MMWR
Morbidity and Mortality Weekly Report
www.cdc.gov/mmwr

Early Release
Vol. 58 / May 7, 2009

Outbreak of *Salmonella* Serotype Saintpaul Infections Associated with Eating Alfalfa Sprouts — United States, 2009

On February 24, 2009, the Nebraska Department of Health and Human Services identified six isolates of *Salmonella* serotype Saintpaul with collection dates from February 7–14. *Salmonella* Saintpaul is not a commonly detected serotype; during 2008, only three *Salmonella* Saintpaul isolates were identified in Nebraska. This report summarizes the preliminary results of the investigation of this outbreak, which has identified 228 cases in 13 states and implicated the source as alfalfa sprouts produced at multiple facilities using seeds that likely originated from a common grower. On April 26, the Food and Drug Administration (FDA) and CDC recommended that consumers not eat raw alfalfa sprouts, including sprout blends containing alfalfa sprouts, until further notice. On May 1, FDA alerted sprout growers and retailers that a seed supplier was withdrawing voluntarily from the market all lots of alfalfa seeds with a specific three-digit prefix.

Initial Outbreak Investigation

For this investigation, a case was defined as illness in a person whose stool culture on or after February 1, 2009, yielded *Salmonella* Saintpaul with the outbreak strain pulsed-field gel electrophoresis (PFGE) patterns (*Xba*I JN6X01.0072, JN6X01.0252, JN6X01.0340, JN6X01.0709, JN6X01.0712, JN6X01.0718, or JN6X01.0719). During January 1, 2008 to January 31, 2009, only four cases of the outbreak strain of *Salmonella* Saintpaul were identified by PulseNet.*

After a nationwide notice was sent February 26 to state public health officials about a cluster of cases of *Salmonella* Saintpaul infection among Nebraska residents; additional cases were reported from Iowa, Kansas, Minnesota, Missouri, and South Dakota. Interviews showed that five of 14 Nebraska patients patronized a common restaurant chain (chain A) and that nine had recently eaten alfalfa sprouts. Among the first seven Iowa case-patients interviewed, one had eaten at restaurant chain A, and six had eaten alfalfa sprouts. Alfalfa sprouts was the most common food item reported.

To determine if a particular food item or restaurant was associated with this outbreak, health officials in Nebraska and Iowa conducted a case-control study. They attempted to identify two controls for each case; a well spouse or partner of the case-patient, and a well friend or colleague of the same sex and similar age as the case-patient. Food consumption histories, including restaurants patronized, were collected from case-patients for the 10 days before symptoms began and from controls for the matching period.

Thirty-two confirmed cases and 32 controls were enrolled. Case-patients were significantly more likely to have eaten alfalfa sprouts than matched controls (27/32 versus 5/32, crude odds ratio [OR] = 29.2, 95% confidence interval [CI] = 7.6–112.4). No other food item was significantly associated with illness. Case-patients were significantly more likely to have eaten at restaurant chain A than were controls (24/32 versus 10/32, OR = 6.6, CI = 1.96–22.93), but this association was not statistically significant after adjustment for exposure to alfalfa sprouts.

By March 19, a total of 186 cases had been identified in Illinois, Iowa, Kansas, Minnesota, Nebraska, and South Dakota. Of the 156 patients with completed interviews, 114 (73%) reported alfalfa sprout consumption.

Linking Cases to a Single Seed Grower

Tracebacks from the initial outbreak investigation indicated that although the sprouts had been distributed by various companies, all originated at the same sprouting facility in Omaha, Nebraska (facility A). Of the 114 patients with reported alfalfa sprout exposure, 112 (98%) could be linked to a restaurant or a retail outlet that had received alfalfa sprouts from facility A. On March 3, 2009, facility A agreed to conduct a voluntary recall.

Facility A produces several types of sprouts, including alfalfa, clover, radish, broccoli, and onion, and distributes those to locations within a 250-mile radius. Facility A reported that it produced sprouts following FDA guidance for reducing microbial food safety hazards for sprouted seeds (*1*). This

*The national molecular subtyping network for foodborne disease surveillance.

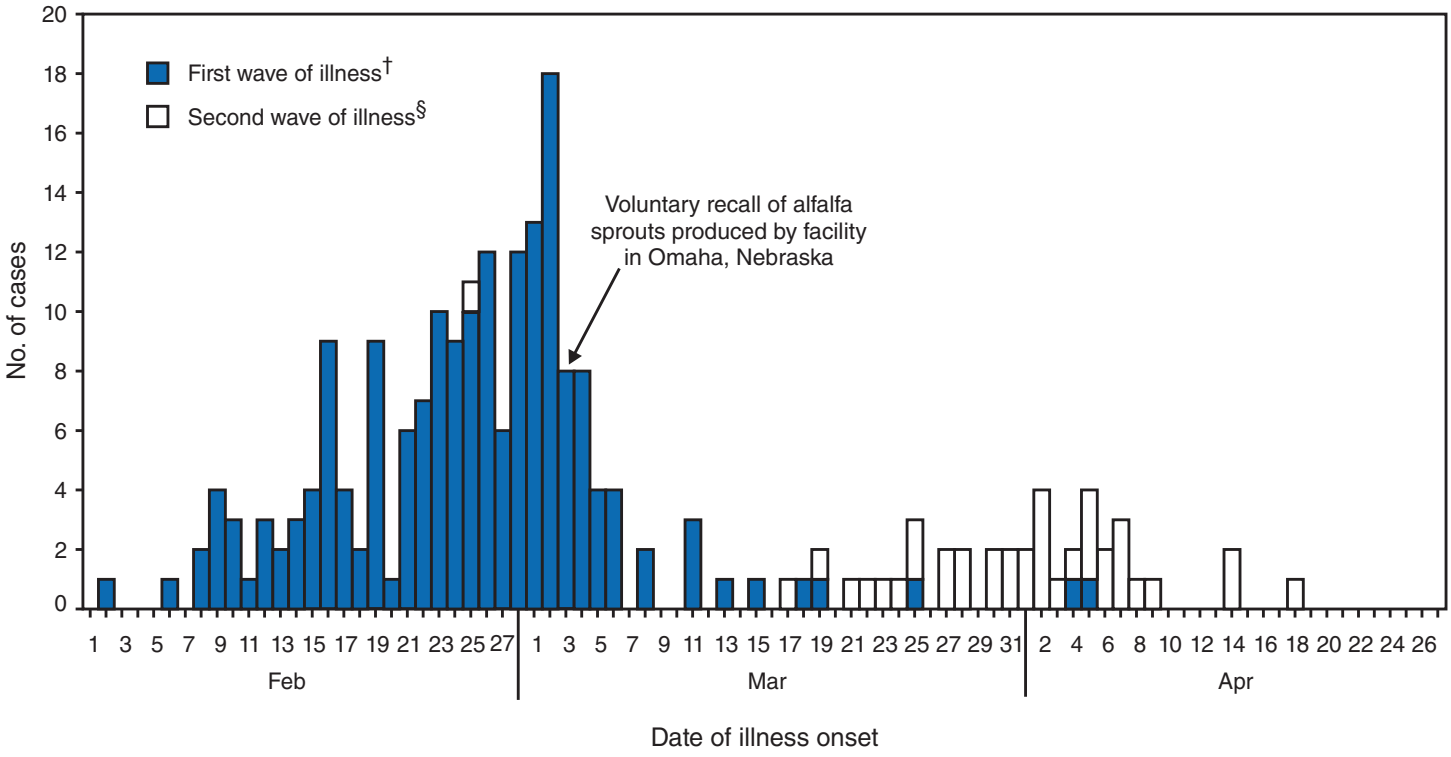
included soaking alfalfa seeds for 15 minutes in a 20,000 ppm chlorine solution derived from calcium hypochlorite. The seeds were then rinsed and placed in germination containers; after 48 hours, seed irrigation water was cultured for *Salmonella* and *Escherichia coli* O157. The facility reported that it had no positive test results during January–February 2009.

An evaluation of records correlated the outbreak with the distribution of sprouts from a seed shipment that arrived at the facility on January 13, and last sprouted on February 13. Multiple seed lots, purchased only from seed company B, were used for producing alfalfa sprouts during the period of the outbreak; all seed lots were identified with the prefix 032, indicating that they originated from the same seed grower (grower C). A sample of facility A alfalfa sprouts collected from a Nebraska restaurant on February 28, 2009, grew *Salmonella* serotype Typhimurium. A sample of alfalfa seeds collected at facility A on March 3 and identified with the lot prefix 032 grew *Salmonella* serotype Give.

In mid-April, 42 additional case-patients with onset of illness beginning after March 15 were identified from Florida, Iowa, North Carolina, Michigan, Minnesota, Nebraska, Ohio, Pennsylvania, Utah, and West Virginia (Figure 1). At least 20 of these case-patients reported recently eating sprouts. Alfalfa sprouts eaten by these case-patients were traced back to growing facilities in Michigan, Minnesota, and Pennsylvania that received seed lots identified with prefix 032 from seed company B. Alfalfa sprout irrigation water collected on March 10 from a growing facility in Wisconsin grew *Salmonella* Saintpaul indistinguishable from the outbreak strain. These sprouts also were grown from a seed lot identified with prefix 032 received from seed company B. No human illnesses have been linked to the Wisconsin facility. Preliminary findings indicate that the implicated seed lots were sold in many states and might account for a large proportion of the alfalfa seeds that were being used by sprout growers during this outbreak.

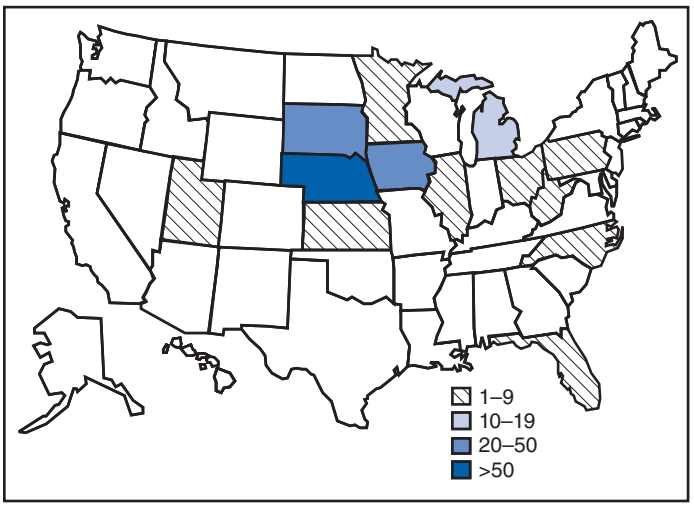
Since February 1, a total of 228 cases have been reported from 13 states: Nebraska (110 cases), Iowa (35), South Dakota (35), Michigan (18), Kansas (eight), Pennsylvania (seven), Minnesota (five), Ohio (three), Illinois (two), West Virginia (two), Florida (one), North Carolina (one), and Utah (one) (Figure 2). Patients range in age from <1 year to 85 years (median: 29 years); 69% are female. Among patients with available information, 4% reported being hospitalized. No deaths have been reported.

FIGURE 1. Number of infections (N = 226*) with the outbreak strain of *Salmonella* Saintpaul associated with eating alfalfa sprouts, by date of illness onset — United States, February–April 2009



* Onset dates were unavailable for two patients among a total of 228 cases.
† Infections first and primarily occurred in Illinois, Iowa, Kansas, Nebraska, and South Dakota.
§ Additional infections occurred in Florida, Michigan, Minnesota, North Carolina, Ohio, Pennsylvania, North Carolina, Utah, and West Virginia, primarily after March 15.

FIGURE 2. Number of infections (N = 228*) with the outbreak strain of *Salmonella* Saintpaul, associated with eating alfalfa sprouts, by state — United States, February–April 2009



* As of May 1, 2009.

On April 26, FDA and CDC recommended that consumers not eat raw alfalfa sprouts, including sprout blends containing alfalfa sprouts, until further notice (*2*). On May 1, FDA notified sprout growers and retailers that seed company B was withdrawing voluntarily from the market all alfalfa seeds bearing six-digit lot numbers that start with 032 (*3*).

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Editorial Note: Raw and lightly cooked sprouts have been recognized as a source of foodborne illness in the United States since 1995 (*4,5*). In 1999, FDA released guidance to help seed producers and sprout growers enhance the safety of their products (*1,4*). Specific measures recommended in the guidelines include seed disinfection and microbiologic tests of water used to grow sprouts (*1,6*).

Although the methods recommended by FDA appear to reduce the risk of sprout-related human illness (*7*), CDC's electronic Foodborne Outbreak Surveillance System has reports of 13 *Salmonella* and three *E. coli* O157 outbreaks linked to sprouts from 2000 through 2007. Process failures, including inadequate disinfection, sampling, and testing procedures, and incorrect interpretation of test results, have been identified in some of these investigations.

The outbreak described in this report is linked to consumption of alfalfa sprouts produced at several sprout growers and appears to involve only seeds sold by seed company B that originated from grower C. This strongly suggests that the seeds were contaminated. The degree to which the various sprout growers involved have appropriately and consistently implemented FDA recommendations or other protective methods is under investigation. These outbreaks might indicate a need to determine how well this important but voluntary guidance is being implemented. Additional studies of measures to prevent, detect, and eliminate contamination of seeds and sprouts also are needed.

Alfalfa seeds might become contaminated in several ways, although the exact method is unknown. Possible methods include preharvest contamination from use of contaminated water, the use of improperly composted manure as fertilizer, fecal contamination from domestic or wild animals, runoff from animal production facilities, and improperly cleaned harvesting or processing equipment. Seeds also might become contaminated during conditioning, distribution, or improper storage. Many alfalfa seeds are produced for agricultural use, and might not be processed, handled, and stored under conditions appropriate for human food. Conditions suitable for sprouting also are ideal for markedly increasing counts of bacteria that might be present on seeds (*8*). Unsanitary conditions during processing, storage, distribution, handling, or preparation of sprouts could exacerbate the problem.

Since 1999, CDC and FDA have recommended that persons at high risk for complications of infection with *Salmonella* and *E. coli* O157, such as the elderly, young children, and those with compromised immune systems not eat raw sprouts. While investigations into the current outbreak continue, and until more specific recommendations or control measures can be implemented, FDA and CDC recommend not eating raw alfalfa sprouts, including sprout blends containing alfalfa sprouts. FDA recommends that any sprouts that are eaten should be cooked thoroughly (*9*).

Acknowledgments

The findings in this report are based on contributions by public health professionals who interviewed and collected data on the case-patients, and the collaborative efforts of 13 state health departments, multiple local health departments, several state departments of agriculture and food regulatory services, FDA, and consultants from the Enteric Diseases Epidemiology Branch, CDC.

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