events when the employee became contagious 4-5 days later. However, restaurant owners insisted that the well water was used to provide beverages to customers as well as employees on August 10, so more infections would be expected to have occurred and been captured by surveillance with this date of exposure instead of five days later.

The possibility that illness was introduced and spread by a mildly ill or asymptomatic foodhandler cannot be excluded. Little is available in the published literature regarding asymptomatic human carriage of *E. coli* O111, but our investigation found compelling evidence of asymptomatic infections during this outbreak. Three attendees of the Church Tea had serum IgM antibodies to *E. coli* O111 suggesting recent infection but did not report any symptoms of illness. Additionally, we identified a sporadic case of *E. coli* O111:NM infection with an outbreak strain whose most likely source of exposure was one of two family members who dined at the Country Cottage during the outbreak period but did not develop clinical illness. All restaurant workers were interviewed extensively about gastrointestinal symptoms and submission of stool specimens was mandated of seven employees who reported diarrheal illness. Bacterial culture and Shiga toxin testing of submitted stool specimens did not identify an infected foodhandler, although delayed collection of specimens substantially reduces the ability to recover STEC bacteria. The duration of excretion in adults is typically one week or less.³ Another limitation was the reliability of illness history obtained from restaurant employees. Some expressed fears of liability or villainy if they were found to be infected. To fully assess all employees' bacterial colonization or infection status, stool specimens from all restaurant workers, including managerial staff, would have had to be obtained within this window of time (one week following initial infection), which was problematic if not impossible to obtain from all employees within the constraints of the investigation. Obtaining serum samples from all employees may also have been helpful; however, the outbreak had been controlled and an endeavor to require all employees to provide blood specimens would not have guaranteed our ability to identify an index foodhandler. The presence of IgM antibodies in a worker would be indicative of recent infection with *E. coli* O111, but one could not ascertain the precise timing of exposure, i.e. whether they were exposed prior to the outbreak and contributed to the outbreak, or whether they were exposed in the restaurant along with other patrons. Moreover, persons with asymptomatic infections would be less likely to mount an IgM antibody response to intestinal carriage of *E. coli* O111 [personal communication, Debra Talkington, CDC].

This unusually large *E. coli* O111 cohort provided a unique opportunity to evaluate potential differences from *E. coli* O157:H7 outbreaks. The gastroenteritis symptom profile among ill persons and the proportion of cases progressing to HUS were similar to what is observed in O157 reports. The median incubation period of 4 days is also consistent with O157 infections. However, a relatively large number of cases with incubation periods outside of the expected range of the incubation period for STEC infections were identified. Another striking feature in this outbreak was the median age of 51 years, which is considerably older than that reported during O157 outbreaks. The older age distribution among the O111 cases may have merely been a reflection of the age distribution of restaurant patrons. However, unlike *E. coli* O157, the highest proportion of case-patients requiring hospitalization and developing HUS were adults. Children less than 5 years old are classically described as the highest risk age group for HUS and death as a complication to *E. coli* O157 infections.^{14,15} The fatality in our outbreak was a previously healthy 26 year-old man. The strain of *E. coli* O111 recovered in this outbreak had not been previously isolated in Oklahoma. PFGE analysis revealed an indistinguishable or closely related XbaI restriction digestion patterns in the majority of isolates suggesting that a predominant bacterial clone was involved in this outbreak. Whether the Oklahoma strains represent a newly emerged and more virulent STEC strain or not is unclear. Two culture-confirmed infections of *E. coli* O111 that did not have any clear linkages with the Country Cottage-associated outbreak were identified. One had an isolate that matched the primary outbreak strain and reported dining at another restaurant location in Locust Grove during the outbreak period. No other infections of *E. coli* O111 were detected among patrons of this restaurant, but the possibility exists that an infected foodhandler employed at Country Cottage may have also been working at other restaurants in the community. The recognition of a spurious case of *E. coli* O111 infection during

the restaurant-associated outbreak is significant and indicates that there is a low level of transmission of *E. coli* O111 in our state that generally goes unrecognized. This case occurred in a child residing in Tulsa County who had daycare contact. STEC organisms are considered somewhat ubiquitous in nature, particularly in areas with high cattle density, so the potential for another *E. coli* O111 outbreak in Oklahoma exists. Public education campaigns to inform persons about the risk of STEC infections, particularly those living in rural areas, and methods of prevention are warranted.

CONCLUSION

To the best of our knowledge, this was the largest community outbreak of diarrheal illness and hemolytic uremic syndrome attributable to Shiga toxin-producing *E. coli* O111:NM ever reported. The findings of the epidemiologic investigation indicate this was a point source outbreak originating from the Country Cottage restaurant in Locust Grove, Oklahoma. Within 48 hours of public health notification of increased numbers of persons with bloody diarrhea being admitted to Tulsa area hospitals, the restaurant was identified as the common point of transmission and closing the restaurant successfully contained the outbreak. In the absence of isolating the outbreak organism from any environmental specimen, including restaurant surfaces, food, well water and animal feces, or from a restaurant employee who reported diarrheal illness, the original vehicle of contamination could not be determined. The exact mode of spread within the restaurant was not established, however, the epidemic curve and exposure analyses suggests there was ongoing foodborne transmission of *E. coli* O111:NM to Country Cottage restaurant patrons between August 15 and August 24, 2008.

ACKNOWLEDGEMENTS

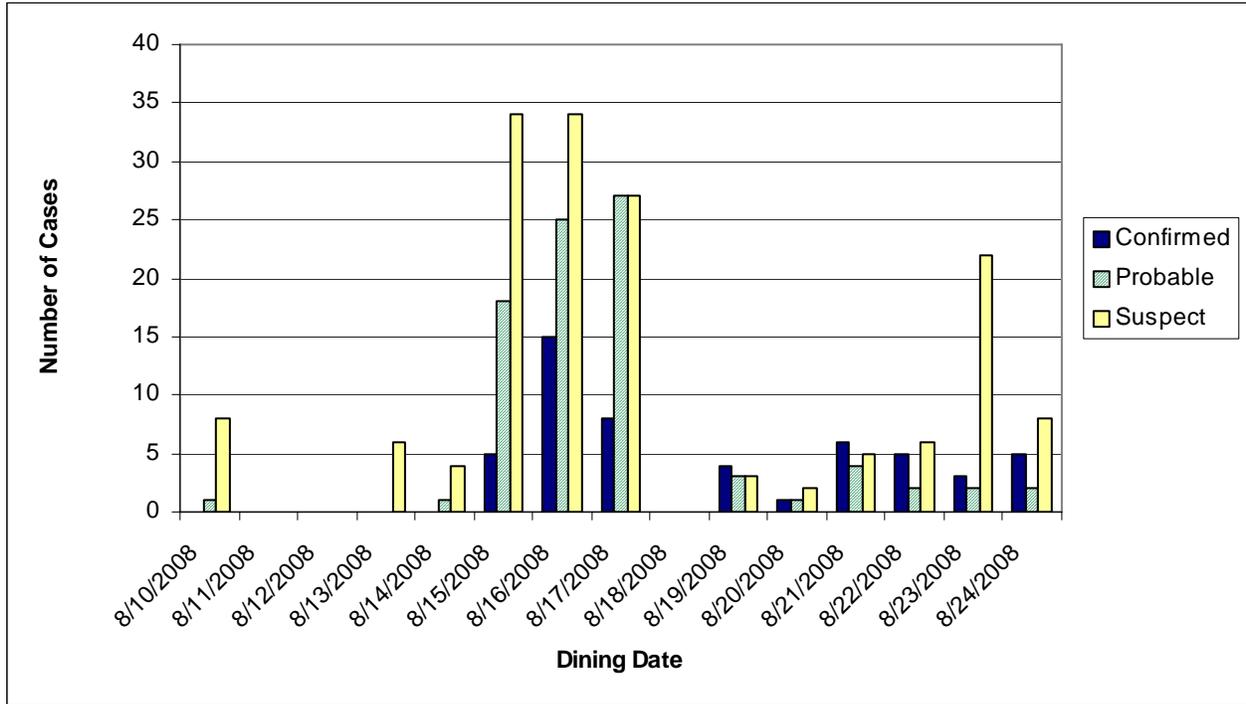
The public health workers who dedicated their time and talents to this public health investigation are too numerous to list in this report. Their efforts were recognized by Dr. James M. Crutcher, former Commissioner of Health and Secretary of Health with bestowment of the Commissioners Award for Excellence on November 13, 2008. The epidemiologic team from the Tulsa Health Department also had an integral role in the investigation and we value their public health partnership. For their tireless assistance with the outbreak investigation and medical response, we especially want to thank Connie Bourne, Deanna Osborn, and other dedicated medical personnel at Saint Francis Hospital in Tulsa, Oklahoma along with Kelly Deal and Johnnie Munn at the Tulsa Medical Emergency Response Center. Most of all, we wish to acknowledge everyone personally affected by this outbreak and their families for their openness and willingness to assist us with this investigation. Their resilience and hope was inspiring.

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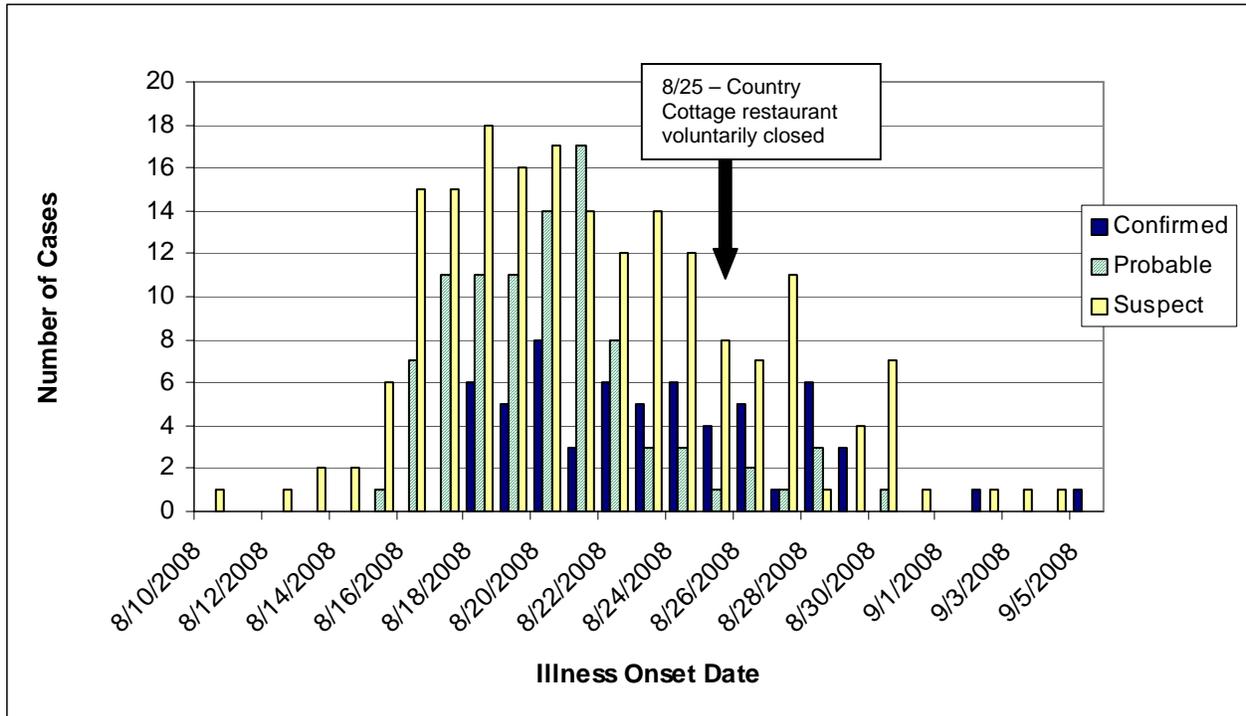
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Figure 1: Country Cottage Restaurant Exposure Dates by Outbreak Case Classification[^]



[^]N=297. Cases who ate at the catered Ladies Tea (N=21), reported multiple dining dates, reported exposure on a day the restaurant was not open, or were an ill employee are not included (N=23).

Figure 2. Onset of Illness by Case Classification, *E. coli* O111:NM Outbreak Investigation- Oklahoma, August-September 2008



N=341.

Symptom onset dates of restaurant workers self-reporting diarrheal illness included 8/20 for (1) probable case and 8/12, 8/17, 8/17, and 8/20 for 4 suspect cases.

Figure 3. Work Schedule for Country Cottage Restaurant Employees Self-Reporting Any Symptom of Illness, August 9-24, 2008

Ill Employee	Calendar Date for August 9 through August 24, 2008															
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Blue	Blue	Blue	Blue	Blue	Blue	Purple	Purple	Purple						Yellow	Yellow
2	Green						Yellow	Yellow	Yellow		Yellow	Yellow			Yellow	Yellow
3 *				Orange		Orange	Purple	Purple	Purple					Yellow	Yellow	Yellow
4						Green	Yellow	Yellow	Yellow		Yellow	Yellow			Yellow	Yellow
5							Yellow			Blue	Purple	Blue	Purple	Yellow	Yellow	Yellow
6 *							Yellow		Purple	Blue	Blue	Blue	Blue	Purple	Purple	Purple
7 *							Yellow	Yellow	Blue	Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
8									Yellow	Green				Yellow	Yellow	Yellow
9								Yellow	Yellow	Blue	Blue	Yellow			Yellow	Yellow
10 *							Yellow	Yellow	Yellow			Blue		Yellow	Yellow	Yellow
11 *								Yellow	Yellow			Blue	Blue	Blue	Orange	Orange
12							Yellow	Yellow						Blue		
13								Yellow	Yellow						Orange	Yellow
14							Yellow	Yellow	Yellow		Yellow					Orange
15 ^							Yellow	Yellow			Yellow	Yellow		Yellow		
16 #							Yellow				Yellow	Yellow		Yellow		



Work schedules are not known for all employees before 8/15.

- No Diarrhea
- Diarrhea days
- Days worked with diarrhea
- Days worked with other symptoms – not including diarrhea
- Days worked without symptoms

* Met suspect or probable case definition.

^ Symptom onset occurred on 8/25 after restaurant closed on 8/25.

Symptom onset occurred on 8/27 after restaurant closed on 8/27.

Table 1. Outbreaks of *E. coli* O111 Reported to the Centers for Disease Control and Prevention

State	Year	# Illnesses	Other Agents	Transmission Type	Reference
OH	1990	5	None	Undetermined	Banatvala et al. <i>Pediatr Infect Dis J.</i> 1996; 15:1008-11.
TX	1999	55	None	Foodborne?	Brooks JT, et al. <i>Clin Infect Dis.</i> 2004; 38:190-8.
UT	2000	102	None	Waterborne	EFORS*
MN	2000	59 total; 4 <i>E. coli</i> O111 culture-confirmed	<i>Salmonella Typhimurium</i> , <i>Cryptosporidium parvum</i> , <i>Campylobacter</i>	Animal Contact	Smith KE, et al. <i>Pediatr Infect Dis J.</i> 2004; 23: 1098-1104.
SD	2001	3		Daycare	EFORS*
MN	2001	25 (3 non-O157 STEC)	<i>E. coli</i> O157:H7, <i>C. parvum</i>	Animal Contact	Smith KE, et al. <i>Pediatr Infect Dis J.</i> 2004; 23: 1098-1104.
NY	2004	212 (25 had culture of <i>E. coli</i> O111)	<i>C. parvum</i>	Foodborne (unpasteurized cider)	Coronado F. et al. Abstr: 54 th Epidemiol. Intelligence Serv. Conf, Atlanta; 2005.
ME	2007	8	None	Foodborne	EFORS*
ND	2007	6	None	Person-to Person	EFORS*
ND	2007	23	None	Foodborne	EFORS*

* Electronic Foodborne Outbreak Reporting System

Table 2. Frequency of Cases[^] by Outbreak Case Definition Classification*, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

Classification		Description	Number (%)
Confirmed	1	<i>E. coli</i> O111:NM isolated with matching outbreak PFGE pattern	56 (16.4)
	2	Laboratory evidence of Shiga toxin-producing <i>E. coli</i> – No organism found ^a	4 (1.2)
Probable	3	HUS with positive EIA ^b for Shiga toxin, negative lab results, or no lab testing conducted	13 (3.8)
	4	Bloody diarrhea (\geq three loose stools in one 24 hour period) with positive EIA for Shiga toxin, negative lab results or no lab testing conducted	79 (23.2)
	5	Non-bloody diarrhea (\geq three loose stools in one 24 hour period) and abdominal cramps with positive EIA for Shiga toxin	2 (0.6)
Suspect	6	Non-bloody diarrhea (\geq three loose stools in one 24 hour period) and abdominal cramps with negative lab results or no lab testing conducted	187 (54.8)

[^] N=341.

* For all case classifications, interview history needed to include consumption of food prepared by Country Cottage restaurant between August 10 and August 24, 2008 and illness onset occurring after restaurant exposure.

^a Laboratory evidence equivalent to positive EIA test (Meridian Premier EHEC) of stool-inoculated broth specimen, negative virulence marker sweep of specimen plated on SMAC, and positive PCR test for stx 1 and stx 2 genes on broth pellet.

^b Enzyme immunoassay

Table 3. Frequency of Exposure of Dining at the Country Cottage Restaurant During August 10-24 or Attending a Restaurant Catered Event on August 16 Among Cases and Controls, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

	Total Number (%)	Confirmed Number (%)	Probable Number (%)	Suspect Number (%)	Control Number (%)
Dined one time at CC[^]	298 (87.4)	52 (86.7)	86 (91.5)	160 (85.6)	700 (91.4)
Dined multiple days at CC	22 (6.5)	6 (10.0)	5 (5.3)	11 (5.9)	66 (8.6)
Ate at Church Tea and Dined at CC	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)+
Ate at Church Tea only	21 (6.2)*	2 (3.3)	3 (3.2)	16 (8.6)	0 (0.0)*
Total Number	341	60	94	187	766

[^] CC=Country Cottage restaurant

+ Seven persons without illness reported attendance at the Church Tea and dining at CC restaurant, but were excluded as controls.

* A separate cohort epidemiologic study of the church catered event was conducted by an Epi-Aid Team from the Centers for Disease Control and Prevention (CDC). Analysis in this study included 156 controls and 24 cases using different case definitions than those applied for the overall outbreak study.

Table 4. Frequency of Reported Symptoms and Medical Treatment Among Cases, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, Aug-Sept 2008

Symptom	All Cases (N=341) Number (%)	Confirmed (N=60) Number (%)	Probable (N=94) Number (%)	Suspect (N=187) Number (%)
Diarrhea (≥3 loose stools in 24 hrs)	335 (98.2)	54 (90.0) ¹	94 (100)	187 (100)
Blood in stools	140 (41.1)	48 (80.0)	92 (97.9)	0 (0.0)
Fever	123 (36.1)	27 (45.0)	43 (45.7)	53 (28.3)
Nausea	245 (71.8)	45 (75.0)	71 (75.5)	129 (69.0)
Vomiting	118 (34.6)	27 (45.0)	47 (50.0)	44 (23.5)
Abdominal cramps	330 (96.8)	54 (90.0)	89 (94.7)	187 (100)
Chills	141 (41.3)	27 (45.0)	48 (51.1)	66 (35.3)
Headache	169 (49.6)	27 (45.0)	50 (53.2)	92 (49.2)
Myalgia (Body aches)	153 (44.9)	30 (50.0)	47 (50.0)	76 (40.6)
Fatigue	251 (73.6)	54 (90.0)	80 (85.1)	117 (62.6)
Duration of diarrhea (days) Range Median	0 – 45 4	0 – 12 4	0 – 17 5	0 – 45 3
Incubation ² Range Median (days)	0.5 hrs – 14 days 3	2.5 hrs – 13 days 4	1.5 hrs – 11 days 3	0.5 hrs – 14 days 3
Saw healthcare provider	191 (56.0)	56 (93.3)	69 (73.4)	66 (35.3)
Hospitalized	70 (20.5)	31 (51.7)	36 (38.3)	3 (1.6)
Number of days hospitalized Range Median	1 – 55 5	1 – 41 7	1 – 55 5	1 – 2 1
HUS	25 (7.3)	12 (20.0)	13 (13.8)	0 (0.0)
Dialysis / Plasmapheresis	19 (5.6)	9 (15.0)	10 (10.6)	0 (0.0)

¹ Diarrhea was reported by all confirmed cases, although the number of loose stools in one 24-hour period was not obtained for 6 cases meeting the criteria for a confirmed outbreak case.

² Incubation periods were calculated for cases who dined only once at the Country Cottage during the outbreak period or only ate at the catered event.

Table 5. Daily and Overall Attack Rates, Restaurant-associated *E. coli* O111:NM Outbreak Investigation-- Oklahoma, August 2008

Date	Number of Patrons	Number of Cases	Attack Rate (%)
Aug 15	631	57	9.03
Aug 16	888	74	8.33
Aug 17	918	62	6.75
Aug 18	0 [^]	0	0.00
Aug 19	318	9	2.83
Aug 20	303	4	1.32
Aug 21	532	15	2.82
Aug 22	649	14	2.16
Aug 23	1107	27	2.44
Aug 24	803	15	1.87
Multiple dining days	--	22	--
Total	6149	299*	4.86

[^] Restaurant routinely closed on Mondays.

*Church Tea attendees (N=21) and cases with restaurant exposure before August 15 (N=21) are excluded.

Table 6. Demographics of Cases and Controls, *E. coli* O111:NM Outbreak Investigation—Oklahoma, 2008

	All Cases (N=341) Number (%)	Confirmed (N=60) Number (%)	Probable (N=94) Number (%)	Suspect (N=187) Number (%)	Controls (N=766) Number (%)
Age (years)					
Range	3 mo – 89	1 – 89	1 – 88	3 mo – 87	0 – 98
Median	51	52	53.5	50	58
Gender¹					
Male	116 (34.0)	28 (46.7)	27 (28.7)	61 (32.6)	348 (45.4)
Female	225 (66.0)	32 (53.3)	67 (71.3)	126 (67.4)	414 (54.0)
Race²					
Black	1 (0.3)	1 (1.7)	0 (0.0)	0 (0.0)	0 (0.0)
Native American	72 (21.1)	9 (15.0)	23 (24.5)	40 (21.6)	128 (16.7)
White	258 (75.7)	49 (81.7)	68 (72.3)	141 (75.1)	603 (78.7)
Ethnicity³					
Hispanic	2 (0.6)	1 (1.7)	1 (1.1)	0 (0.0)	3 (0.4)
Not Hispanic	233 (68.3)	39 (65.0)	67 (71.3)	127 (67.9)	431 (56.3)
County of residence⁴					
Adair	3 (0.9)	0 (0.0)	3 (3.2)	0 (0.0)	5 (0.7)
Cherokee	13 (3.8)	4 (6.7)	4 (4.3)	5 (2.7)	52 (6.8)
Craig	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.5)	19 (2.5)
Creek	2 (0.6)	1 (1.7)	1 (1.1)	0 (0.0)	17 (2.2)
Delaware	23 (6.7)	4 (6.7)	6 (6.4)	13 (7.0)	35 (4.6)
Garvin	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.4)
LeFlore	3 (0.9)	0 (0.0)	1 (1.1)	2 (1.1)	2 (0.3)
Mayes	87 (25.5)	10 (16.7)	26 (27.7)	51 (27.3)	257 (33.6)
Muskogee	10 (2.9)	1 (1.7)	3 (3.2)	6 (3.2)	34 (4.4)
Oklahoma	3 (0.9)	1 (1.7)	1 (1.1)	1 (0.5)	4 (0.5)
Okmulgee	4 (1.2)	2 (3.3)	0 (0.0)	2 (1.1)	4 (0.5)
Osage	5 (1.5)	1 (1.7)	3 (3.2)	1 (0.5)	10 (1.3)
Ottawa	1 (0.3)	0 (0.0)	1 (1.1)	0 (0.0)	3 (0.4)
Rogers	44 (12.9)	6 (10.0)	12 (12.8)	26 (13.9)	68 (8.9)
Tulsa	99 (29.0)	28 (46.7)	19 (20.2)	52 (27.8)	160 (20.9)
Wagoner	16 (4.7)	1 (1.7)	6 (6.4)	9 (4.8)	52 (6.8)
State of residence⁵					
Arkansas	5 (1.5)	0 (0.0)	3 (3.2)	2 (1.1)	5 (0.7)
Colorado	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)
Kansas	4 (1.2)	1 (1.7)	0 (0.0)	3 (1.6)	4 (0.5)
Louisiana	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)
Mississippi	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)
Missouri	2 (0.6)	0 (0.0)	0 (0.0)	2 (1.1)	0 (0.0)
Oklahoma	325 (95.3)	59 (98.3)	89 (94.7)	177 (94.7)	737 (96.2)
Oregon	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.3)
Pennsylvania	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.4)
Tennessee	1 (0.3)	0 (0.0)	1 (1.1)	0 (0.0)	4 (0.5)
Texas	1 (0.3)	0 (0.0)	1 (1.1)	0 (0.0)	3 (0.4)

¹ Gender was unknown for four (0.5%) controls.

² Race was unknown for 10 (2.9%) cases and 34 (4.4%) controls. One control reported 'Other' for race.

³ Ethnicity was unknown for 106 (31.1%) cases and 332 (43.3%) controls.

⁴ Residents of the following counties represented less than 3 cases and/or controls and are not listed in the table: Canadian, Cleveland, Grady, Grant, McClain, McIntosh, Pawnee, Pottawatomie, Pushmataha, Sequoyah and Washington. County of residence was unknown for one suspect case and nine controls.

⁵ State of residence was unknown for one suspect case and seven controls.

Table 7. Analysis of Female Gender by Age Group as a Risk Factor for Illness, *E. coli* O111:NM Outbreak Investigation -- Oklahoma, 2008

	OR	95% CI	p value
Overall	1.61	1.00 – 2.59	0.047
Age group			
0 – 4 years	1.17	0.22 – 6.08	0.85
5 – 12 years	0.38	0.09 – 1.65	0.19
> 12 years	1.75	1.01 – 3.03	0.04

Table 8. Crude Univariate Analysis of Individual Food Items Consumed from Country Cottage Buffet, August 15-17, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

Food Item	Case (N=96) Number (%)*	Control (N=384) Number (%)	Odds Ratio (95% C.I.)	p-value
Bacon bits	9 (9.4)	19 (5.0)	1.97 (0.86, 4.49)	
Caesar Salad	9 (9.4)	16 (4.2)	2.36 (1.01, 5.52)	0.04
Cheese	15 (15.6)	43 (11.3)	1.46 (0.77, 2.75)	
Chicken fried steak	27 (28.7)	133 (34.8)	0.75 (0.46, 1.24)	
Corn	27 (29.4)	121 (32.4)	0.57 (0.53, 1.43)	
Cream gravy	44 (47.8)	162 (42.5)	1.24 (0.78, 1.96)	
Fried Chicken	53 (55.8)	160 (41.8)	1.76 (1.12, 2.77)	0.01
Green beans	25 (27.8)	125 (33.1)	0.78 (0.47, 1.29)	
Ham	23 (24.0)	56 (14.8)	1.81 (1.05, 3.13)	0.03
Macaroni and cheese	22 (23.2)	53 (13.9)	1.87 (1.07, 3.26)	0.03
Mashed potatoes	66 (68.8)	211 (55.4)	1.77 (1.10, 2.85)	0.02
Rolls	49 (51.0)	165 (43.2)	1.37 (0.88, 2.15)	
Salad – any type	34 (35.4)	145 (37.8)	0.90 (0.57, 1.44)	
Salad toppings	32 (33.3)	112 (29.2)	1.21 (0.75, 1.96)	
Spinach salad	6 (6.5)	9 (2.4)	2.85 (0.99, 8.22)	
Dessert	77 (80.2)	245 (64.0)	2.28 (1.33, 3.93)	0.002
Warm dessert	46 (47.9)	151 (39.3)	1.42 (0.91, 2.23)	
Cold dessert	54 (56.3)	191 (49.7)	1.30 (0.83, 2.04)	
Cheesecake	6 (6.3)	6 (1.6)	4.19 (1.32, 13.29)	0.009
Cheesecake – any type	9 (9.4)	26 (6.8)	1.42 (0.64, 3.15)	
Ice cream	33 (34.4)	117 (30.5)	1.20 (0.74, 1.92)	
Tres leche cake	3 (3.1)	2 (0.5)	6.13 (1.01, 37.2)	0.03
Desserts w/ “fluff” or ice cream	45 (46.9)	161 (41.9)	1.22 (0.78, 1.92)	
Ice	87 (95.6)	299 (92.9)	1.67 (0.56, 4.97)	

* Denominators for each food item vary depending on the number of unknown responses.

Table 9. Univariate Analysis of Country Cottage Buffet Food Items Consumed August 15-17 by Persons 0- 4 years Old, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

Food Item	Case N=11 Number (%)*	Control N=12 Number (%)*	Odds Ratio[^] (95% C.I.)	p-value
Bacon bits	0 (0.0)	1 (8.3)	1.09 (0.00, 42.55)	
Caesar Salad	0 (0.0)	0 (0.0)	--	
Cheese	0 (0.0)	3 (25.0)	0.25 (0.00, 2.51)	
Chicken fried steak	3 (33.3)	1 (9.1)	4.61 (0.29, 288.13)	
Corn	2 (20.0)	2 (16.7)	1.24 (0.07, 20.72)	
Cream gravy	4 (57.1)	5 (41.7)	1.81 (0.20, 18.60)	
Fried Chicken	7 (63.6)	4 (33.3)	3.30 (0.48, 27.27)	
Green beans	1 (9.1)	2 (16.7)	0.52 (0.01, 11.42)	
Ham	4 (36.4)	3 (25.0)	1.67 (0.20, 15.52)	
Macaroni and cheese	9 (81.8)	1 (8.3)	37.30 (2.96, >999.99)	0.001
Mashed potatoes	10 (90.9)	4 (36.4)	15.00 (1.30, 864.97)	0.024
Rolls	5 (45.5)	4 (33.3)	1.63 (0.23, 12.45)	
Salad – any type	1 (9.1)	4 (33.3)	0.16 (0.01, 1.47)	
Salad toppings	3 (27.3)	4 (33.3)	0.76 (0.08, 6.23)	
Spinach salad	0 (0.0)	1 (8.3)	1.09 (0.00, 42.55)	
Dessert	11 (100.0)	8 (66.7)	2.20 (1.26, 3.99)	0.004
Warm dessert	5 (45.5)	3 (25.0)	2.40 (0.32, 21.82)	
Cold dessert	8 (72.7)	6 (50.0)	2.55 (0.36, 22.77)	
Cheesecake	0 (0.0)	0 (0.0)	--	
Ice cream	6 (54.6)	6 (50.0)	1.20 (0.23, 6.19)	
Desserts w/ “fluff” or ice cream	7 (63.6)	6 (50.0)	1.71 (0.25, 12.83)	
Ice	8 (80.0)	12 (100.0)	0.32 (0.00, 4.33)	

* Unknown responses to individual food items are not included in the denominator, so percentages vary.

[^] Fisher’s Exact Test performed for exposure items in which at least one cell had < 5 responses.

Table 10. Univariate Analysis of Country Cottage Buffet Items Consumed August 15-17 by Persons 5-12 Years Old, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

Food Item	Case (N=11) Number (%)*	Control (N=25) Number (%)*	Odds Ratio[^] (95% C.I.)
Bacon bits	0 (0.0)	0 (0.0)	--
Caesar Salad	0 (0.0)	0 (0.0)	--
Cheese	1 (9.1)	1 (4.0)	2.34 (0.03, 196.09)
Chicken fried steak	2 (18.2)	2 (8.0)	2.48 (0.16, 39.21)
Corn	3 (27.3)	9 (36.0)	0.67 (0.09, 3.83)
Cream gravy	2 (18.2)	12 (48.0)	0.25 (0.02, 1.57)
Fried Chicken	7 (63.6)	12 (50.0)	1.72 (0.33, 10.29)
Green beans	0 (0.0)	6 (25.0)	0.24 (0.00, 1.92)
Ham	3 (27.3)	5 (20.0)	1.48 (0.19, 9.97)
Macaroni and cheese	2 (18.2)	5 (20.0)	0.89 (0.07, 6.86)
Mashed potatoes	6 (54.6)	17 (68.0)	0.56 (0.13, 2.42)
Rolls	8 (72.7)	11 (44.0)	3.28 (0.60, 23.82)
Salad – any type	2 (18.2)	6 (24.0)	0.71 (0.06, 5.11)
Salad toppings	4 (36.4)	3 (12.0)	4.00 (0.54, 34.50)
Spinach salad	0 (0.0)	0 (0.0)	--
Dessert	8 (72.7)	21 (84.0)	0.52 (0.07, 4.34)
Warm dessert	3 (27.3)	3 (12.0)	2.66 (0.30, 24.37)
Cold dessert	3 (27.3)	21 (84.0)	0.06 (0.01, 0.39)
Cheesecake	0 (0.0)	2 (8.0)	0.92 (0.00, 12.30)
Ice cream	3 (27.3)	18 (72.0)	0.16 (0.02, 0.88)
Desserts w/ “fluff” or ice cream	3 (27.3)	18 (72.0)	0.16 (0.02, 0.88)
Ice	10 (90.9)	19 (90.5)	1.05 (0.05, 68.23)

* Unknown responses to individual food items not included in the denominator, so percentages vary.

[^] Fisher’s Exact Test performed for exposure items in which at least one cell had < 5 responses.

Table 11. Univariate Analysis of Country Cottage Buffet Items Consumed by Persons >12 Years of Age by Gender, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

Food Item	Male				Female			
	Case (N=22) %	Non-case (N=88) %	Odds Ratio (95% C.I.)	p-value	Case (N=52) %	Non-case (N=208) %	Odds Ratio (95% C.I.)	p-value
Bacon bits	1 (4.6)	7 (8.1)	0.54 (0.06, 4.67)		8 (15.4)	7 (3.4)	2.14 (1.77, 14.93)	0.001
Caesar Salad	1 (4.6)	2 (2.3)	2.05 (0.18, 23.67)		8 (15.4)	11 (5.4)	3.21 (1.22, 8.44)	0.014
Cheese	1 (4.6)	5 (5.8)	0.78 (0.09, 7.05)		13 (25.0)	27 (13.1)	2.21 (1.05, 4.66)	0.034
Chicken fried steak	5 (22.7)	37 (42.1)	0.41 (0.14, 1.20)		17 (32.7)	73 (35.1)	0.90 (0.47, 1.71)	
Corn	7 (31.8)	37 (43.5)	0.61 (0.22, 1.64)		15 (30.6)	54 (26.5)	1.23 (0.62, 2.43)	
Cream gravy	16 (72.7)	44 (50.6)	2.61 (0.93, 7.29)		22 (42.3)	88 (42.7)	0.98 (0.53, 1.82)	
Croutons	1 (4.6)	3 (3.5)	1.33 (0.13, 13.47)		7 (13.5)	9 (4.4)	3.39 (1.20, 9.58)	0.016
Fried Chicken	14 (63.6)	41 (46.6)	2.01 (0.76, 5.26)		25 (49.0)	89 (41.4)	1.36 (0.74, 2.52)	
Green beans	6 (30.0)	28 (31.8)	0.92 (0.32, 2.64)		18 (36.7)	73 (35.8)	1.04 (0.55, 1.99)	
Ham	8 (36.4)	13 (14.9)	3.25 (1.14, 9.29)	0.03	8 (15.4)	31 (15.2)	1.01 (0.44, 2.36)	
Macaroni and cheese	1 (4.8)	14 (15.9)	0.26 (0.03, 2.13)		10 (19.2)	31 (15.2)	1.33 (0.60, 2.92)	
Mashed potatoes	17 (77.3)	56 (63.6)	1.94 (0.65, 5.76)		33 (63.5)	113 (54.9)	1.43 (0.76, 2.68)	
Rolls	8 (36.4)	39 (44.3)	0.72 (0.27, 1.88)		28 (53.9)	87 (42.2)	1.60 (0.87, 2.94)	
Salad – any type	4 (18.2)	26 (29.6)	0.53 (0.16, 1.72)		28 (53.9)	89 (42.8)	1.56 (0.85, 2.87)	
Salad toppings	5 (22.7)	22 (25.0)	0.88 (0.29, 2.67)		20 (38.5)	67 (32.2)	1.32 (0.70, 2.47)	
Spinach salad	0 (0.0)	1 (1.1)	--		6 (12.2)	4 (2.0)	7.01 (1.90, 25.92)	0.0009
Dessert	14 (63.6)	59 (67.1)	0.86 (0.32, 2.28)		44 (84.6)	131 (63.3)	3.19 (1.43, 7.13)	0.003
Warm dessert	10 (45.5)	34 (38.6)	1.32 (0.52, 3.40)		28 (53.9)	95 (45.7)	1.39 (0.75, 2.55)	
Cold dessert	6 (27.3)	46 (52.3)	0.34 (0.12, 0.96)		39 (75.0)	105 (50.5)	2.94 (1.48, 5.83)	0.002
Cheesecake	1 (4.6)	0 (0.0)	--		5 (9.6)	4 (1.9)	5.43 (1.40, 20.98)	0.007
Chocolate syrup	0 (0.0)	1 (1.1)	--		4 (7.7)	4 (1.9)	4.25 (1.03, 17.60)	0.031
Ice cream	4 (18.2)	28 (31.8)	0.48 (0.15, 1.54)		20 (38.5)	51 (24.5)	1.92 (1.01, 3.66)	0.044
Tres leche cake	0 (0.0)	0 (0.0)	--		3 (5.8)	2 (1.0)	6.31 (1.03, 38.77)	0.024
Desserts w/ "fluff" or ice cream	4 (18.2)	36 (40.9)	0.32 (0.10, 1.03)		31 (59.6)	89 (41.4)	2.09 (1.13, 3.89)	0.018
Ice	19 (95.0)	74 (96.1)	0.77 (0.08, 7.83)		50 (100.0)	165 (94.3)	--	

* Unknown responses to individual food items are not included in the denominator, so percentages vary.

^ Fisher's Exact Test performed for exposure items in which at least one cell had < 5 responses.

Table 12. Summary of Country Cottage Restaurant Employees Reporting Any Illness Symptoms, Stool Specimen Results, and IgM Serology Results, *E. coli* O111:NM Outbreak Investigation -- Oklahoma, 2008

Ill employee	Case definition category	Onset date	Diarrhea (≥ 3 loose stools)	Blood in stools	Abdominal cramps	Vomit	Stool culture result	Date collected	Serology result
1	Not a case	8/9	Yes	No	No	Yes	Neg	8/31	NA+
2	Not a case	8/9	No	No	Yes	Yes	NA		NA
3	Suspect	8/12	Yes	Unk	Yes	Yes	Neg (X 2)	8/28, 8/29	NA
4	Not a case	8/14	No	No	Yes	No	NA		NA
5	Not a case	8/15	No*	No	Yes	No	NA		NA
6	Suspect	8/17	Yes	No	Yes	No	Neg (X 2)	8/28, 8/30	Neg
7	Suspect	8/17	Yes	Unk	Yes	No	Neg (X 2)	8/28, 8/29	NA
8	Not a case	8/18	No	No	No	Yes	NA		NA
9	Not a case	8/18	No*	No	Yes	Yes	Neg (X 3)^	8/24, 8/29, 8/30	NA
10	Probable	8/20	Yes	Yes	Yes	Yes	Neg	8/28	Neg
11	Suspect	8/20	Yes	No	Yes	Yes	Neg (X 2)	8/29, 8/30	NA
12	Not a case	8/22	No*	No	No	No	NA		NA
13	Not a case	8/23	No	No	Yes	No	Neg	8/28	NA
14	Not a case	8/24	No	No	Yes	No	NA		NA
15	Not a case	8/25	No	No	No	Yes	NA		NA
16	Not a case	8/27	No*	Unk	Yes	No	Neg (X 2)	8/30, 9/1	NA

+ NA = Results not available; employee either declined to provide specimen upon request or was not contacted to provide a specimen.

* Employee reported experiencing diarrhea with frequency of < 3 loose stools in a 24 hour period.

^ One specimen submitted via a healthcare facility and two specimens submitted via county health department; all tested at OSDH PHL.

Table 13. Summary of Ill Restaurant Employee Duty Assignments and Food Handling Responsibilities, *E. coli* O111:NM Outbreak Investigation -- Oklahoma, 2008

Ill employee	Case definition category	Symptom onset date	Restaurant position	Food handling duties	Dates worked with diarrhea
1	Not a case	8/9/2008	Hostess	None – cashier, seated customers and cleaned tables	8/15 – 8/17
2	Not a case	8/9/2008	Cook	Cooked and handled fried foods, prepared cobblers	NA [^]
3	Suspect	8/12/2008	Cook	Cooked and handled all hot foods except fried items, replenished hot foods on buffet table, prepped foods for catered event on 8/15 and worked at the event on 8/16	8/15 – 8/17
4	Not a case	8/14/2008	Waitress and hostess	Cut lemons for drinks, cut fudge	NA
5	Not a case	8/15/2008	Waitress	Prepared salads for menu orders, cut bread for tables, poured/served drinks	8/19, 8/21*
6	Suspect	8/17/2008	Waitress	Prepared salads for menu orders, poured/served drinks	8/17, 8/22 – 8/24
7	Suspect	8/17/2008	Prep cook	Handled/mixed vegetables for buffet salads, prepared cookies, cheesecakes, refilled salads on buffet, made salads on 8/16 for catered event	None
8	Not a case	8/18/2008	Waitress and hostess	Poured/served drinks	NA
9	Not a case	8/18/2008	Waitress	Prepared salads for menu orders, poured/served drinks	NA
10	Probable	8/20/2008	Waitress	Poured/served drinks	None
11	Suspect	8/20/2008	Prep cook	Handled/mixed vegetables for buffet salads, prepared cheesecake and cakes	None
12	Not a case	8/22/2008	Cater prep	Prepared vegetables and hash brown casserole for catered event, iced cakes for buffet, worked at catered event on 8/16	NA
13	Not a case	8/23/2008	Hostess	None – cashier, seated customers and cleaned tables	NA
14	Not a case	8/24/2008	Waitress and hostess	Prepared salads for menu orders, poured/served drinks	NA
15	Not a case	8/25/2008	Hostess	None – cashier, seated customers and cleaned tables	NA
16	Not a case	8/27/2008	Waitress	Cut lemons for drinks, poured/served drinks	NA

[^] NA = Not applicable because diarrhea not reported as a symptom of illness.

* Employee reported experiencing diarrhea 8/18 – 8/21, but did not experience more than 3 loose stools in a 24-hour period.

Table 14. Pulsed Field Gel Electrophoresis (PFGE) Patterns and Epidemiological Linkage to *E. coli* O111:NM Outbreak – Oklahoma, 2008

Classification	Xbal pattern							Total
	0001	0002	0003 ^a	0004	0005	0006	Other state*	
Confirmed Case	46	4	--	1	1	1	3	56
Secondary Case	2	--	--	--	--	--	1	3
Contact to asymptomatic family members who ate at restaurant	1	--	--	--	--	--	--	1
No link to Outbreak	1	--	1	--	--	--	--	2
Total	50	4	1	1	1	1	4	62

^a Pattern EXDX01.0003OK differed by 7-8 bands from the other patterns and was considered unrelated to the outbreak.

*The Xbal PFGE patterns for isolates received and tested by other state public health labs were indistinguishable from the outbreak patterns. All matched the national PulseNet Xbal pattern # EXDX01.0050.

Table 15. Oklahoma Department of Environmental Quality Water Sample Results, *E. coli* O111:NM Outbreak Investigation – Oklahoma, 2008

Collection date	Environmental Specimen Description	Report Date	Results
8/25/2008	Locust Grove water plant, sample # 744518 (100 ml)	8/26/2008	Negative
8/25/2008	Locust Grove water plant, sample # 744519 (100 ml)	8/26/2008	Negative
8/25/2008	Country Cottage restaurant, filtered, hand sink, sample # 744520 (100 ml)	8/26/2008	Negative
8/25/2008	Country Cottage restaurant, unfiltered, hand sink, sample # 744521	8/26/2008	Negative
8/27/2008	Country Cottage restaurant, well water, sample # 744733	8/28/2008	Positive coliform (TC/MPN=>200.5) and Fecal coliform (EC/MPN=>200.5)
8/27/2008	Country Cottage restaurant, well water, sample # 744734	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/27/2008	Country Cottage restaurant, well water, sample # 744735	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/27/2008	Country Cottage restaurant, well water, sample # 744736	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/27/2008	Country Cottage restaurant, well water, sample # 744737	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/27/2008	Country Cottage restaurant, well water, sample # 744738	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/27/2008	Country Cottage restaurant, well water, sample # 744739	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/27/2008	Country Cottage restaurant, well water, sample # 744740	8/28/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/29/2008	Country Cottage restaurant, well water, sample # 744848	8/30/2008	Suspect colonies identified, forwarded to OSDH-PHL
8/29/2008	Country Cottage restaurant, well water, sample # 744849	8/31/2008	Positive coliform (TC/MF=400); Negative fecal coliform (EC/MPN<1)
8/29/2008	Country Cottage restaurant, well water, sample # 744850	8/30/2008	Positive coliform (PA/MPN>2419.2); Positive fecal coliform (EC/MPN=34.1)
8/29/2008	Country Cottage restaurant, well water, sample # 744851	8/30/2008	Suspect colonies identified, forwarded to OSDH-PHL

Table 16. Bacterial Culture and Isolate Identification of Country Cottage Restaurant Well Water Samples at OSDH Public Health Laboratory, *E. coli* O111:NM Outbreak Investigation – Oklahoma, 2008

Date Received from DEQ	Water Specimen Description	Culture Results	Shiga Toxin PCR Test Results
8/28/2008	DEQ plate 1, Lab # BAC08-0828000981	<i>Proteus mirabilis</i>	--
8/28/2008	DEQ plate 2, Lab # BAC08-0828000982	<i>Klebsiella oxytoca</i>	--
	DEQ plate 2	<i>Serratia marcescens</i>	--
	DEQ plate 2	<i>Providencia stuartii</i>	--
	DEQ plate 2	<i>Klebsiella pneumoniae</i>	--
	DEQ plate 2	<i>Enterobacter spp.</i>	--
8/28/2008	DEQ plate 3, Lab # BAC08-0828000983	<i>Pseudomonas spp.</i>	--
	DEQ plate 3	<i>Proteus mirabilis</i>	--
8/28/2008	DEQ plate 4, Lab # BAC08-0828000984	<i>Klebsiella oxytoca</i>	--
8/28/2008	DEQ plate 5, Lab # BAC08-0828000985	<i>Klebsiella pneumoniae</i>	--
	DEQ plate 5	<i>Proteus mirabilis</i>	--
8/27/2008	DEQ plate 6, Lab # BAC08-0828000986	<i>Enterobacter aerogenes</i>	--
	DEQ plate 6	<i>Enterobacter cloacae</i>	--
	DEQ plate 6	<i>Proteus mirabilis</i>	--
9/2/2008	1/100 XLD Pink A, Lab # BAC08-0902000993	<i>Acinetobacter asaccharolytic</i>	--
9/2/2008	1/100 XLD Black, Lab # BAC08-0902000994	<i>Pseudomonas spp.</i>	--
9/2/2008	1/100 well water yellow, Lab # BAC08-0902000995	<i>Enterobacter aerogenes</i>	--
9/2/2008	1/100 Endo D, Lab # BAC08-0902000996	<i>Enterobacter cloacae</i>	--
9/2/2008	1/100 Endo E, Lab # BAC08-0902000997	<i>Pantoea species</i>	--
9/2/2008	1/100 Endo F, Lab# BAC08-0902000998	<i>Klebsiella oxytoca</i>	--
9/2/2008	1/100 Endo G, Lab # BAC08-0902000999	<i>Klebsiella pneumoniae</i>	--
9/2/2008	1 st set, Country Cottage A, Lab # BAC08-0902001000	<i>Escherichia coli</i>	Negative
9/2/2008	1 st set, Country Cottage B, Lab # BAC08-0902001001	<i>Escherichia coli</i>	Negative
9/2/2008	1 st set, Country Cottage C, Lab # BAC08-0902001002	<i>Escherichia coli</i>	Negative
9/2/2008	1 st set, Country Cottage D, Lab # BAC08-0902001003	<i>Escherichia coli</i>	Negative
9/2/2008	1 st set, Country Cottage E, Lab # BAC08-0902001004	<i>Klebsiella pneumoniae</i>	--

Table 17. Environmental Swab Results* of Specimens Collected from the Country Cottage Restaurant on August 28, 2008, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

Collection date	Environmental Swab Sample Description	Culture Results	Shiga Toxin Results
8/28/2008	Vegetable walk in refrigerator shelves, Lab # BAC08-1034	<i>Escherichia coli</i>	Negative
8/28/2008	Vegetable walk in refrigerator shelves, Lab # BAC08-1033	<i>Escherichia coli</i>	Negative
8/28/2008	Counter top cutting boards, Lab # BAC08-1032	<i>Kluyvera spp.</i>	N/A [^]
8/28/2008	Counter top cutting boards, Lab # BAC08-1031	<i>Escherichia coli</i>	Negative
8/28/2008	Vegetable/bakery prep table, Lab # BAC08-1030	<i>Enterobacter cloacae</i>	N/A
8/28/2008	Meat walk in refrigerator shelves, Lab # BAC08-1029	<i>Escherichia coli</i>	Negative
8/28/2008	Tea container/fountain nozzle, Lab # BAC08-1028	<i>Enterobacter spp.</i>	N/A
8/28/2008	Large mixing bowl on casters, Lab # BAC08-1027	<i>Enterobacter amnigenus</i>	N/A
8/28/2008	Large mixing bowl on casters, Lab # BAC08-1026	<i>Enterobacter amnigenus</i>	N/A
8/28/2008	Vegetable prep sink, Lab # BAC08-1025	<i>Enterobacter cloacae</i>	N/A

* Swabs from surfaces where no bacteria was isolated are not listed.

[^] N/A= Not applicable; Shiga toxin testing only conducted on *E. coli* isolates.

Table 18. Environmental Swab Results* of Specimens Collected from the Country Cottage Restaurant on September 17, 2008-- E. coli O111:NM Outbreak Investigation

Collection date	Environmental Swab Specimen Description	Culture Results
9/17/2008	Watermelon swab, Lab# BAC08-1087	<i>Enterobacter spp.</i>
9/17/2008	Watermelon swab, Lab# BAC08-1088	<i>Enterobacter spp.</i>
9/17/2008	Watermelon swab, Lab# BAC08-1089A	<i>Enterobacter spp.</i>
9/17/2008	Watermelon swab, Lab# BAC08-1089B	<i>Pantoea spp.</i>
9/17/2008	Men's overflow rest room, toilet bowl, Lab# BAC08-1097A	<i>Serratia odorifera</i>
9/17/2008	Men's overflow rest room, toilet bowl, Lab# BAC08-1097B	<i>Serratia marcescens</i>
9/17/2008	Women's overflow rest room, left sink left water handle, Lab# BAC08-1106	<i>Pseudomonas spp.</i>
9/17/2008	Women's overflow rest room, right toilet bowl, Lab# BAC08-1107	<i>Pseudomonas spp.</i>
9/17/2008	Women's overflow rest room, left toilet bowl, Lab# BAC08-1108A	<i>Klebsiella pneumoniae ssp. pneumoniae</i>
9/17/2008	Women's overflow rest room, left toilet bowl, Lab# BAC08-1108B	<i>Escherichia coli</i> non-toxigenic
9/17/2008	Overflow hot buffet surface area, Lab# BAC08-1123	<i>Pantoea spp.</i>

* Swabs from surfaces where no bacteria was isolated are not listed.

Table 19. Detection of *E. coli* O111 IgM Antibodies by Case Classification, *E. coli* O111:NM Outbreak Investigation-- Oklahoma, 2008

	Confirmed	Probable	Suspect	Mild Illness	Not a Case	Secondary	Total
<i>E. coli</i> O111 IgM							
Positive	13	9	0	1	5 ^a	1	29
Negative	13*	13	12	7	61	0	106
Total	26	22	12	8	66	1	135

^a Three of five non-cases attended Church tea event and were asymptomatic; two of five non-cases reported g.i. illness but did not have restaurant food exposure (catered or dine-in).

* Seven of thirteen persons with negative tests had specimen collection dates less than 7 days following onset of symptoms.

APPENDIX A

Incident Command Structure Organizational Charts



NE REGIONS GI OUTBREAK ICS

Epidemiological Operations

2008.08.27



OSDH

PUBLIC HEALTH RESPONSE

AUG/SEP COMPLEX PUBLIC HEALTH RESPONSE ICS

REVISION 2008.08.29

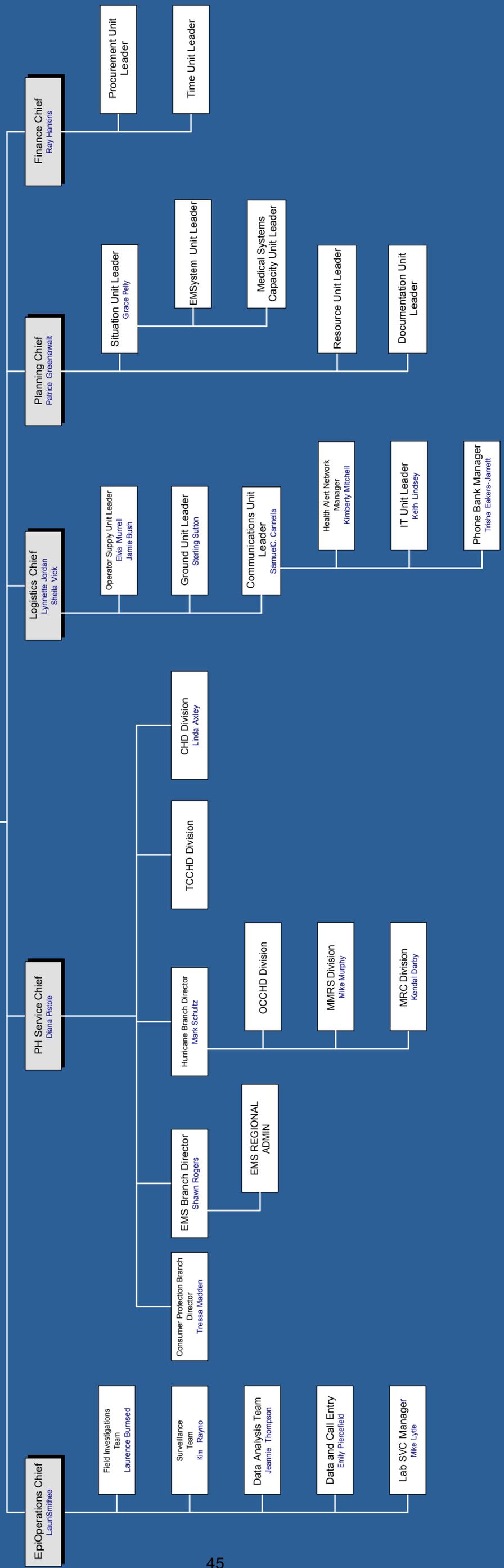


AREA COMMAND
Krisly Bradley, DVM
NE REGIONS GIOB
HURRICANE GUSTAV
Scott Sproat

PIO
Leslea BennetWebb
Larry Weatherford

Legal
Nick Slaymaker

ESF-8 Liaison Officer
Ed Kostluk



Available Subject Matter Experts

Consumer Health Vernon Boiz	Immunizations Don Blose	Intelligence OPEN	Legal Nick Slaymaker	Long Term Care Dorya Huser	Medical Charles Harvey, MD Philip Lindsey, MD	Medical Reserve Corps Kendal Darby	MMRS Mike Murphy	Pharmacy Michael Harman
Public Health Lab Dr. Garry McKee	Radiation OPEN	SME	SME	SME	SME	SME	SME	SME

APPENDIX B

Oklahoma Health Alert Network Advisory



This is an official Oklahoma Health Alert Network Health Advisory

August 24, 2008
OKHAN-0093-08-08-24-ADV-N

Outbreak of Severe Diarrheal Illness among Northeastern Oklahoma Communities

Epidemiologists from the Oklahoma State Department of Health (OSDH) are investigating an outbreak of severe diarrheal illness among residents of a variety of northeastern Oklahoma communities. As of this report, at least 14 cases have been hospitalized and 10 to 20 additional possible cases are under investigation. Signs and symptoms of these cases include diarrhea, bloody diarrhea, vomiting, and severe abdominal cramping. Fever is generally mild to absent. Onsets of illness have ranged from Aug 18 through Aug 23. Two cases have had renal failure and one of these has died.

Epidemiologists are investigating all likely sources, including restaurants, but no source has been identified. Case interviews as well as non-ill household and meal companion interviews are currently underway to determine common venues and food items.

Although little laboratory data is currently available, the presentation of illness in this outbreak is consistent with an enterohemorrhagic E. coli (EHEC), and 1 rapid test on a stool has indicated the presence of a shiga-toxin. Health care providers should:

- note that EHEC infections are toxin-mediated and antibiotics are generally contraindicated due to increased risk of development of HUS in those patients;
- report cases of hemorrhagic diarrhea, HUS, TTP, and acute renal failure immediately upon diagnosis to the Epidemiologist-On-Call at 405-271-4060; and
- collect stool specimens from suspect cases, plate on sorbitol-MacConkey agar, and perform shiga-toxin testing if available; consider saving a portion of the stool specimen (if there is sufficient quantity) and placing it in Carey-Blair media for additional testing at the OSDH Public Health Laboratory.

Categories of Health Alert messages:

Health Alert highest level of notification that the Oklahoma State Department of Health will send out. This usually refers to an immediate threat to the OSDH community and requires immediate action.

Health Advisory advises medical providers of a condition in the area. These are usually not medical emergencies. These may not require immediate action.

Health Update provides updates on previous alerts or advisories. These are unlikely to require immediate action.

This advisory has been distributed to Primary Care Physicians, Emergency Departments, Laboratories in Tulsa, Washington, Mayes, Creek, Muskogee, Wagoner, Rogers, Cherokee, Delaware, Ottawa, and Craig Counties and state and local health personnel##

=====
You have received this message based upon the information contained within our emergency notification database. If you have a different or additional e-mail or fax address that you would like us to use please contact the OSDH Communicable Disease Division at (405) 271-4060.
=====

This is an official Oklahoma Health Alert Network Health Advisory

August 27, 2008
OKHAN-0094-08-08-27-ADV-N

Non-O157 *E. coli* Identified as Cause of Foodborne Illness Outbreak Under Investigation in Northeast Oklahoma

The Oklahoma State Department of Health (OSDH) began investigating an outbreak of severe diarrheal illness among residents of a variety of northeastern Oklahoma communities on August 22, 2008. As of this report, 65 cases meet the outbreak case definition; 37 (57%) report bloody diarrhea. Signs and symptoms of these cases include diarrhea, bloody diarrhea, vomiting, and severe abdominal cramping. Fever is generally mild to absent. Six cases have developed renal failure/hemolytic uremic syndrome (HUS) and one adult male has died. Onsets of illness have ranged from Aug 18 through Aug 25; however identification of new cases is anticipated. Ongoing updates can be found at:

http://www.ok.gov/health/Organization/Office_of_Communications/News_Releases/2008_News_Releases/Northeastern_Oklahoma_GI_Outbreak_Updates.html.

The clinical presentation of illness in this outbreak and initial screening tests on stool specimens indicated a Shiga-toxin producing bacteria as the etiology early in the investigation, yet bacterial culture and isolation from enteric specimens proved challenging. Testing of ten patient specimens at the OSDH Public Health Laboratory has today identified a **non-O157 *E. coli*** bacteria as the etiological agent. Isolates have been forwarded to the CDC for further serotyping and classification. Based on these findings, the OSDH is requesting the following of Oklahoma health care providers:

- note that antibiotics and antidiarrheal agents are generally not recommended for treatment of patients with Shiga-toxin producing *E. coli* infections due to increased risk of development of HUS;
- report patients with their contact information who have presented to your office with bloody diarrhea since August 15th to the OSDH at 405-271-6680 (fax) or 405-271-4060 (phone);
- collect stool specimens from patients presenting with bloody diarrhea, plate on sorbitol-MacConkey agar, and perform shiga-toxin testing if available; consider saving a portion of the stool specimen (if there is sufficient quantity) and placing it in Carey-Blair media for additional testing at the OSDH Public Health Laboratory; and
- remind health care personnel and household members of cases of the importance of good hand hygiene.

Epidemiologic investigation is ongoing, but the majority of cases report eating at the Country Cottage buffet-style restaurant in Locust Grove, OK between Aug 15 and Aug 23. Due to the low infectious dose of this type of pathogenic *E. coli*, potential secondary transmission from restaurant-associated cases may occur.

Categories of Health Alert messages:

Health Alert highest level of notification that the Oklahoma State Department of Health will send out. This usually refers to an immediate threat to the OSDH community and requires immediate action.

Health Advisory advises medical providers of a condition in the area. These are usually not medical emergencies. These may not require immediate action.

Health Update provides updates on previous alerts or advisories. These are unlikely to require immediate action.

This advisory has been distributed to Primary Care Physicians, Emergency Departments, Laboratories, and state and local health personnel##

=====

You have received this message based upon the information contained within our emergency notification database. If you have a different or additional e-mail or fax address that you would like us to use please contact the OSDH Communicable Disease Division at (405) 271-4060.

=====

This is an official Oklahoma Health Alert Network Health Advisory

August 29, 2008

OKHAN-0095-08-08-29-ADV-N

Guidance for Physicians and Laboratories Regarding Collection and Testing of Specimens Potentially Related to the *E. coli* O111 Foodborne Illness Outbreak in Northeast Oklahoma

The Oklahoma State Department of Health (OSDH) continues an investigation of an outbreak of diarrheal illness and hemolytic uremic syndrome (HUS) caused by a Shiga-toxin producing *E. coli*. Most cases report eating at the Country Cottage Restaurant in Locust Grove, Oklahoma from August 15 through August 24. As of this report, 116 outbreak-related cases have been identified with 57% of the cases reported having bloody diarrhea. Nine patients have progressed to HUS and one person has died. Serotyping of forwarded bacterial isolates at the Centers for Disease Control and Prevention (CDC) has identified the outbreak strain as *E. coli* O111.

Due to the unusual outbreak agent and the heightened awareness surrounding this outbreak, laboratories are reporting an increase in the number of enteric test requests (EHEC screen, stool culture). The OSDH desires to capture outbreak-related cases and achieve diagnoses of patients with infectious diarrheal illness without overburdening the laboratory system. Therefore, the following guidance is provided to assist in appropriately identifying patients who may be infected with enterohemorrhagic *E. coli*.

Recommendations for Physicians:

- Collect stool specimens on patients that reside in or have visited northeastern Oklahoma during Aug 15th – Aug 24th presenting with:
 - HUS;
 - Bloody diarrhea; or
 - Acute diarrhea (3 or more stools) and severe abdominal cramps.
- Collect stool specimens on patients that are family or close contacts of a patient that previously met the above criteria, but were not cultured.
- Notify the clinical diagnosis laboratory about suspicion of a **nonO157 *E. coli*** infection.
- Report contact information of patients who have presented to your office and meet the above criteria to the OSDH at 405-271-6680 (fax) or 405-271-4060 (phone).

*Please note that antibiotics and antidiarrheal agents are generally not recommended for treatment of patients with Shiga-toxin producing *E. coli* infections due to increased risk of development of HUS.*

Recommendations for Clinical Diagnostic Laboratories

- As recommended by the CDC, clinical diagnostic laboratories should **strongly consider including Shiga toxin-producing *E. coli* (STEC) in their routine bacterial enteric panel** (with *Salmonella*, *Shigella*, and *Campylobacter*).
- Screen stool samples for Shiga toxins (Stxs) using enzyme immunoassay (EIA) or polymerase chain reaction.
- Culture simultaneously for STEC, for example on sorbitol MacConkey agar.

- If simultaneous culture not done, culture all Stx-positive broths for STEC as soon as possible and forward these isolates to the OSDH Public Health Laboratory for confirmation and subtyping.
- Alternatively, Stx-positive broths can be forwarded directly to the OSDH Public Health Laboratory for bacterial culture and isolation.

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Health Update provides updates on previous alerts or advisories. These are unlikely to require immediate action.

This advisory has been distributed to Primary Care Physicians, Emergency Departments, Laboratories, and state and local health personnel##

=====
You have received this message based upon the information contained within our emergency notification database. If you have a different or additional e-mail or fax address that you would like us to use please contact the OSDH Communicable Disease Division at (405) 271-4060.
=====

This is an official Oklahoma Health Alert Network Health Update

September 15, 2008
OKHAN-0096-08-09-15-UPT-N

Update: Severe Diarrheal Illness in Northeastern Oklahoma

The Oklahoma State Department of Health (OSDH) began investigating an outbreak of severe diarrheal illness among residents of a variety of northeastern Oklahoma communities on August 22, 2008. As of this report, 291 persons have been identified as cases of this outbreak. Secondary cases have been identified indicating person-to-person transmission within households. At least 67 persons have been hospitalized including 16 who have received dialysis treatment, and one person has died. The OSDH Public Health Laboratory along with the assistance of the Centers for Disease Control and Prevention (CDC) has identified *E. coli* O111 as the etiologic agent. The majority of cases reported eating at the Country Cottage restaurant in Locust Grove, OK, and it is currently closed.

The OSDH outbreak investigation team is extremely appreciative of the efforts of our public health partners during the outbreak investigation. Infection prevention and control practitioners (ICPs), laboratory personnel, emergency departments and healthcare providers have all been enormously helpful in providing information that has led to identification of suspects and cases associated with the outbreak. Analysis of this information will hopefully reveal information to prevent future outbreaks of this kind. Upon review of the daily reports from our healthcare partners, OSDH epidemiologists have determined that the outbreak is on the decline. However, the risk of secondary transmission is still possible, especially in those communities with affected individuals. We continue to urge all healthcare personnel, affected individuals and their respective household members, to continue the practice of good hand hygiene to prevent the spread of disease.

Beginning Monday, 15 September, we will no longer continue enhanced daily surveillance and reporting of suspected cases of disease related to this outbreak. We will continue to investigate reports of Hemolytic Uremic Syndrome (HUS) and cases of enterohemorrhagic *E. coli* non-O157 to find or rule out additional cases associated with the outbreak. Healthcare providers should collect stool specimens from patients presenting with bloody diarrhea, and request routine enteric culture panel and additional culture on sorbitol-MacConkey agar specific for Shiga toxin-producing *E. coli* (STEC), as well as perform Shiga toxin testing on stool if available. The OSDH asks that hospitals, clinical laboratories, and healthcare providers use their routine reporting mechanisms for state required reporting of EHEC and HUS cases, including submission of designated isolates to the OSDH Public Health Laboratory. Go to our website www.health.ok.gov and enter "disease reporting" in the search box to find further information about the diseases and conditions reportable to OSDH per OAC 310:515.

Categories of Health Alert messages:

Health Alert highest level of notification that the Oklahoma State Department of Health will send out. This usually refers to an immediate threat to the OSDH community and requires immediate action.

Health Advisory advises medical providers of a condition in the area. These are usually not medical emergencies. These may not require immediate action.

Health Update provides updates on previous alerts or advisories. These are unlikely to require immediate action.

##This update has been distributed to Primary Care Physicians, Emergency Departments, Laboratories in Tulsa, Washington, Mayes, Creek, Muskogee, Wagoner, Rogers, Cherokee, Delaware, Ottawa, and Craig Counties and state and local health personnel##

† This Health Notification is an update to the OK-HAN Notification OKHAN-0094-08-08-27-ADV-N

=====
You have received this message based upon the information contained within our emergency notification database. If you have a different or additional e-mail or fax address that you would like us to use please contact the OSDH Communicable Disease Division at (405) 271-4060.
=====

APPENDIX C

Fax Surveillance Form/Cover Sheet



Oklahoma State
Department of Health



Oklahoma State Department of Health
Creating a State of Health

DATE: September 10, 2008

TO: _____

FROM: Kim Rayno, MPH

NAME

AGENCY/FIRM

ADDRESS

CITY/STATE

PHONE NUMBER

FAX NUMBER

NAME

Oklahoma State Department of Health
Acute Disease Service
1000 N.E. 10th Street
Oklahoma City, OK 73117-1299
Phone: (405) 271-4060
Fax: (405) 271-6680

3

Total number of pages (including this page)

Shiga-like Toxin Verification List - Northeastern Oklahoma Gastrointestinal Outbreak

Please review the attached list and verify, correct, or add additional names to the list and fax it back to my attention. Thanks, Kim

Notice of Confidentiality

The information contained in the transmission accompanying this notice may be confidential and protected by the physician-patient privilege. It is intended only for the use of the individual or entity identified above. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination or distribution of the accompanying communication is prohibited. The physician-patient privilege is not waived by the parties sending the accompanying documents. If you have received this communication in error, please notify us immediately by telephone and return the original message to us at the above address via the United States Postal Service.

10 September 2008

Dear Microbiology Manager/Supervisor,

We are investigating an outbreak of *E. coli* O111 in northeastern Oklahoma. Your collaboration in forwarding specimens on suspect cases has been incredibly valuable. We urgently need your assistance with identifying persons with a Shiga-like toxin positive lab test result for specimens collected since 12 August 2008.

Attached is a listing of persons your facility tested for Shiga-like toxin or for which an enteric specimen was forwarded to the Public Health Laboratory. Please review your list and indicate if the information is correct. If it is not correct, please correct it on that page or attach additional pages if needed. If there are no names on the list, please add the information for any Shiga-like toxin positive lab test results for specimens collected since 12 August 2008. Below is an explanation of some of the column headings.

Laboratory	Name of laboratory
DOB/Age	Date of Birth is preferred if available. If not, please list Age and either Years, Months or Days.
Verify	If the information in that row is correct, please write “Y” for “Yes” or “N” for “No”. Note: This does not apply if the patient is not preprinted on the list.
Culture (Only for new persons)	If applicable, please provide the name of the organism cultured from the enteric specimen. Note: This does not apply if the person is preprinted on the list.
Physician (Only for new persons)	If applicable, please provide the name of the ordering physician. Note: This does not apply if the person is preprinted on the list.
Physician Phone (Only for new persons)	If applicable, please provide the phone number of the ordering physician. Note: This does not apply if the person is preprinted on the list.

If your laboratory does not perform Shiga-like toxin testing or if you send it out to a reference laboratory, please make a note of it on the form.

Please fax the attached page(s) back to me as soon as you have a chance today, even if you did not have any persons test positive for Shiga-like toxin. If you have any questions or suggestions, we truly welcome your input. Regular updates and fact sheets about the investigation are available on our website www.health.ok.gov: just click on “Current Features – Severe Diarrheal Illness Outbreak”.

Very Sincerely,

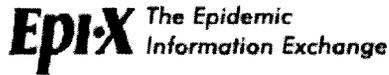
Kim Rayno, MPH
OSDH Acute Disease Service
Main Phone: 405-271-4060 or 800-234-5963
Confidential Fax: 405-271-6680 or 800-898-6734
Email: KimR@health.ok.gov

APPENDIX D

EPI-X Postings



Oklahoma State
Department of Health



Outbreak of Hemorrhagic Diarrhea and HUS Associated with a Restaurant -- Oklahoma, 2008

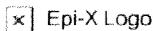
Access and Notification:	Make available to all <i>Epi-X</i> users Click to view user notifications, if any										
Distribution: Contributor's instructions for distributing this report.	Distribute on a need-to-know basis										
Brief Summary of Report:	Four children have developed renal failure, and a 26-year-old man has died. The restaurant has voluntarily closed pending further investigation. Please report related cases to OSDH at (405) 271-4060.										
Description:	<p>On August 22, 2008, the Oklahoma State Department of Health (OSDH) was notified of an increase in emergency department visits in the Tulsa area for bloody diarrhea and severe abdominal cramping. Initial interviews indicated that six of eight patients had eaten at a popular buffet-style restaurant in northeastern Oklahoma within one week of symptom onset. Additional cases have been identified in area hospitals and among dining companions.</p> <p>As of August 25, a total of 20 of 22 ill persons reported eating at this same restaurant during August 15–21. Four children have developed renal failure, and one 26-year-old man has died. Initial laboratory testing indicated Shiga toxin present in five of 15 stool specimens. Bacterial cultures are pending. Cases continue to be identified, including among ill food handlers. The restaurant passed a standard inspection, but has voluntarily closed pending further investigation. Interviews are being conducted to determine possible food items of exposure, and if exposures may have occurred in other locations.</p> <p>Local health officials who identify cases of bloody diarrhea and/or HUS in persons who traveled to northeastern Oklahoma on or after August 15 are asked to report to their state health departments (SHDs). SHDs, in turn, are asked to report cases to OSDH Acute Disease Service at (405) 271-4060.</p>										
Report Category:	Infectious Disease: Food Borne										
Type of Cases:	Human										
Number of Cases:	<table border="0"> <tr> <td>Estimated</td> <td></td> </tr> <tr> <td>Exposed:</td> <td>~2500</td> </tr> <tr> <td>Total Ill or Injured:</td> <td>32</td> </tr> <tr> <td>Hospitalized:</td> <td>14</td> </tr> <tr> <td>Deaths:</td> <td>1</td> </tr> </table>	Estimated		Exposed:	~2500	Total Ill or Injured:	32	Hospitalized:	14	Deaths:	1
Estimated											
Exposed:	~2500										
Total Ill or Injured:	32										
Hospitalized:	14										
Deaths:	1										
Date First Case Became Ill or Injured:	08/15/2008										
Cause/Agent:	Unknown										
Setting:	Restaurant										
Other Setting Information:	Northeastern Oklahoma										
Location:	Oklahoma										
Other Location Information:	Tulsa area										
Public Health Actions Taken:	Investigation in Progress										
Other Contributors to This Report:	Emily Piercefield, MD, DVM, EIS Officer										

Status Information

Contributor: Kristy Bradley, MPH, DVM
Job Title: State Epidemiologist & State Public Health Veterinarian
Program or Division: Disease Prevention Services
Submitted: 8/25/2008 10:53 PM
Posted: 8/26/2008 11:21 AM
Number of Persons Who Viewed This Report: 357
Total Views: 387

[Close Window](#)

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**Restaurant-Associated Outbreak of E. coli O111 -- Oklahoma, August 2008**

Access and Notification:	Make available to all <i>Epi-X</i> users Click to view user notifications, if any
Distribution:	Release outside of Epi-X as needed
Contributor's instructions for distributing this report.	
Brief Summary of Report:	Over 320 ill persons, food handlers, and dining companions have been interviewed, but a food vehicle has not been identified. Please report related cases to OSDH at (405) 271-4060.
Description:	<p>The Oklahoma State Department of Health (OSDH) continues to investigate an outbreak of diarrheal illness and hemolytic-uremic syndrome (HUS) associated with a buffet-style restaurant in northeastern Oklahoma. Over 320 ill persons, food handlers, and dining companions have been interviewed regarding food exposures, but a common food vehicle has not been determined. Cross contamination of multiple food items within the restaurant may have occurred. Initial laboratory testing identified enterohemorrhagic <i>Escherichia coli</i> (EHEC) by enzyme immunoassay. Samples were positive for Shiga-toxin 1 and 2 production by polymerase chain reaction. On August 27, 2008, the OSDH Public Health laboratory isolated non O157 <i>E. coli</i> from fecal specimens collected from 10 patients. Isolates were forwarded to CDC for serotyping where the outbreak agent has been identified as a strain of <i>E. coli</i> O111. The PFGE pattern has been posted to PulseNet. The national pattern numbers are:</p> <ul style="list-style-type: none"> • XbaI: EXDX01.0050 • BlnI: EXDA26.0174 <p>The restaurant had a high volume of patrons, including buses of out-of-state tourists. Some cases among persons from other states have been reported, and others are suspected. Local health officials who identify cases of bloody diarrhea, HUS, or EHEC infection in persons with a travel history to northeastern Oklahoma from August 15 through August 24 are asked to report to their state health departments (SHDs). In turn, SHDs are asked to report cases to the OSDH Acute Disease Service at (405) 271-4060.</p>
Report Category:	Infectious Disease: Bacterial, Food Borne
Type of Cases:	Human
Number of Cases:	Estimated
	Exposed: ~ 2,500
	Total Ill or Injured: 73
	Hospitalized: 48
	Deaths: 1
Date First Case Became Ill or Injured:	08/15/2008
Cause/Agent:	<i>E. coli</i> O111

Setting: Restaurant

Location: Oklahoma

Public Health Actions Taken: Investigation in Progress, Public Education

Links to Related Reports: Outbreak of Hemorrhagic Diarrhea and HUS Associated with a
Links to previously posted reports. Restaurant -- Oklahoma, 2008
~*~ Media Tracking Report, August 28, 2008 ~*~

Status Information

Contributor: Kristy Bradley, MPH, DVM

Job Title: State Epidemiologist & State Public Health Veterinarian

Program or Division: Disease Prevention Services

Submitted: 8/28/2008 10:10 PM

Posted: 8/28/2008 11:34 PM

Number of Persons Who Viewed This Report: 249

Total Views: 288

[Close Window](#)

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APPENDIX E

Situation Updates



Oklahoma State
Department of Health

For Release: September 5, 2008
Contact: Leslea Bennett-Webb
Office of Communications
405/271-5601

Note to News Outlets: No Situation Updates will be issued this weekend unless events warrant. Next update will be Monday, Sept. 8.
Situation Update No. 10 – Amended

Situation Update No. 10 – Amended

Please note the following addition to Situation Update No. 10 sent earlier this date:

The Oklahoma State Department of Health is actively seeking persons who ate at the Country Cottage restaurant in Locust Grove, OK, on these days: Friday, Aug. 15, Saturday, Aug. 16, and Sunday, Aug. 17. If you ate at the restaurant on those dates and did not become ill, and you have not been interviewed by a health department representative, please call the Oklahoma State Department of Health at 1-800-234-6196 on these days/times ONLY: Saturday, Sept. 6, from 10 a.m. to 4 p.m., and Sunday, Sept. 7, from noon to 5 p.m.

Situation Update No. 10 Outbreak of Severe Diarrheal Illness in Northeastern Oklahoma

The Oklahoma State Department of Health said today it has determined the need to interview additional persons as part of its ongoing investigation into the source of an E. coli 0111 outbreak in northeastern Oklahoma.

“In our efforts to establish if there is an association with particular food items and illness, we will be interviewing more persons to find those who ate at the Country Cottage and did not become ill,” said State Epidemiologist Dr. Kristy Bradley. “In an investigation of this scope, it is as important to collect information on those who did not get sick as those who did become ill. We’ve determined that our statistical database does not adequately represent those who ate at the Country Cottage but did not become ill.”

Bradley said state health officials have identified about 320 persons not previously interviewed who ate at the Country Cottage Aug. 15-17, the days most persons who became ill ate at the restaurant. These newly identified persons will be contacted this weekend to see if they can recall what food items they ate and if they got sick afterward. “This information is necessary so that we can make the distinction between what might have been a popular food choice versus a valid association with illness,” Bradley explained.

The OSDH also announced today that it has invited officials from the Foodborne and Diarrheal Diseases Branch of the federal Centers for Disease Control and Prevention (CDC) to Oklahoma to participate in the outbreak investigation.

“This outbreak is of great interest to CDC because it will add to knowledge on the range of disease that the E. coli 0111 organism can cause,” Bradley said. She said federal officials will conduct medical reviews to look at acute symptoms and complications of those who became sick due to the E. coli 0111 infection. They will also assist OSDH staff in telephone interviews.

Where available in northeastern Oklahoma, the public may call 2-1-1 for more information about the outbreak. Additional information is also on the Oklahoma State Department of Health’s Web site at www.health.ok.gov. Click on [“Current Features – Severe Diarrheal Illness Outbreak.”](#)

For Release: September 9, 2008
Contact: Leslea Bennett-Webb
Office of Communications
405/271-5601

Situation Update No. 12

Outbreak of Severe Diarrheal Illness in Northeastern Oklahoma

The Oklahoma State Department of Health (OSDH) said today that analysis of environmental samples taken from the Country Cottage restaurant in Locust Grove, OK, indicated no disease-causing pathogens were found on the restaurant's surfaces. The restaurant has been the focus of an ongoing investigation into the source of an E. coli 0111 outbreak in northeastern Oklahoma.

"We found no firm evidence of E. coli 0111 on food preparation and serving surfaces," said State Epidemiologist Dr. Kristy Bradley. "I would caution, however, that it is very challenging to go to the scene of a food-borne illness outbreak and try to retrieve an organism from surfaces that may have been cleaned since any contamination took place."

E. coli 0111 was identified from laboratory specimens of patients sickened by the outbreak.

Laboratory analysis of foods sampled at the restaurant is continuing.

"It is possible that any environmental contamination was not widespread in the restaurant, so our epidemiological investigation will continue to focus on what foods may have been contaminated and caused persons to become ill," Bradley said.

The OSDH is continuing to interview families who had children who ate at the restaurant Aug. 15-17 to determine the possible association of illness to specific food items. Most persons who became ill reported eating at the Country Cottage the weekend of Aug. 15. Persons can call the OSDH at 1-800-990-2769 between the hours of 8 a.m. and 8 p.m. each day through this Friday, Sept. 12.

Where available in northeastern Oklahoma, the public may call 2-1-1 for more information about the outbreak. Additional information is also on the Oklahoma State Department of Health's Web site at www.health.ok.gov. Click on "[Current Features – Severe Diarrheal Illness Outbreak.](#)"

APPENDIX F

Specimen Submission Order



Oklahoma State
Department of Health

**ORIGINAL
FILED UNDER SEAL**

**BEFORE THE OKLAHOMA STATE DEPARTMENT OF HEALTH
STATE OF OKLAHOMA**

STATE OF OKLAHOMA, <i>ex rel.</i> ,)	
Disease and Prevention Services, the)	
Oklahoma State Department)	
of Health,)	
)	
Petitioner,)	
)	
v.)	AD-2008-_____
)	
JOHN DOE, a person who is suspected)	
to be infected with a communicable)	
disease,)	
)	
Respondent.)	

**EMERGENCY ORDER AND DIRECTIVE TO AN INDIVIDUAL
WHO PRESENTS AN IMMEDIATE THREAT TO PUBLIC HEALTH**

Based upon the findings of fact and conclusions of law set forth hereinbelow, which are derived from information supplied by Disease and Prevention Services of the Oklahoma State Department of Health (“OSDH” or the “Department”), the Commissioner of Health finds that you have been identified as a person likely to be infected with a communicable disease. Further, based upon this known likelihood and the specific medical findings set forth below demonstrating that you represent a substantial and continuing risk of communication of a disease to the general public, the Commissioner of Health finds that an emergency exists which immediately threatens the health, safety and/or welfare of the citizens of Oklahoma and that the imposition of the terms of this Order is necessary to abate this emergency. Accordingly, this Final Emergency Order is hereby entered pursuant to Title 63 O.S.Supp.2007, § 1-106(B)(1), 75 O.S.2001, § 314.1, Oklahoma Administrative Code (OAC) 310:2-21-3, 310:2-21-23 and 310:257-15-37.

Findings of Fact Made by the Commissioner of Health

1. The Commissioner of the Department of Health has jurisdiction of this matter pursuant to 63 O.S. 2001, §§ 1-106 and 1-1118 and 75 O.S. 2001, § 314(C).
2. The State Board of Health has adopted the regulations for food establishments (Rules) pursuant to 63 O.S. 2001, §§ 1-1114 and 1-1118.
3. Respondent, _____, is an employee at COUNTRY COTTAGE, a food service establishment operating at 6570 HWY 82 S., Locust Grove, OK 74352.
4. Kenneth D. Moore, d/b/a COUNTRY COTTAGE, holds food license number 6329 as a food service establishment as defined in Rule 310:257-1-2.
5. Respondent, _____, has been identified as a person likely to be infected with a communicable disease and working at COUNTRY COTTAGE.
6. As a result, _____'s employment at COUNTRY COTTAGE constitutes an **imminent health hazard** to the public in that a communicable disease may be spread to the public.
7. OAC 310:257-15-37 provides:

“310:257-15-37. Obtaining information: personal history of illness, medical examination, and specimen analysis

The regulatory authority shall act when it has reasonable cause to believe that a food employee has possibly transmitted disease; may be infected with a disease in a communicable form that is transmissible through food; may be a carrier of infectious agents that cause a disease that is transmissible through food; or is affected with a boil, an infected wound, or acute respiratory infection, by:

- (1) Securing a confidential medical history of the employee suspected of transmitting disease or making other investigations as deemed appropriate; and

(2) *Requiring appropriate medical examinations, including collection of specimens for laboratory analysis, of a suspected employee and other employees.* (emphasis added) [**Source:** Added at 23 Ok Reg 2358, eff 6-25-06]

8. The Commissioner of Health finds that the information cited above constitutes an **imminent health hazard** imperatively requiring emergency action in order to protect the health, safety and welfare of the public.

Conclusions of Law

9. Entry of this Order is proper and authorized by Title 63 O.S.Supp.2007, § 1-106(B)(1), 75 O.S.2001, §§ 312, 314.1, (OAC) 310:2-21-23 and 310:257-15-37.
10. The Commissioner of Health has jurisdiction of this matter pursuant to Title 63 O.S. 2001, §§ 1-106 and 1-1118.
11. Adoption of the Food Service Establishment regulations by the State Board of Health is authorized by 63 O.S. 2001, §§ 1-1114 and 1-1118.
12. Respondent, _____, should submit to an appropriate medical examinations, including collection of specimens for laboratory analysis in order to protect the health, safety and welfare of the public.

ORDER

IT IS THEREFORE ORDERED by the Commissioner of Health that Respondent shall immediately make contact (Phone number) with the Mayes County Health Department and submit to appropriate medical examinations, including collection of specimens for laboratory analysis as directed by personnel of the Mayes County Health Department.

IT IS FURTHER ORDERED by the Commissioner of Health that pursuant to 75 O.S. § 317, Respondent may request reconsideration of this Order by requesting that the Commissioner of Health set an emergency hearing within ten (10) days of the date of this Order. Any request for reconsideration must be based upon one or more of the following grounds: (1.) Newly discovered or newly available evidence, relevant to the issues; (2.) Need for additional evidence adequately to develop the facts essential to proper decision; (3.) Probable error committed by the agency in the proceeding or in its decision such as would be ground for reversal on judicial review of the final agency order; (4.) Need for further consideration of the issues and the evidence in the public interest; or (5.) A showing that issues not previously considered ought to be examined in order properly to dispose of the matter.

Any request by Respondent shall be submitted in writing to Carolyn Guthrie, Administrative Hearing Clerk for the State Department of Health, 1000 N.E. 10th St. Oklahoma City, OK 73117.

THE RESPONDENT IS ADVISED, in the alternative, that pursuant to 75 O.S.2001, § 318, Respondent has the right to seek judicial review of this Order within thirty (30) days of receipt of this Order. Respondent shall seek such judicial review by filing a Petition for Judicial Review within the county in which Respondent resides.

THE RESPONDENT IS FURTHER ADVISED that if Respondent refuses to abide by the terms of this Order the Commissioner of Health will seek such remedies as provided by law, including, but not limited to, injunctive relief in state district court, together with such costs and attorneys fees incurred by the Department.

Additionally, the Department may refer this matter to the District Attorney for criminal prosecution if you fail to comply with this Order pursuant to 63 O.S. § 1-1701.

HEREOF FAIL NOT UNDER PENALTY OF LAW.

Done this _____ day of August 2008.

James M. Crutcher, M.D., M.P.H.
Commissioner of Health and State
And State Health Officer

ATTORNEYS FOR PETITIONER:

NICK E. SLAYMAKER, OBA #14320
General Counsel
TOM L. CROSS, OBA #11630
Deputy General Counsel
CHARLES L. BROADWAY, OBA #11624
Assistant General Counsel
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Office of the General Counsel
Oklahoma State Department of Health
1000 N. E. Tenth, Room 206
Oklahoma City, OK 73117-1207
Phone: 405.271.6017
Fax: 405.271.1268

**ORIGINAL
FILED UNDER SEAL**

**BEFORE THE OKLAHOMA STATE DEPARTMENT OF HEALTH
STATE OF OKLAHOMA**

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JOHN DOE, a person who is suspected)	
to be infected with a communicable)	
disease,)	
)	
Respondent.)	

RETURN OF SERVICE

I hereby certify that on the ____ day August 2008, the undersigned delivered a copy of the foregoing *Emergency Order and Directive to an Individual Who Presents an Immediate Threat to Public Health*, to the above-named Respondent, at the following address, to wit:

RESPONDENT LOCATED
Address
City, State Zip

For the Department

APPENDIX G

Restaurant Inspection Report



Oklahoma State
Department of Health

Reg # 1587	Month 8	Day 23	Year 08	Insp. Time	Mgr. Cert.	County # 49	Establishment # 6329	Date Of Exp. 7/19/09	Type 45F	Class	Priority H
Purpose of Inspection: 1-Routine 2-Compliance 3-Issue License Application 4-Complaint 5-Other 6-Out of Business 7-Follow-Up Activity											
Establishment: Country Cottage							Owner:				
Physical Address: 6570 Hwy 82 S.					City: LG		Zip: 74352		Phone: () -		
++ Denotes CDC Risk Factor * Denotes FDA - Identified Risk Factors and Food Code					OT - Out of Compliance IN - In Compliance		NA - Not Applicable NO - Not Observed		Cell Phone: () -		
OAC 310:257	O T	I N	A	N O	I. Food (PHF) Temperature/Time Requirements Violations Require Immediate Corrective Action (CDI) = corrected during inspection						Correct by Date
5-57		✓			1. Proper Cooling for Cooked/Prepared Food (135° - 70°F in 2 hrs./70° - 41°F in 4 hrs.) ++*						
5-9(n), 59(2), 62	✓				2. Cold Hold (41°F)/Time Control ++*						
5-9(b), 59(1), 62	✓				3. Hot Hold (135°F)/Time Control ++*						
5-25, 46, 47		✓			4. Proper Cooking Temperature per PHF ++*						
5-52			✓		5. Rapid Reheating (165°F in 2 hrs) ++*						
	O T	I N	A	N O	II. Personnel/Handling/Source Requirements - Requires Immediate Corrective Action						Date
3-5, 7, 19		✓			6. Personnel with Infections Restricted/Excluded ++*						
3-9, 10, 12, 19, 21; 5-21		✓			7. Proper Handwashing/Proper Handling of Ready-To-Eat ++*						
3-9, 16		✓			8. Good Hygienic Practices (Eating/Drinking/Smoking/Other) ++*						
5-1-8, 9(c)(d), 10-12, 14, 16- 18, 49, 63, 64, 70		✓			9. Approved Source/Sound Condition ++*						
5-13, 22, 23(a)(1), 27, 29, 30, 41, 43(a), 44; 11-44; 15-5	✓				10. Food Protected during Storage, Display, Transportation, Service						
5-23(n)(1)(b); 7-4, 5		✓			11. Cross-Contamination of Raw/Cooked Foods/Other ++						
3-1-4		✓			12. Demonstration of Knowledge / Person In Charge *						
9-8, 9		✓			13. Hot and Cold Water Under Pressure / Sufficient Capacity						
	O T	I N	A	N O	III. Facility and Equipment Requirements - Requires Corrective Action Within 10 Calendar days						Date
7-36, 50, 56		✓			14. Equipment Adequate to Maintain Product Temperature/Accurate Thermometers Provided						
9-18, 23, 26; 11- 23, 24, 25, 27; 11-35, 44		✓			15. Handwash Facilities Adequate/Accessible with Soap and Towels						
11-15, 50, 54		✓			16. Evidence of Rodent/Insect Contamination/Other Animals/Outer Openings Protected						
13-1-17, 19	✓				17. Toxic Items Properly Used/Stored/Labeled						
7-72, 73, 75, 79, 93, 95; 13-7, 10		✓			18. Manual/Mechanical Warewashing and Sanitizing at <u>OK</u> ppm temperature*						
9-1-5, 12, 13(a), 15, 19, 21, 22, 27; 5-64, 70; 13-9		✓			19. Approved Water Supply/Sewage Disposal Systems/Cross-Connections						
7-1, 12, 14, 15, 63, 82(a)(b), 83 92, 94; 9-29, 41; 11-44	✓				20. Food Contact Surfaces of Equipment and Utensils Cleaned/Sanitized/Good Repair *						
5-20, 81, 89		✓			21. Date Marking; Consumer Advisory (Raw, Undercooked Animal Foods); Shellstock tags						
15-12, 17, 21		✓			22. Valid license to operate, non-renewal of license, and license not transferable						
Co. Health Dept. Phone #	Follow-up Required Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Based on an inspection this day, the items documented above identify the violations in operations or facilities, which must be corrected. Items 1-13 must be corrected immediately, items 14-21 must be corrected within 10 days, and all additional items must be corrected within 90 days or as noted. Failure to comply with any time limits for corrections specified in this notice may result in cessation of your Retail Food Establishment operations.						SEE NEXT PAGE(S)		
825-4224	Date:										

INSPECTION REPORT

Establishment Country Cottage					License No. 6329			Date 8/23/08		
Food	Temp	Process	Location	Time	Food	Temp	Process	Location	Time	
Corn	179°	HH	Oven		Bologna	51°	CH	Red Cooler		
Green Beans	190°	HH			Chicken	180°	Chopping	Tray		
Mac. Cheese	157°	HH			Onion	115°	HH	Grill		
Brown Beans	127°	HH			Meat loaf	37°	CH	WIC		
Roast	34°	CH	WIC		Potatoes	160°	HH	Grill		

Violation Item Number	Based on an inspection this day, the items documented below identify the violations in operations or facilities, which must be corrected. As indicated on the inspection form, the items 1-13 must be corrected immediately. Items 14-21 must be corrected within 10 calendar days. All additional items must be corrected within 90 days or such shorter time as specified by the regulatory authority. Failure to comply with any time limits for corrections specified in this notice may result in cessation of your Retail Food Establishment operation.	Correct By Date/ (Time)
34	Door seals in coolers are dirty	
(2)	Corn muffin mix, bologna, cheese > 50°F in red cooler → Discarded CDI	
34	Venthood + grates are dirty/dusty / Fans have food debris on them	
42	Floor is dirty / Ceiling is dusty	
(3)	Chicken 115°F warmer → discarded	CDI
28	Door not sealed	
25	● Food stored in open containers (original packaging)	
(10)	Fish not covered in wicc	
28	No end caps on lights in meat walk-in	
(12)	Bleach water excess of 200 ppm	
42	Tiles in wash room are busted	
(20)	Tea nozzles are dirty	
All hot hold food on buffet is > 135°F.		
All cold hold food on buffet is < 41°F.		

Comments:
 2 Cap per gallon of water / Establishment is to install a hand sink in salad prep area.

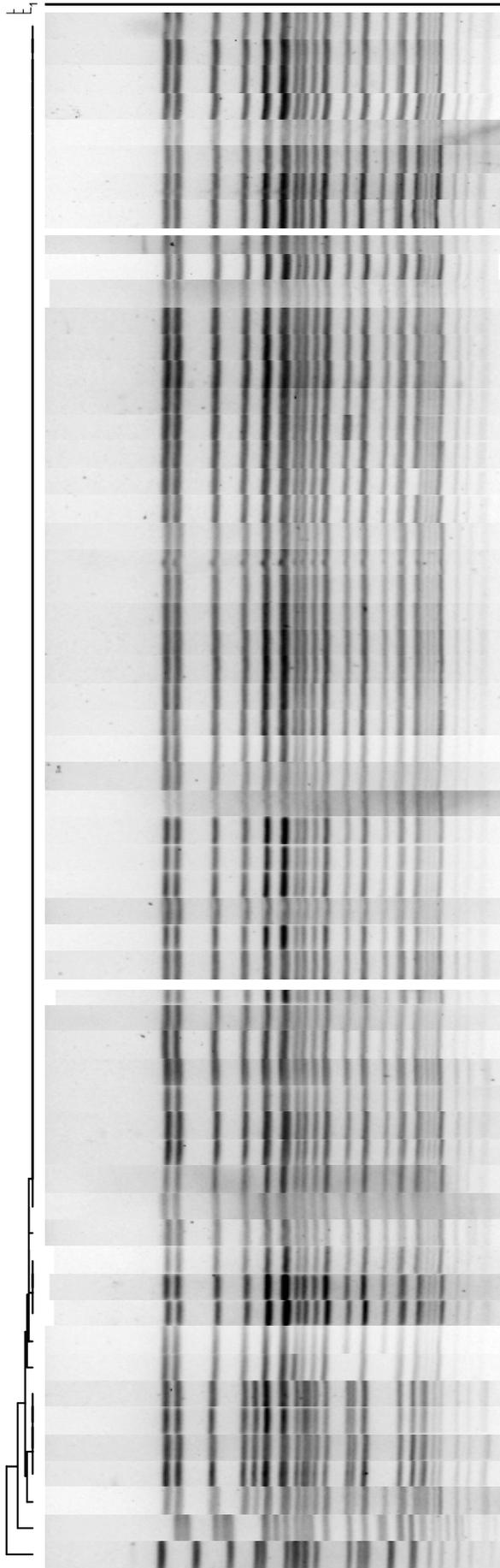
Inspected by: Ben May RPS# 1587 Received by: [Signature] Title _____

APPENDIX H

PFGE PATTERNS



Oklahoma State
Department of Health



LabID	Serotype	OK-Xbal-pattern	SourceCity	SourceCounty	SourceState
08OKE1082A	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1085A	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1092A	E. coli O111:NM	EXDX01.0001OK	Oklahoma City	Oklahoma	OK
08OKE1094A	E. coli O111:NM	EXDX01.0001OK	Oklahoma City	Oklahoma	OK
08OKE1114	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1116	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1117	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1118	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1131	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1132A	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1134A	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1148	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1149	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1168	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1169	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1170	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1171	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1172	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1173	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1174	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1175	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1176	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1177	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1178	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1179	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1219	E. coli O111:NM	EXDX01.0001OK	Claremore	Rogers	OK
08OKE1234	E. coli O111:NM	EXDX01.0001OK	Pryor	Mayes	OK
08OKE1248	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1261	E. coli O111:NM	EXDX01.0001OK	Sand Springs	Tulsa	OK
08OKE1263	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1266	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1267	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1268	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1269	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1290	E. coli O111:NM	EXDX01.0001OK	Oklahoma City	Oklahoma	OK
08OKE1291	E. coli O111:NM	EXDX01.0001OK	Oklahoma City	Oklahoma	OK
08OKE1296	E. coli O111:NM	EXDX01.0001OK	Oklahoma City	Oklahoma	OK
08OKE1303	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1306	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1310	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1314	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1358	E. coli O111:NM	EXDX01.0001OK	Jay	Delaware	OK
08OKE1359	E. coli O111:NM	EXDX01.0001OK	Sand Springs	Tulsa	OK
08OKE1367	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1625	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1079	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1382	E. coli O111:NM	EXDX01.0001OK			OK
08OKE1411	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1412	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1249	E. coli O111:NM	EXDX01.0001OK	Tulsa	Tulsa	OK
08OKE1244	E. coli O111:NM	EXDX01.0004OK	Del City	Oklahoma	OK
08OKE1180	E. coli O111:NM	EXDX01.0002OK	Tulsa	Tulsa	OK
08OKE1265	E. coli O111:NM	EXDX01.0002OK	Tulsa	Tulsa	OK
08OKE1349	E. coli O111:NM	EXDX01.0002OK	Tulsa	Tulsa	OK
08OKE1366	E. coli O111:NM	EXDX01.0002OK	Tulsa	Tulsa	OK
08OKE1115	E. coli O111:NM	EXDX01.0005OK	Tulsa	Tulsa	OK
08OKE1308	E. coli O111:NM	EXDX01.0003OK	Tulsa	Tulsa	OK
08OKE1357	E. coli O111:NM	EXDX01.0006OK	Tulsa	Tulsa	OK