

- NDM-positive *Salmonella* sp. strain identified in the United States. Antimicrob Agents Chemother. 2011;55:5957–8. <http://dx.doi.org/10.1128/AAC.05719-11>
5. Centers for Disease Control and Prevention. Carbapenem-resistant *Enterobacteriaceae* containing New Delhi metallo- β -lactamase in two patients—Rhode Island, March 2012. MMWR Morb Mortal Wkly Rep. 2012;61:446–8.
 6. Centers for Disease Control and Prevention. Notes from the field: hospital outbreak of carbapenem-resistant *Klebsiella pneumoniae* producing New Delhi metallo- β -lactamase—Denver, Colorado, 2012. MMWR Morb Mortal Wkly Rep. 2013;62:108.
 7. Mathers AJ, Hazen KC, Carroll J, Yeh AJ, Cox HL, Bonomo RA, et al. First clinical cases of OXA-48-producing carbapenem-resistant *Klebsiella pneumoniae* in the United States: the “menace” arrives in the new world. J Clin Microbiol. 2013;51:680–3. <http://dx.doi.org/10.1128/JCM.02580-12>
 8. Berçot B, Poiriel L, Nordmann P. Updated multiplex polymerase chain reaction for detection of 16S rRNA methylases: high prevalence among NDM-1 producers. Diagn Microbiol Infect Dis. 2011;71:442–5. <http://dx.doi.org/10.1016/j.diagmicrobio.2011.08.016>
 9. Potron A, Rondinaud E, Poiriel L, Belmonte O, Boyer S, Camiade S, et al. Genetic and biochemical characterisation of OXA-232, a carbapenem-hydrolysing class D β -lactamase from *Enterobacteriaceae*. Int J Antimicrob Agents. 2013;41:325–9. <http://dx.doi.org/10.1016/j.ijantimicag.2012.11.007>
 10. Giske CG, Froding I, Hasan CM, Turlej-Rogacka A, Toleman M, Livermore D, et al. Diverse sequence types of *Klebsiella pneumoniae* contribute to the dissemination of *bla*_{NDM-1} in India, Sweden, and the United Kingdom. Antimicrob Agents Chemother. 2012;56:2735–8. <http://dx.doi.org/10.1128/AAC.06142-11>

Address for correspondence: Yohei Doi, Division of Infectious Diseases, University of Pittsburgh School of Medicine, Scaife Hall S829, 3550 Terrace St, Pittsburgh, PA 15261, USA; email: yod4@pitt.edu

The opinions expressed by authors contributing to this journal do not necessarily reflect the opinions of the Centers for Disease Control and Prevention or the institutions with which the authors are affiliated.

Ground Beef Recall Associated with Non-O157 Shiga Toxin-producing *Escherichia coli*, United States

To the Editor: Shiga toxin-producing *Escherichia coli* (STEC) cause severe illness in humans, especially young and elderly persons. In previous decades, prevention and control measures focused on STEC O157:H7; however, in recent years, non-O157 STEC-related outbreaks and illnesses have been detected more frequently. In the United States, 6 serogroups (O26, O45, O103, O111, O121, and O145) account for $\approx 75\%$ of the reported non-O157 STEC illnesses (1).

On August 4, 2010, the Maine Center for Disease Control and Prevention (Maine CDC) investigated 2 isolates of nonmotile STEC O26 that were indistinguishable by pulsed-field gel electrophoresis (PFGE). Both case-patients had diarrhea and abdominal cramps, shopped at grocery stores in the same town, and reported consumption of ground beef. Case-patient 1 purchased ground beef at Store A; a shopper card used for the purchase was shared with investigators. Case-patient 2 consumed ground beef purchased from 2 stores (Stores B and C); neither shopper cards nor receipts were available.

On August 5, a Maine Department of Agriculture, Food and Rural Resources (Maine DoA) inspector visited Stores A and B. On June 25, case-patient 1 had purchased 90% lean ground beef at Store A; the beef was produced by a parent company with multiple establishments. Inspectors cross-referenced this purchase with meat grinding logs from Store B, which revealed that the parent company that supplied ground beef to Store A also supplied beef to Store B. Maine DoA notified the United States

Department of Agriculture, Food Safety and Inspection Service (USDA-FSIS), of a common manufacturer.

On August 9, the New York State (NYS) Department of Health contacted Maine CDC regarding a third case-patient with an STEC O26 isolate that was indistinguishable by PFGE from the other 2 isolates. Case-patient 3 had handled 90% lean ground beef purchased from the grocery store chain used by case-patient 1 (Store A). Shopper card information indicated that the beef was purchased on June 17. Ground beef was the only common exposure among the 3 case-patients.

During August 18–26, Maine DoA, NYS Department of Agriculture and Markets, and USDA-FSIS conducted a traceback of ground beef (Figure). Traceback revealed that for >10 years, Store A had been purchasing 90% lean ground beef from Establishment X (1 of many establishments within the parent company). Further investigation revealed that implicated ground beef from Store A locations in Maine and New York had come from the same lot at Establishment X. USDA-FSIS conducted ground beef traceback at Stores B and C; source materials were received from multiple establishments, but Establishment X was the only common supplier (Figure). On August 28, Establishment X recalled $\approx 8,500$ pounds of ground beef that had been produced on June 11.

On September 2, the NYS Department of Health Public Health Laboratory tested leftover hamburger patties purchased by case-patient 3. The samples were confirmed as STEC O26 with a PFGE pattern indistinguishable from the strains isolated from case-patients.

On November 17, USDA-FSIS completed an assessment at Establishment X and determined that the company's food safety system was adequate to control pathogens of concern. Follow-up testing of beef trim samples at Establishment X were negative for STEC O26 and O157:H7.

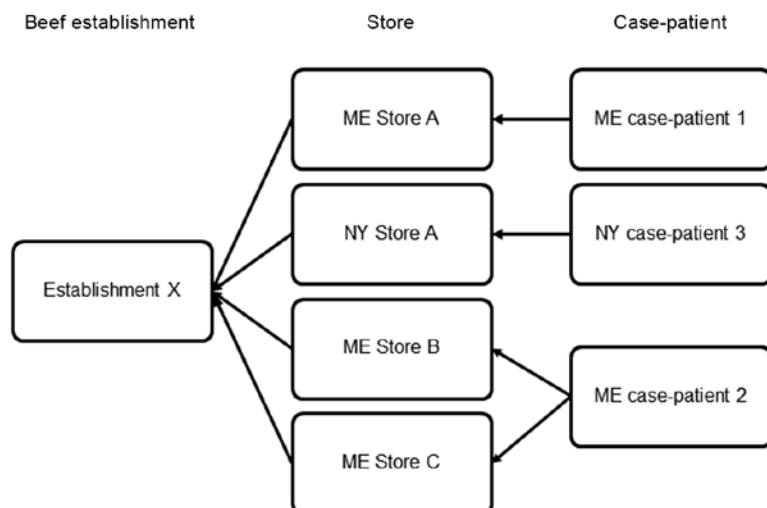


Figure. Supplier traceback for ground beef associated with a cluster of *Escherichia coli* O26 infections in Maine (ME) and New York (NY), 2010.

The Council to Improve Foodborne Outbreak Response guidelines emphasize the importance of timely involvement of all members in outbreak investigations (2). A review of enteric disease investigations by Hedberg et al. (3) concluded a need to increase timeliness of case investigation and to reduce delays during outbreak investigations. While waiting for PFGE confirmation, Maine CDC notified Maine DoA of case-patients who purchased ground beef in the same city. Within 48 hours, an inspector visited grocery stores where case-patients purchased ground beef and notified USDA-FSIS of the illness investigation. Ten days after the shopper card information from case-patient 3 was available, USDA-FSIS convened a recall committee. Quick action by all agencies led to timely investigation, traceback, and recall. This well-characterized outbreak of only 3 cases of STEC O26 infection led to a recall of ground beef.

Foodborne illness investigations increasingly rely on purchase records from shopper cards, which record information such as purchase dates, brands, and product types that are valuable for traceback and identification

of common exposure to a food item. After a thorough record review, investigators in this outbreak were able to narrow the purchased beef to 1 production date. This finding emphasizes the importance of recordkeeping at retail stores and meat processing establishments to determine production dates in the event of a recall. Shopper cards are used more frequently during investigations, so safeguards to protect the consumers' personally identifiable information are needed to prevent inappropriate disclosure and accidental breaches of confidentiality.

In an effort to reduce human illnesses, USDA-FSIS developed policy on non-O157 STEC in raw beef products to declare 6 serogroups of pathogenic STEC as adulterants in nonintact raw beef (4). The Agency began implementing routine testing for these serogroups in June 2012.

Acknowledgments

We thank Heather Grieser and Kristi Rossignol for assistance with testing; Patty Carson for interviewing case-patients; and Erin Sawyer for traceback assistance. We also thank the Philadelphia District Office, United States Department of Agriculture, Food Safety and Inspection Service.

**Amy Robbins, Madhu Anand,
David C. Nicholas,
Jessica S. Egan,
Kimberlee A. Musser,
Steve Giguere, Hal Prince,
Henrietta E. Beaufait,
Stephen D. Sears,
James Borda, Debbie Dietz,
Thomas Collaro, Peter Evans,
Scott A. Seys,
and Bonnie W. Kissler**

Author affiliations: Maine Department of Health and Human Services, Augusta, Maine, USA (A. Robbins, S.D. Sears); New York State Department of Health, Albany, New York, USA (M. Anand, D.C. Nicholas, J.S. Egan, K.A. Musser); Maine Department of Agriculture, Augusta (S. Giguere, H. Prince, H.E. Beaufait); United States Department of Agriculture, Philadelphia, Pennsylvania, USA (J. Borda); United States Department of Agriculture, Pittsburgh, Pennsylvania, USA (D. Dietz); United States Department of Agriculture, Waltham, Massachusetts, USA (T. Collaro); United States Department of Agriculture, Washington, DC, USA (P. Evans); United States Department of Agriculture, Minneapolis, Minnesota, USA (S.A. Seys); and United States Department of Agriculture, Atlanta, Georgia, USA (B.W. Kissler)

DOI: <http://dx.doi.org/10.3201/eid2001.130915>

References

1. United States Department of Agriculture. The Public Health Significance of non-O157 Shiga Toxin-Producing *Escherichia coli* Public Meeting, 2007 [cited 2011 May 5]. http://www.fsis.usda.gov/wps/wcm/connect/f7c45ebe-75d6-465a-9f44-2278004309d2/Non-STECS_Transcripts.pdf?MOD=AJPERES.
2. Council to Improve Food. Guidelines for foodborne disease outbreak response. 2009 [cited 2011 May 5]. <http://cifor.us/documents/CIFORGuidelinesforFoodborneDiseaseOutbreakResponse.pdf>
3. Hedberg CW, Breenblatt J, Matyas BT, Lemmings J, Sharp DJ, Skibicki RT, et al. Timeliness of enteric disease surveillance in 6 US States. *Emerg Infect Dis*. 2008;14:311–3. <http://dx.doi.org/10.3201/eid1402.070666>
4. United States Department of Agriculture. Shiga toxin-producing *Escherichia coli* in certain raw beef products. *Federal Register*.

Vol. 76, no. 182. 2011:58157–65 [cited 2011 May 5]. <http://www.gpo.gov/fdsys/pkg/FR-2011-09-20/html/2011-24043.htm>

Address for correspondence: Amy Robbins, Maine Center for Disease Control and Prevention, 286 Water St, 8th Floor, 11 State House Station, Augusta, ME 04333, USA; email: Amy.robbs@maine.gov

Salmonellosis and Meat Purchased at Live-Bird and Animal-Slaughter Markets, United States, 2007–2012

To the Editor: *Salmonella* spp. cause ≈1.2 million human illnesses annually in the United States (1). Infections are primarily acquired through exposure to contaminated food or infected animals (1,2). Since 2007, state and local health departments and the Centers for Disease Control and Prevention have investigated multiple salmonellosis outbreaks linked to meat purchased at live-bird markets (LBMs) and live-animal markets (LAMs), where poultry and livestock are sold for onsite slaughter. These markets typically operate in large cit-

ies and serve populations of diverse ethnic backgrounds (3).

In 2007, an outbreak involving 62 case-patients infected with 1 of 3 *S. enterica* serotype Schwarzengrund strains was investigated in Massachusetts; 61% were children <5 years of age, including 14 (23%) infants <1 year of age, and 96% were Asian (Table). A case-patient was defined as a person infected with *S. enterica* who had a pulsed-field gel electrophoresis *Xba*I restriction enzyme pattern indistinguishable from the outbreak strain. Exposure to poultry purchased at LBMs was reported, and environmental sampling at an implicated LBM identified 6 *S. enterica* serotypes, including 1 outbreak strain.

Three subsequent investigations of *S. enterica* serotype Schwarzengrund infections were conducted: a 2009 outbreak of 50 cases in New York, New York; a 2010–2011 multistate outbreak of cases predominantly in New York, New Jersey, and Massachusetts; and a 2012 multistate outbreak of cases mostly in Illinois and Michigan. Most case-patients in these outbreaks were of Asian race or Hispanic ethnicity, but 3/5 case-patients in Michigan reported Arab ethnicity; >50% were infants or children <5 years of age.

Among case-patients with available information, exposure to poultry from LBMs was reported by 88% of

case-patients in the 2009 New York investigation, 35% in the 2010–2011 multistate investigation, and 50% in the 2012 multistate investigation. In Michigan, the outbreak strain was isolated from chicken purchased at an LBM and collected from households of 2 case-patients.

During 2011–2012, the Centers for Disease Control and Prevention investigated a nationwide increase in *S. enterica* serotype I,4,[5],12:i- infections (pulsed-field gel electrophoresis *Xba*I restriction enzyme pattern JPXX01.1314). Although no single vehicle was implicated, clusters linked to LAMs were identified. In Minnesota, 14 illnesses were linked to meat from 3 neighboring LAMs. Environmental sampling identified the outbreak strain from an animal-holding pen at 1 of the markets. Seven case-patients were infants <1 year of age, and 10 reported Hmong ethnicity. In California, 10 illnesses likely associated with pork, lamb, and beef purchased at 3 LAMs were identified; case-patients reported Ethiopian and Hmong ethnicity. The outbreak strain was isolated from a pork leg collected from the freezer of a case-patient.

LBMs and LAMs appear to be preferred by certain populations for cultural, culinary, or religious reasons. Exposure to meat from these markets is being increasingly recognized as a potential source of salmonellosis. The

Table. Characteristics of outbreaks of human *Salmonella enterica* serotype Schwarzengrund infections linked to meat purchased at live-bird markets, United States, 2007–2012*

Year	Location	Outbreak strain†	No. cases	No. yes/total no. (%)‡				Exposure to meat purchased at live-bird markets
				Children <5 y of age§	Infants <1 y of age	Asian race	Hispanic ethnicity	
2007	Massachusetts	JM6X01.0240, JM6X01.0225, JM6X01.0118	62	38/62 (61)	14/62 (23)	53/54 (98)	NA	8/10 (80)
2009	New York, NY	JM6X01.0240	50	37/50 (74)	15/50 (30)	7/20 (35)	9/17 (53)	14/16 (88)
2010–2011	Multistate¶	JM6X01.0240	233	105/209 (50)	19/209 (9)	26/72 (36)	29/72 (40)	28/80 (35)
2012	Multistate#	JM6X01.0323	15	8/15 (53)	3/15 (20)	1/12 (8)	5/12 (42)	6/12 (50)

*NA, not available.

†Defined by pulsed-field gel electrophoresis *Xba*I restriction enzyme pattern.

‡Denominators are dependent on number of case-patients interviewed and may vary from case counts.

§Includes infants <1 y of age.

¶Case distribution includes New York (91, 39%), New Jersey (52, 22%), and Massachusetts (44, 19%).

#Case distribution includes Illinois (8, 53%) and Michigan (5, 33%).