

Investigation of Kansas Cases in a Multistate
Outbreak of *Salmonella* Muenchen Infections
Associated with Alfalfa Sprouts — Kansas, 2016



Background

On January 19, 2016, at 3:08 p.m., the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified by the Centers for Disease Control and Prevention (CDC) that three Kansas residents with cases of salmonellosis were part of a multistate cluster of *Salmonella* Muenchen infections. The pulsed-field gel electrophoresis (PFGE) pattern of the three Kansas residents' *Salmonella* isolates was indistinguishable from eight isolates in three other states, suggesting a common source of infection.

KDHE began an outbreak investigation immediately after CDC's notification. On January 26, KDHE food histories and other exposure information collected via telephone interviews with the case-patients conducted by the Sedgwick County Health Department (2 case-patients) and the McPherson County Health Department (1 case-patient) was shared with CDC. After reviewing information provided by all of the affected states, CDC developed a supplemental questionnaire to focus on four possible causes of the outbreak: sprouts, seeds, nuts, and powdered nutritional supplements, and distributed the questionnaire to states on February 8.

As the investigation progressed, KDHE identified two additional case-patients among residents of Shawnee County.

Methods

Epidemiologic Investigation

CDC led the investigation of this multistate outbreak with support from state and local public health departments. An outbreak case was defined as laboratory evidence of *Salmonella* Muenchen with a pulsed-field gel electrophoresis (PFGE) pattern indistinguishable from the outbreak strain of *Salmonella* Muenchen (PFGE pattern J6X01.0134). CDC requested that all case-patients involved in this outbreak be interviewed with a supplemental questionnaire. KDHE interviewed case-patients associated with this salmonellosis outbreak with the supplemental questionnaire in addition to the hypothesis-generating questionnaire utilized for all Kansas salmonellosis case investigations.

Clinical Laboratory Analysis

Stool specimens collected from Kansas residents were cultured at the Kansas Health and Environmental Laboratories (KHEL). *Salmonella* isolates were then serotyped and PFGE was performed. Four *Salmonella* Muenchen isolates were submitted to the CDC laboratory for

Whole Genome Sequencing (WGS), to further assess the association among case-patients linked to the multistate outbreak.

Results

Epidemiologic Investigation

Five case-patients were identified among Kansas residents of three counties: McPherson, Sedgwick, and Shawnee. All were female. Case-patients ranged in age from 30 to 73 years, with a median age of 66 years. Illness onset dates were available for four case-patients; two reported onset on 12/9/2015 and two reported onset on 1/21/2016. Three case-patients were hospitalized.

Upon interview with the CDC's outbreak-specific supplemental questionnaire, all reported eating alfalfa sprouts within the seven days prior to their illness onset. Each reported eating the alfalfa sprouts at a different Kansas restaurant.

Clinical Laboratory Analysis

The five Kansas case-patient isolates and the other state case-patient isolates were indistinguishable by PFGE (PFGE pattern J6X01.0134), and WGS sequencing of four Kansas isolates and multiple isolates from other states determined that their genetic sequences were highly related.

Traceback, Environmental Laboratory Analysis, and Environmental Assessment

Traceback Investigation

When the multistate outbreak focused on alfalfa sprouts as the likely source of illness, a traceback investigation was conducted by the Kansas Department of Agriculture (KDA) and the U.S. Food and Drug Administration (FDA). Using the exposure histories provided by the case-patients, KDA and FDA determined whether food items served or sold at restaurants or grocery stores were produced at a common location.

KDA visited the five restaurants where the Kansas case-patients reported exposure, as well as one additional Kansas restaurant where a Missouri case-patient reported exposure. Each restaurant's alfalfa sprouts were produced by Sweetwater Farms LLC, located at 158 Chisholm Rd, Inman, Kansas.

Information obtained by investigators in Oklahoma and Missouri indicated that case-patients in those states also consumed alfalfa sprouts from Sweetwater Farms.

Environmental Assessment

A joint inspection by KDA and FDA was conducted at the identified sprout producer, Sweetwater Farms LLC, beginning on February 10. No objectionable conditions were noted at the facility.

Environmental Laboratory Analysis

FDA collected samples of alfalfa seed, retail packages of alfalfa sprouts, and irrigation water from Sweetwater Farms on 2/10/16 and conducted testing at an FDA laboratory. Sprout and water samples tested positive for *Salmonella* Kentucky and *Salmonella* Cubana. *Salmonella* Muenchen was not isolated. *Salmonella* was not detected in the samples of alfalfa seeds.¹

KDA collected samples of sprouts, seeds, and water from Sweetwater Farms on February 25. In addition, KDA collected sprout samples from the six restaurants where case-patients reported exposure. Testing for *Salmonella* was conducted by the KDA Laboratory. No *Salmonella* was detected.

Discussion

Epidemiologic Investigation and Traceback Investigation

Following the detection of *Salmonella* from samples collected at Sweetwater Farms, KDHE issued a press release recommending that people not consume any sprout product from Sweetwater Farms.² Sweetwater Farms voluntarily recalled sprouts from the implicated lot.

While no additional cases were reported in Kansas after Sweetwater Farms' recall, the multistate outbreak investigation continued. One case-patient's *Salmonella* Kentucky isolate matched the PFGE pattern from the environmental sample, and was added to the outbreak case count. Additional *Salmonella* Muenchen outbreak cases were reported, and traceback investigations revealed that alfalfa sprouts consumed by the new outbreak cases were produced by sprouters that used the same lot of alfalfa seeds as Sweetwater Farms. Testing of this lot of alfalfa seeds at the FDA laboratory detected *Salmonella* Cubana that matched the *Salmonella* Cubana isolated in irrigation water from Sweetwater Farms. Whole Genome Sequencing (WGS) performed by the CDC laboratory determined that outbreak-associated

isolates of *Salmonella* Muenchen were closely related to each other, as were isolates within the other serotype groups (Kentucky and Cubana).

Suspecting the seed lot was contaminated, the FDA worked with the seed supplier and sprouters to remove the seeds and affected sprouts from the market.³

On May 13, approximately one month following the final case-patient's illness onset date, CDC announced that the outbreak appeared to be over. Nationally, 26 cases of salmonellosis (25 *Salmonella* Muenchen and one *Salmonella* Kentucky) in 12 states were identified as part of this outbreak (Figure 1). Illness onset dates ranged from November 26, 2015 to April 7, 2016 (Figure 2). Eight (31%) hospitalizations occurred and no deaths were reported. Ill people ranged in age from 12 years to 73, with a median age of 38. Seventy-six percent were female.⁴

Figure 1. People infected with the outbreak strains of *Salmonella* Muenchen or *Salmonella* Kentucky, by state of residence, as of May 9, 2016 (n=26)

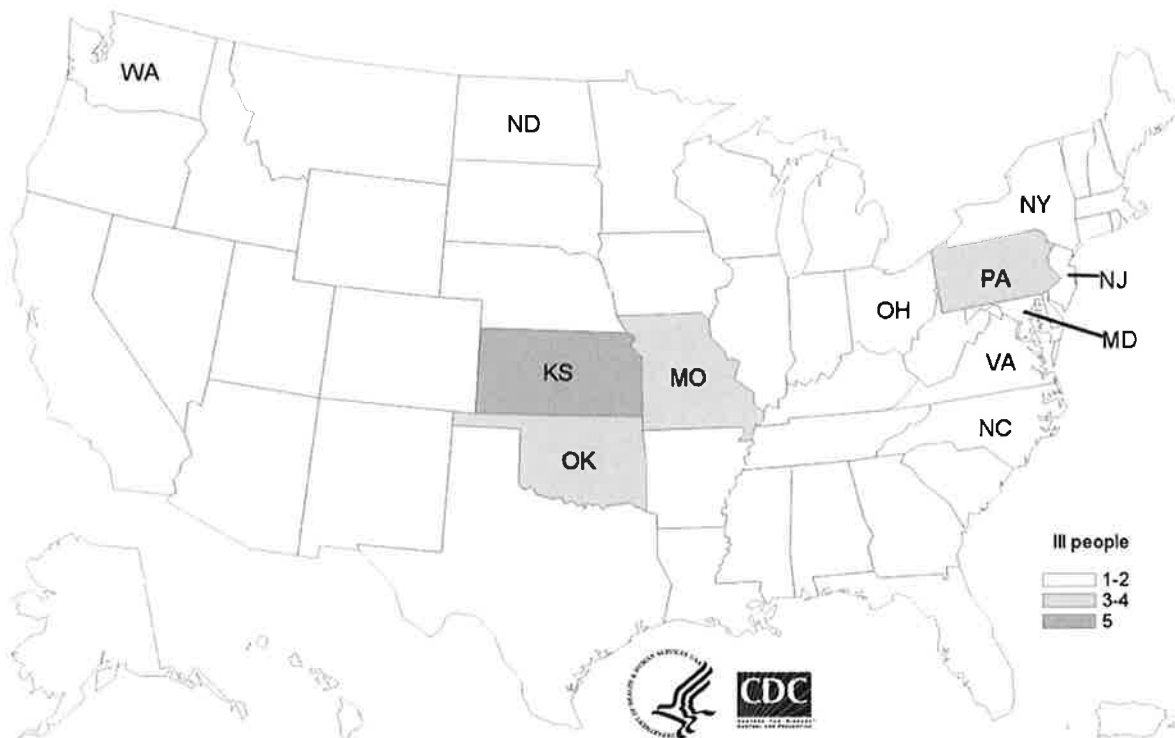
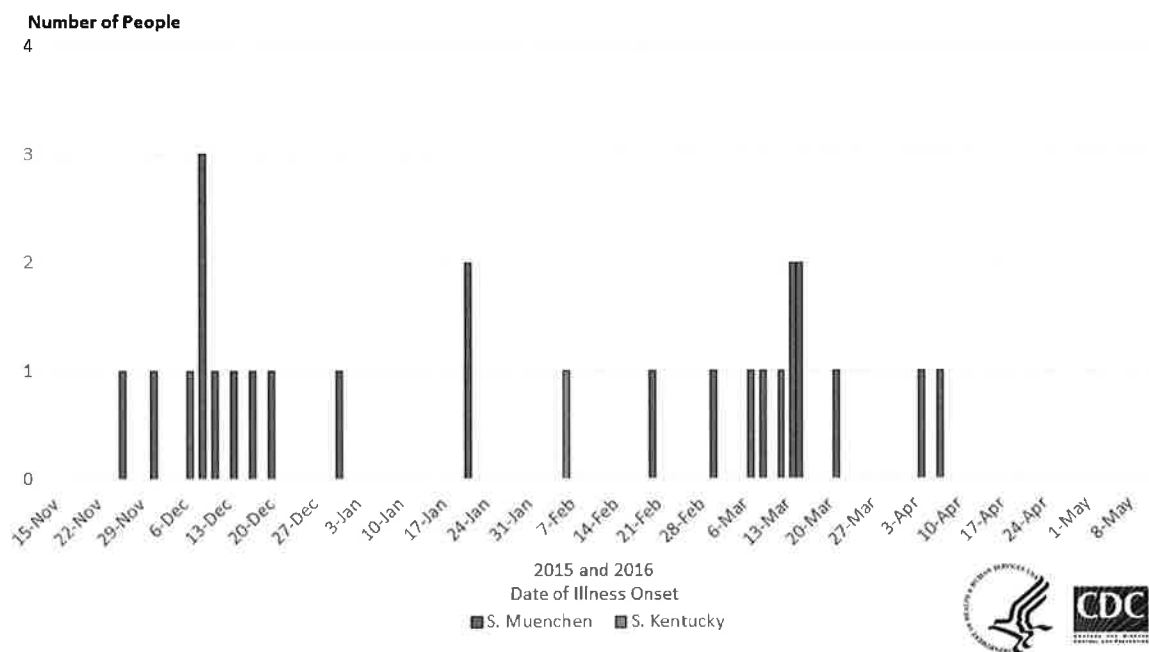


Figure 2. People infected with the outbreak strains of *Salmonella* Muenchen or *Salmonella* Kentucky, by date of illness onset*



*n=26 for whom information was reported as of May 9, 2016. Some illness onset dates have been estimated from other reported information.

Alfalfa Sprouts and Food Safety

Alfalfa sprouts, sprouted from the seeds of alfalfa plants (*Medicago sativa*), are one of the most common types of sprouts eaten in the United States. Alfalfa plants are used as feed for cattle; seeds that are used for sprouting not typically prepared or distributed differently than those used for planting.⁵

The sprouting process requires warm, humid conditions, which can promote the growth of harmful bacteria such as *Salmonella*. Edible sprouts (including alfalfa, broccoli, mung bean, and radish sprouts) have been associated with 30 reported foodborne outbreaks in the U.S. since 1996; approximately 1,800 illnesses, mostly *Salmonella* and Shiga toxin-producing *E. coli*, have resulted from these outbreaks.⁶ Washing sprouts may reduce the risk of foodborne illness, but will not eliminate it. As a result, the FDA recommends that everyone should cook sprouts prior to eating to reduce the risk of foodborne illness, and that those at high risk for complications from foodborne illness (such as children, the elderly, pregnant women, and those with compromised immune systems) do not consume raw sprouts.⁷

Sprouts produced by Sweetwater Farms, LLC, were contaminated with *Salmonella* despite the fact that no objectionable conditions were noted during the KDA/FDA inspection, illustrating the need for enhanced production techniques to reduce the risk of foodborne illness from sprouts. New FDA standards will go into effect soon for sprouters:

*FDA has provided the sprouters with information on reducing microbial food safety hazards for sprouted seeds and complying with new standards for growing, harvesting, packing, and holding of produce for human consumption under the Produce Safety Rule, which begins to go into effect for sprouters in January 2017 with additional time for small and very small operations. In particular, covered sprouters will now be required to comply with sprout-specific requirements such as treating seeds to reduce the presence of microorganisms of public health significance, testing the growing environment for *Listeria* as well as testing each production batch of spent sprout irrigation water or sprouts for *E. coli* O157:H7, *Salmonella* species and, under certain conditions, other pathogens. In addition, sprouters would be expected to comply with all other applicable requirements of the Produce Safety Rule, such as requirements related to worker health and hygiene, agricultural water and buildings, tools and equipment.⁸*

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¹ Centers for Disease Control and Prevention. Multistate Outbreak of Salmonella Infections Linked to Alfalfa Sprouts from One Contaminated Seed Lot (Final Update). 13 May 2016. Retrieved May 2016 from <http://www.cdc.gov/salmonella/muenchen-02-16/index.html>.

² Kansas Department of Health and Environment. Five Kansans ill from Salmonella linked to sprouts. 19 February 2016. Retrieved May 2016 from http://www.kdheks.gov/news/web_archives/2016/02192016a.htm.

³ Centers for Disease Control and Prevention. Multistate Outbreak of Salmonella Infections Linked to Alfalfa Sprouts from One Contaminated Seed Lot (Final Update). 13 May 2016. Retrieved May 2016 from <http://www.cdc.gov/salmonella/muenchen-02-16/index.html>.

⁴ Ibid.

⁵ Colorado Integrated Food Safety Center of Excellence. Sprouts. Retrieved May 2016 from <http://fsi.colostate.edu/sprouts/>.

⁶ Ibid.

⁷ FoodSafety.gov. Sprouts: What You Should Know. Retrieved May 2016 from <http://www.foodsafety.gov/keep/types/fruits/sprouts.html>.

⁸ U.S. Food and Drug Administration FDA Investigated Multistate Outbreak of Salmonella Infections Linked to Alfalfa Sprouts Retrieved May 2016 from <http://www.fda.gov/Food/RecallsOutbreaksEmergencies/Outbreaks/ucm487329.htm>