

Notes from the Field

Outbreak of Multidrug-Resistant *Salmonella* Infections Linked to Pork — Washington, 2015

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During June–July 2015, Public Health–Seattle & King County (PHSKC) and Washington State Department of Health (WADOH) investigated 22 clusters of *Salmonella* serotype I 4,[5], 12:i:- infections. Serotype I 4,[5], 12:i:- is the fifth most frequently reported *Salmonella* serotype in the United States, but is uncommon in Washington.* On July 29, 2015, WADOH and PHSKC requested assistance from CDC to identify the infection source, determine risk factors, and make recommendations for prevention.

A confirmed case was initially defined as a gastrointestinal illness with onset during April 25–September 25, 2015, with documentation of a *Salmonella* serotype I 4,[5], 12:i:- isolate from one of five closely related pulsed-field gel electrophoresis (PFGE) *XbaI* patterns (JPXX01.1314, JPXX01.2311, JPXX01.2429, JPXX01.3161, or JPXX01.3336) in a Washington resident, or with an isolate matching one of the outbreak PFGE patterns with highly related whole genome sequencing, in a non-Washington resident. Later in the investigation, an additional PFGE *XbaI* pattern (JFXX01.0046) was added to the case definition.

A total of 192 confirmed cases were reported from five states; 184 (96%) occurred in Washington (Figure). Patients ranged in age from <1 to 90 years (median = 35 years), and 97 (51%) were female. Among 180 patients for whom information about hospitalization was available, 30 (17%) were hospitalized; no deaths were reported.

On the basis of cases investigated before August 2015, a supplemental questionnaire that went into more detail in addressing meat and livestock exposures was developed. Among 80 patients (42% of all confirmed cases) who were interviewed, 59 (74%) reported eating pork during the 7 days preceding illness. This was significantly higher than the most recently published (2007) Foodborne Diseases Active Surveillance Network (FoodNet) population survey of healthy persons, in which 43% reported eating pork in the week before they were interviewed ($p < 0.001$) (1).

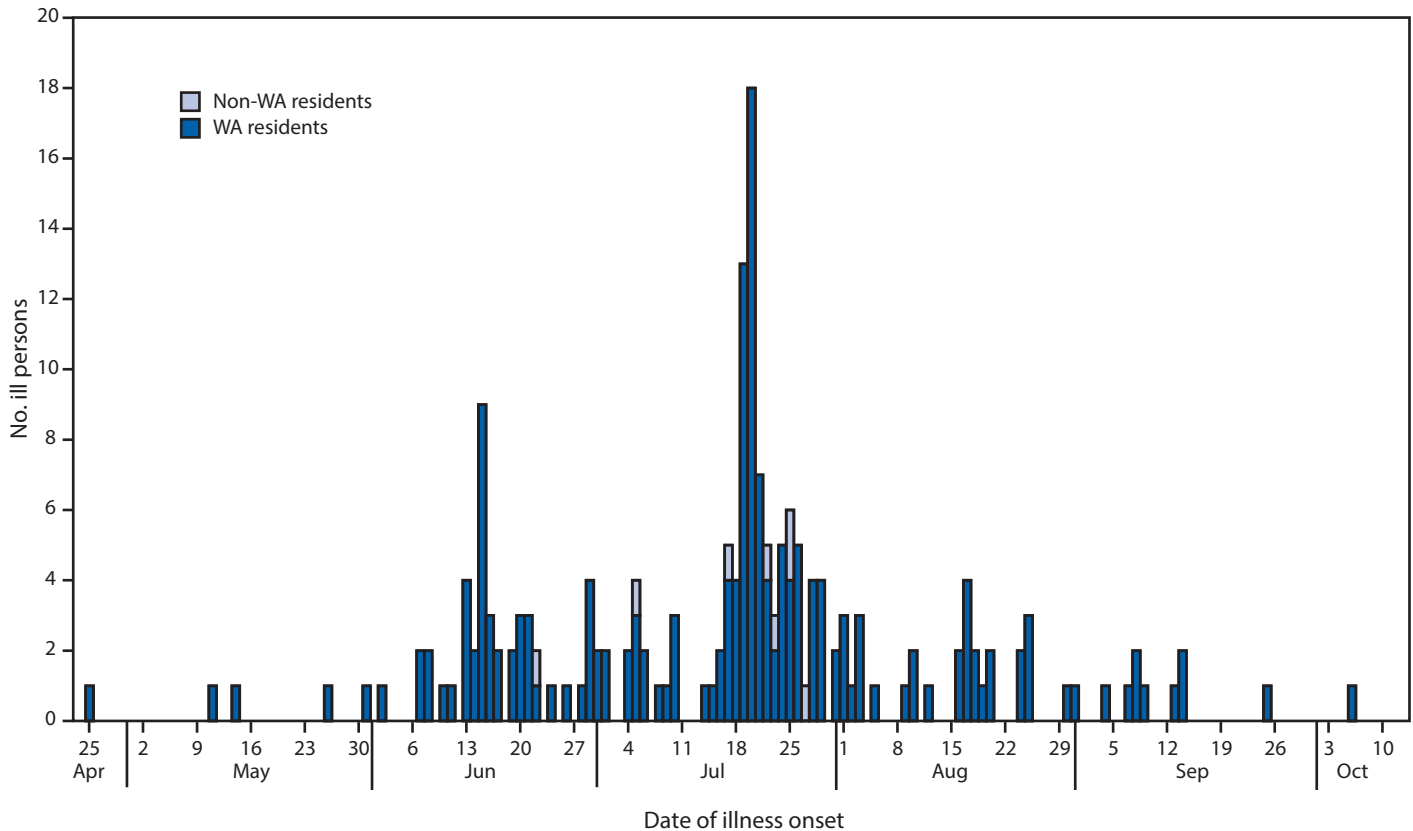
WADOH and PHSKC investigation into the source of pork traced the pork consumed by 35 (59%) of the 59 interviewed patients who reported eating pork back to a U.S. Department of Agriculture's Food Safety and Inspection Service–inspected pork slaughter establishment in Graham, Washington. During the outbreak period, the establishment distributed whole hogs and pork parts, primarily from five farms in Montana and one in Washington, to Washington, Oregon, and Alaska. Among the 21 interviewed patients who did not report consuming pork before becoming ill, 13 had eaten at one of two restaurants or had shopped at one market where pork from the establishment was served. During June and July 2015, PHSKC inspections of these three facilities identified potential opportunities for cross-contamination of raw pork with other meat and produce, including inadequate employee handwashing and insufficient cleaning and sanitization of food contact surfaces and utensils used for raw meat. Food and environmental sampling by PHSKC at all three facilities yielded the outbreak strains.

Eight of 11 pooled environmental samples collected on July 31, 2015, from the slaughter establishment by WADOH yielded one of the outbreak strains. A parallel Food Safety and Inspection Service investigation of the establishment, conducted during August 10–14, cited insanitary conditions, supported by isolation of outbreak strains from samples taken before the start of daily operations, consistent with WADOH results. Additionally, the Food Safety and Inspection Service isolated *Salmonella* *Infantis* (*XbaI* pattern JFXX01.0046) from the establishment, which was subsequently added to the case definition. Four patients (2% of all confirmed cases) were identified using the updated case definition. On August 13, 2015, the establishment recalled an estimated 116,262 pounds of whole hogs produced during April 18–July 27, and on August 27, expanded the recall to include approximately 523,380 pounds of pork products produced during April 18–August 26 because of potential contamination with *Salmonella* I 4,[5], 12:i:- (2). On August 27, the slaughter establishment voluntarily ceased operations.

Ten clinical isolates of the outbreak strains from Washington were submitted to CDC's National Antimicrobial Resistance Monitoring System for resistance testing. All 10 exhibited resistance to ampicillin, streptomycin, sulfisoxazole, and tetracycline (ASSuT resistance). In 2009, the National Antimicrobial Resistance Monitoring System reported <1.5% of *Salmonella* I 4,[5], 12:i:- human isolates had the ASSuT resistance pattern; in 2013, this number had increased to 45.5% (3). Regarding future *Salmonella* I 4,[5], 12:i:- outbreaks,

*National Enteric Disease Surveillance: *Salmonella* Annual Report, 2012. <http://www.cdc.gov/nceid/dfwed/pdfs/salmonella-annual-report-2012-508c.pdf>.

FIGURE. Date of illness onset* among 192 persons† infected with the outbreak strains of *Salmonella* I 4,[5], 12:i:- or *S. Infantis*, by state residency status — Washington, 2015



Abbreviation: WA = Washington.

* When unknown, illness onset dates were estimated by the following formula: (isolation date of outbreak strains of *Salmonella* I 4,[5], 12:i:- or *S. Infantis*) – 3 days.

† N = 192 for whom information was reported as of November 24, 2015.

increasing ASSuT resistance is concerning because infections with antimicrobial-resistant *Salmonella* strains are associated with an increased risk for hospitalization, bloodstream infection, and treatment failure (4,5). Further study of the epidemiology and etiology of ASSuT resistance and *Salmonella* I 4,[5], 12:i:- is recommended.

This was the largest *Salmonella* outbreak in Washington in recent history, and highlights that pork is an important source for human *Salmonella* infections (6). Best practices in all parts of the pork production industry, from farm to processing plant, can help reduce the risk for future outbreaks (7). In addition, prevention strategies that include rigorous *Salmonella* control in pork slaughter establishments in conjunction with food handling education at the wholesaler and restaurant level should be strengthened.

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