

# **Outbreak of Salmonellosis Associated with an Adult Detention Facility – Butler County, March 2023**



## Background

On Sunday, March 12, 2023, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified by the Butler County Health Department that a resident of an adult detention facility had been diagnosed with salmonellosis and other residents of the facility were reporting similar symptoms. In collaboration with the Butler County Health Department and the Kansas Department of Agriculture's Food Safety and Lodging Program (KDA), an outbreak investigation was initiated to determine the cause of illness, scope of illness, and to implement prevention and control measures.

## Methods

### Epidemiologic Investigation

Questionnaires were developed and distributed to determine each resident's symptoms and food history. The questionnaires focused on food items served between March 4 and March 8, 2023, for both the Regular Meal Program (regular menu) and the Religious Meal Program (religious menu), according to each resident's designated diet. The questionnaires were not distributed to employees of the facility, as no employees reported illness and few employees reported eating the facility's food. A case-control study was conducted to determine potential associations between food items served at the facility and subsequent gastrointestinal illness.

A confirmed case was defined as a resident of the facility with laboratory isolation and culture of *Salmonella spp.* from a clinical specimen on or after March 7, 2023, regardless of symptoms. A probable case was defined as a resident of the facility with either diarrhea (3 or more loose stools in a 24-hour period) or vomiting who became ill on March 7, 2023, or later. A control was defined as a resident of the facility who did not become ill on or after March 7, 2023.

Analysis was conducted using SAS® 9.4; odds ratios, 95% confidence intervals, and Fisher's exact test were calculated. A p-value of  $\leq 0.05$  was considered statistically significant.

### Laboratory Analysis

The Kansas Health and Environmental Laboratories (KHEL) tested stool specimens for gastrointestinal pathogens via multiplex polymerase chain reaction (PCR) and bacterial culture confirmation. KHEL conducted whole genome sequencing (WGS) on all *Salmonella* isolates, and the resulting sequence data were uploaded to PulseNet (the national molecular subtyping network for foodborne disease surveillance) and analyzed using core-genome multilocus sequence typing (cgMLST).

### Environmental Assessment

KDA was invited by the adult detention facility to conduct an environmental assessment of the facility on March 16, 2023. Eleven frozen meal trays that had been served from 3/8 to 3/16 and a sample from a 40-pound block of mechanically separated chicken (MSC) were obtained from the facility. Selected food items were tested at the KDA laboratory for *Salmonella*. The positive isolates were forwarded to KHEL for whole genome sequencing.

## Results

### Epidemiologic Investigation

Among the 102 residents completing the outbreak questionnaires, 61 cases (6 confirmed; 55 probable) and 17 controls were identified. Twenty-one responses were excluded for incomplete responses and three were excluded for not meeting case definition. The overall attack rate was 78.2% among residents completing the outbreak questionnaires. A total of 69 residents, 54 cases and 15 controls, were included in the regular menu questionnaire analysis. A total of nine residents, seven cases and two controls, were included in the religious menu questionnaire analysis.

The most frequently reported symptoms were diarrhea, abdominal cramps, and nausea (Table 1). Twenty-six (33%) residents sought healthcare; no residents were hospitalized. The majority of cases were male and ranged in ages of 20 to 49 (Table 2 & 3). Illness onsets ranged from March 7-13, 2023 (Figure 1). Among the 28 cases with recovery information, the mean duration of illness was 5.5 days (range: 2-9 days).

**Table 1: Symptoms reported among ill cases (N=61)**

| <b>Symptom</b>   | <b># of Ill Persons with Symptom/<br/># of Ill Persons Reporting</b> | <b>% Reporting Symptom</b> |
|------------------|----------------------------------------------------------------------|----------------------------|
| Diarrhea         | 61/61                                                                | 100%                       |
| Abdominal Cramps | 57/59                                                                | 97%                        |
| Nausea           | 52/57                                                                | 91%                        |
| Fever            | 34/38                                                                | 90%                        |
| Vomiting         | 31/54                                                                | 57%                        |

**Table 2: Gender of Cases (N=61)**

| <b>Sex</b> | <b># of Cases</b> | <b>% of Cases</b> |
|------------|-------------------|-------------------|
| Female     | 8                 | 13%               |
| Male       | 53                | 87%               |

**Table 3: Age of Cases (N=61)**

| <b>Age Group</b> | <b># of Cases</b> | <b>% of Cases</b> |
|------------------|-------------------|-------------------|
| 18-19            | 1                 | 2%                |
| 20-49            | 52                | 85%               |
| 50-74            | 8                 | 13%               |
| 75+              | 0                 | 0%                |
| Unknown          | 0                 | 0%                |

\*AM is 12:00 AM to 11:14 AM, PM is 11:15 AM to 11:59 PM

Food items served and consumption of commissary items at the adult detention facility were analyzed for association with illness consistent with salmonellosis. Food analyses included meals served on 3/8, but there were several cases with illness onset prior to some of the meals on this date. These cases were then excluded from the meal analyses for 3/8, but were included for the other meal analyses. Due to the small sample size, odds ratios were not able to be performed for the religious menu analysis. Residents having consumed the chili macaroni from the regular food menu served for dinner on March 8 were statistically more likely to experience illness (OR: 11.8, 95% CI: 2.7-51.4, p 0.001) (Table 4). No other food items were statistically associated with illness (Appendix A).

**Table 4: Salmonella Exposure Information—Wednesday Dinner**

| Meal                      | Food Item             | OR          | 95% CI            | P-value      |
|---------------------------|-----------------------|-------------|-------------------|--------------|
| Wednesday<br>(3/8) Dinner | <b>Chili Macaroni</b> | <b>11.8</b> | <b>2.7 - 51.4</b> | <b>0.001</b> |
|                           | Mixed                 | 2.0         | 0.6 - 7.3         | 0.23         |
|                           | Vegetables            |             |                   |              |
|                           | Cornbread             | 2.3         | 0.6 - 8.4         | 0.18         |
|                           | Dessert               | 1.7         | 0.4 - 6.6         | 0.36         |
|                           | Drink                 | 1.5         | 0.4 - 5.8         | 0.39         |

- OR= Odds Ratio
- CI=Confidence Interval

Using the time when the chili macaroni was served as the time of exposure since all residents are served at the same time, 4:15 PM, an incubation period was calculated from those case patients with a reported illness onset after this time (n=54). The mean incubation period was 23.9 hours (range: 45 minutes – 5 days).

### **Laboratory Analysis**

Seven *Salmonella* isolates from ill residents of the facility were identified as *Salmonella* Enteritidis with allele codes SALM1.0-6743.2.219.1.1 (n=2) and SALM1.0-6743.2.219.1.1.4 (n=5). These isolates were highly related by cgMLST, differing by 0-2 alleles. Two of these isolates were initially identified as *Salmonella* at local hospitals and forwarded to KHEL for further testing. The other five isolates came from stool specimens that were directly sent to KHEL for testing via multiplex PCR and culture.

Stool specimens on five of the seven kitchen staff, who were all asymptomatic, were submitted to KHEL for multiplex PCR and culture testing. Three stool specimens tested negative, one stool specimen tested positive for Enteropathogenic *E. coli* (EPEC), and one stool specimen tested positive for *Salmonella* via multiplex PCR. That *Salmonella* isolate was identified as *Salmonella* Enteritidis with the allele code SALM1.0 - 6743.2.219.1.1.4, which was highly related to the ill residents' isolates (0-1 alleles by cgMLST)

### **Environmental Assessment**

The KDA Laboratory tested foods collected from the facility for *Salmonella*: six food items that contained meat from the 11 meal trays, and a sample of raw MSC from the facility's freezer. The meat food items from the meal trays were negative for *Salmonella*. The MSC was positive for *Salmonella*; however, the isolate was identified as *Salmonella* Enteritidis with allele code SALM1.0-6743.2.109.28.3. This isolate was not related to the outbreak isolates by cgMLST, differing between 64 – 67 alleles.

KDA conducted an environmental assessment of the facility on March 16, 2023. KDA staff observed inadequate cooling of prepared food, lack of temperature monitoring during cooling, lack of quaternary ammonium sanitizer available for sanitization of food contact surfaces, and expired testing strips for the sanitizer. Education was provided to the facility on these food safety issues, and corrective actions were taken.

### **Conclusion**

This was a large outbreak of *Salmonella* Enteritidis associated with an adult detention facility. Sixty-one residents self-reported illness onset between March 7 and March 13. The epidemic curve (Figure 1) suggests a point-source outbreak.

Seven of the residents had laboratory confirmation of *Salmonella* Enteritidis. The sequences of these isolates were highly related to an isolate in PulseNet, the national molecular subtyping network for foodborne disease surveillance. The isolate in PulseNet, which was collected by the United States Department of Agriculture from a chicken sample from Processor A in October 2022, differed from the residents' isolates by 1-5 high-quality single-nucleotide polymorphisms (5). Invoices and photos of food products used at the detention facility showed 40-pound blocks of MSC from Processor A were used for their chicken-containing dishes. The label on the MSC product used by the facility at the time of the outbreak listed the same USDA Establishment Number as the matching isolate found in PulseNet. The MSC block used at the time of the

outbreak was not available for testing. A sample from a different block produced by Processor A was collected from the facility and tested positive for *Salmonella* Enteritidis, but this isolate was not closely related to the isolates from the ill residents.

MSC, a paste-like meat product produced when meat is forced under high pressure through a device to separate edible meat from bone, has been implicated as a likely source of salmonellosis in previous outbreaks within prisons and jails. These institutions often utilize MSC, as it is less expensive than other animal protein products (3, 7). In 2014, a multi-state outbreak of *Salmonella* Heidelberg tied to MSC included nine cases from a correctional facility in Tennessee, and, in 2022, an outbreak of *Salmonella* Enteritidis at a correctional facility in Nebraska was tied to the MSC served at the facility (2, 6). In Kansas, MSC was the suspected source of salmonellosis outbreaks among residents of two state correctional facilities in November 2020 and December 2021 (4). In a progress report published by the United States Department of Agriculture, it was noted that MSC had a higher prevalence of *Salmonella* (82.9%) than ground chicken (39.0%) or other comminuted chicken (41.7%) sampled and tested from June 1, 2013 to December 31, 2014 (8).

The case-control study analysis only identified the consumption of the chili macaroni dinner served on 3/8/23 to be statistically associated with illness. Per the facility, the chili macaroni was one of five meals served from 3/4 to 3/8 that contained MSC. All food items tested from the leftover meal trays were negative for *Salmonella*, including the chili macaroni. It was not determined how many batches of meat items were cooked for each meal, and there was no way to know if the food items on the leftover trays were from a batch that was eaten by residents who later became ill. Seven case patients reported symptom onset dates prior to the chili macaroni dinner on 3/8/23. Though the facility's food service vendor stated they never reused food for meals, many residents noted the reuse of food on their questionnaires. During the environmental assessment, it was noted that the kitchen did not follow proper cooling procedures for a large casserole pan that was being cooled for re-use the following day. This suggests that leftover food was sometimes served at the facility and bacterial growth within the food could have stemmed from lack of temperature measurements and improper cooling of the food.

Other sources of *Salmonella* may have caused illness in addition to undercooked MSC in the chili macaroni. Seven case patients were designated as part of the meatless Religious Meal Program, though four reported consuming meat items from the regular food menu. Cross-contamination with *Salmonella* may have occurred due to improper sanitization of kitchen surfaces. This is supported by the lack of quaternary ammonium sanitizer discovered during the environmental assessment of the facility. Transmission via an infected food handler was also considered. Testing of all kitchen workers was recommended to identify any asymptomatic carriers of *Salmonella*, for which one was identified. The worker reported not consuming any food served to the residents prior to the outbreak. The facility did report that this worker had taken one sick day in the previous month due to diarrheal illness. Transmission from the kitchen worker is a less likely cause of the outbreak, given that most foods served at the facility were cooked, and good hand hygiene and glove use were observed during the environmental assessment. Though KDHE regulations do not require exclusion of food handlers with a *Salmonella* infection, to ensure no additional cases occurred via this route of transmission, KDHE recommended excluding the kitchen worker until two *Salmonella* negative stool samples were obtained.

The investigation was limited by several factors. In addition to not having the original MSC used for the meals around the time of the outbreak available for testing, the facility did not save food trays prior to 3/8 and subsequently could not be tested. The detention facility can hold up to 230 residents, but the actual number of residents present in the facility at the time of the outbreak was not provided. There were a small number of controls used for the analysis. Only 17 residents self-reported not being ill and completed a questionnaire. This could have resulted in selection bias in which those residents who were ill may have been more inclined to complete the survey versus those who were not ill. The questionnaires were administered to the residents about two weeks after the food items were served. This could have impacted their ability to recall the exact foods consumed during each meal. Lastly, in response to this outbreak, the facility switched to a new food vendor. As a result, further questions for the original food vendor could not be answered.

This investigation was aided by the quick response and collaboration between the Butler County Health Department, KDHE, KHEL, and KDA, which allowed for timely initiation of the outbreak investigation. The use of questionnaires allowed for a large number of responses among the residents of the detention facility while minimizing detention facility staff time required for the investigation. Immediate cooperation of the adult detention facility allowed for timely interventions to prevent further transmission and future outbreaks.

Eating contaminated food is a common way to be infected with *Salmonella* (2). Steps to prevent infection and outbreaks include:

- Wash hands using proper hand hygiene, especially after handling raw or undercooked meat
- Wash kitchen utensils and countertops, especially after touching raw or undercooked meat
- Keep raw meat separate from other foods
- Ensure food is cooked to safe internal temperatures to prevent consuming raw meat
- Ensure proper chilling of food to prevent bacterial growth (1)

#### Citations:

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## Appendix A

### Salmonella Exposure Information-- Regular Food Menu

| Meal                         | Food Item             | OR          | 95% CI          | P-value      |
|------------------------------|-----------------------|-------------|-----------------|--------------|
| Wednesday<br>(3/8) Breakfast | Cold Cereal           | 1.2         | 0.3-4.4         | 0.54         |
|                              | Sugar                 | 1.1         | 0.3-4.3         | 0.56         |
|                              | Peanut Butter         | 0.5         | 0.1-2.4         | 0.90         |
|                              | Buttered Bread        | 0.6         | 0.2-2.4         | 0.84         |
|                              | Coffee Cake           | 0.7         | 0.2-2.8         | 0.82         |
|                              | Milk                  | 1.0         | 0.2-4.1         | 0.65         |
|                              | Drink                 | 1.3         | 0.3-4.5         | 0.49         |
| Wednesday<br>(3/8) Lunch     | Sloppy Joes           | 2.9         | 0.6-14.2        | 0.19         |
|                              | Hamburger Bun         | 2.4         | 0.5-11.8        | 0.24         |
|                              | Tater Tots            | 1.0         | 0.1-9.4         | 0.70         |
|                              | Corn                  | 1.4         | 0.4-5.6         | 0.44         |
|                              | Dessert               | 0.7         | 0.1-2.9         | 0.82         |
|                              | Drink                 | 1.0         | 0.3-3.6         | 0.66         |
| Wednesday<br>(3/8) Dinner    | <b>Chili Macaroni</b> | <b>11.8</b> | <b>2.7-51.4</b> | <b>0.001</b> |
|                              | Mixed                 | 2.0         | 0.6-7.3         | 0.23         |
|                              | Vegetables            |             |                 |              |
|                              | Cornbread             | 2.3         | 0.6-8.4         | 0.18         |
|                              | Dessert               | 1.7         | 0.4-6.6         | 0.36         |
|                              | Drink                 | 1.5         | 0.4-5.8         | 0.39         |
| Tuesday (3/7)<br>Breakfast   | Cold Cereal           | 0.6         | 0.1-2.6         | 0.85         |
|                              | Sugar                 | 0.6         | 0.1-2.6         | 0.85         |
|                              | Peanut Butter         | 0.2         | 0.03-1.8        | 0.98         |
|                              | Buttered Bread        | 0.3         | 0.1-1.3         | 0.98         |
|                              | Muffin                | 0.1         | 0.02-1.1        | 1.00         |
|                              | Milk                  | 0.5         | 0.1-2.6         | 0.88         |
|                              | Drink                 | 0.8         | 0.2-3.0         | 0.74         |
| Tuesday (3/7)<br>Lunch       | Taco Meat             | 2.2         | 0.5-8.8         | 0.23         |
|                              | Cheese Sauce          | 2.2         | 0.6-7.8         | 0.18         |
|                              | Tortilla Chips        | 2.1         | 0.4-9.6         | 0.30         |
|                              | Rice                  | 0.9         | 0.2-4.0         | 0.67         |
|                              | Beans                 | 0.7         | 0.2-2.7         | 0.78         |
|                              | Corn                  | 1.2         | 0.3-5.6         | 0.53         |
|                              | Taco Sauce            | 1.8         | 0.5-7.0         | 0.29         |
|                              | Dessert               | 0.5         | 0.1-2.2         | 0.90         |
|                              | Drink                 | 0.7         | 0.2-2.4         | 0.82         |
| Tuesday (3/7)<br>Dinner      | Turkey and Noodle     | 1.4         | 0.4-5.5         | 0.41         |
|                              | Carrots               | 1.7         | 0.5-5.7         | 0.31         |
|                              | Biscuit               | 1.4         | 0.4-5.0         | 0.45         |
|                              | Dessert               | 0.6         | 0.2-2.2         | 0.86         |
|                              | Drink                 | 0.5         | 0.2-1.9         | 0.90         |
| Monday (3/6)<br>Breakfast    | Cold Cereal           | 0.6         | 0.2-2.3         | 0.85         |
|                              | Sugar                 | 0.6         | 0.2-2.4         | 0.85         |
|                              | Peanut Butter         | 0.3         | 0.06-1.6        | 0.97         |
| Monday (3/6)                 | Buttered Bread        | 0.4         | 0.1-1.4         | 0.97         |
|                              | Coffee Cake           | 0.4         | 0.1-1.6         | 0.96         |

|                                 |                            |     |          |      |
|---------------------------------|----------------------------|-----|----------|------|
| Breakfast (cont.)               | Milk                       | 0.6 | 0.1-2.5  | 0.86 |
|                                 | Drink                      | 0.9 | 0.2-3.6  | 0.68 |
| Monday (3/6)<br>Lunch           | Mac N Chees<br>with Franks | 1.5 | 0.4-5.9  | 0.40 |
|                                 | Mixed<br>Vegetables        | 1.0 | 0.2-3.8  | 0.64 |
|                                 | Cornbread                  | 0.3 | 0.1-1.2  | 0.98 |
|                                 | Dessert                    | 0.5 | 0.1-2.1  | 0.91 |
|                                 | Drink                      | 0.5 | 0.1-1.8  | 0.92 |
|                                 | Hamburger Patty            | 1.2 | 0.2-6.7  | 0.57 |
| Monday (3/6)<br>Dinner          | Hamburger Bun              | 1.0 | 0.2-5.6  | 0.64 |
|                                 | Peas and<br>Carrots        | 1.2 | 0.3-4.3  | 0.52 |
|                                 | Fries                      | 0.6 | 0.1-2.9  | 0.86 |
|                                 | Dessert                    | 0.3 | 0.1-1.5  | 0.97 |
|                                 | Drink                      | 0.8 | 0.2-2.7  | 0.78 |
|                                 | Cold Cereal                | 0.6 | 0.2-2.2  | 0.87 |
| Sunday (3/5)<br>Breakfast       | Sugar                      | 0.6 | 0.2-2.3  | 0.85 |
|                                 | Peanut Butter              | 0.3 | 0.1-1.5  | 0.97 |
|                                 | Buttered Bread             | 0.4 | 0.1-1.4  | 0.97 |
|                                 | Coffee Cake                | 0.4 | 0.1-1.8  | 0.94 |
|                                 | Milk                       | 0.6 | 0.1-2.4  | 0.87 |
|                                 | Drink                      | 1.3 | 0.3-5.7  | 0.50 |
| Sunday (3/5)<br>Lunch           | Chuckwagon                 | 0.8 | 0.1-4.1  | 0.75 |
|                                 | Gravy                      | 1.2 | 0.3-5.4  | 0.53 |
|                                 | Mashed<br>Potatoes         | 1.3 | 0.3-5.6  | 0.51 |
|                                 | Carrots                    | 0.8 | 0.2-3.0  | 0.76 |
|                                 | Cornbread                  | 0.8 | 0.2-2.8  | 0.76 |
|                                 | Dessert                    | 0.4 | 0.1-1.8  | 0.94 |
|                                 | Drink                      | 0.5 | 0.1-1.7  | 0.93 |
|                                 | Lasagna                    | 1.4 | 0.4-5.1  | 0.41 |
| Sunday (3/5)<br>Dinner          | Green Beans                | 0.8 | 0.2-3.0  | 0.74 |
|                                 | Biscuit                    | 1.3 | 0.4-4.9  | 0.45 |
|                                 | Dessert                    | 1.1 | 0.3-3.9  | 0.58 |
|                                 | Drink                      | 1.0 | 0.3-3.4  | 0.64 |
|                                 | Cold Cereal                | 0.6 | 0.2-2.2  | 0.86 |
| Saturday (3/4)<br>Breakfast     | Sugar                      | 0.6 | 0.2-2.4  | 0.84 |
|                                 | Peanut Butter              | 0.3 | 0.1-1.5  | 0.98 |
|                                 | Buttered Bread             | 0.5 | 0.1-2.1  | 0.89 |
|                                 | Muffin                     | 0.3 | 0.05-1.3 | 0.98 |
|                                 | Milk                       | 0.9 | 0.1-2.5  | 0.86 |
|                                 | Drink                      | 1.4 | 0.3-6.1  | 0.48 |
| Saturday (3/4)<br>Lunch         | Chicken Patty              | 0.3 | 0.4-2.7  | 0.95 |
|                                 | Hamburger Bun              | 0.3 | 0.04-2.7 | 0.95 |
|                                 | Potato Salad               | 1.0 | 0.3-3.9  | 0.62 |
|                                 | Salad Dressing             | 0.5 | 0.1-2.2  | 0.90 |
|                                 | Applesauce                 | 0.9 | 0.2-3.5  | 0.71 |
| Saturday (3/4)<br>Lunch (cont.) | Dessert                    | 0.3 | 0.1-1.3  | 0.98 |
|                                 | Drink                      | 0.3 | 0.1-1.2  | 0.98 |

|                          |             |     |         |      |
|--------------------------|-------------|-----|---------|------|
| Saturday (3/4)<br>Dinner | Meat'a'Roni | 1.1 | 0.3-4.4 | 0.55 |
|                          | Tomatoes    | 1.1 | 0.3-3.9 | 0.58 |
|                          | Bread       | 1.3 | 0.3-4.7 | 0.50 |
|                          | Dessert     | 0.5 | 0.1-2.3 | 0.89 |
|                          | Drink       | 0.5 | 0.2-1.9 | 0.90 |

• *OR= Odds Ratio*

• *CI= Confidence Interval*