

## Multiple-Serotype Salmonella Outbreaks in Two Arkansas State Prisons

*Arkansas Department of Health collaborated with federal health organizations to tackle the state's largest ever multiple-serotype salmonella outbreak that affected two Arkansas state prisons.*

On Aug. 6, 2012 the Arkansas Department of Health (ADH) became aware of an outbreak of gastrointestinal illness and diarrhea in about 260 inmates at a state prison (prison A) through a local newspaper. ADH promptly responded to this health threat and began an investigation the next day. The Arkansas Department of Health Public Health Laboratory (ADPHL) collected stool samples from seven of the inmates who were experiencing severe symptoms and found three different serotypes of *Salmonella*: Anatum, Cerro, and Heidelberg. The discovery of multiple serotypes of *Salmonella* in one outbreak raised warning flags since multi-serotype outbreaks have rarely been reported.

Almost one week later, on Aug. 14, diarrheal illness was reported at another state prison (prison B) and 16 stool samples were sent to a local laboratory for pathogen testing. On Aug. 21, the ADH was notified that *Salmonella* Anatum had been identified in eight of the 16 samples. Using pulsed-field gel electrophoresis (PFGE), the ADPHL discovered that the Anatum isolates from samples in prison A and prison B were indistinguishable, thus linking the two outbreaks together.

- The burden of these outbreaks in 2012 was five to six times greater than what it usually is in a year.
- Total cost to manage the outbreak over two years was estimated to be about a quarter of a million dollars largely for staff time/man hours.

Having found a link between the two outbreaks, ADH knew that they were dealing with a massive and unprecedented *Salmonella* outbreak and immediately began rapid and detailed investigations to pinpoint the root cause of the outbreaks.

### Steps Taken:

- After multiple serotypes of *Salmonella* were discovered in prison A, the state epidemiologist and nurses immediately began conducting a detailed case-control study inside the prison. Several weeks later, after the second outbreak in prison B was discovered, ADH needed help to effectively contain both outbreaks and solicited help from CDC. CDC sent epidemiological assistance (Epi-Aid) and Epidemic Intelligence Service (EIS) officers to help with the investigations. CDC helped fund these investigations through an Epidemiology and Laboratory Capacity for Infectious Diseases cooperative agreement. The Council of State and Territorial Epidemiologists (CSTE) also funded an Applied Epidemiology Fellow who helped identify and contain these outbreaks.
- Case studies were conducted in both prisons and questionnaires were conducted asking inmates to detail food history and type of symptom onset times. A convenience sample of 505 (59%) inmates from prison A and 440 (27%) inmates from prison B, as well as all available staff, were interviewed.
- A probable case of *Salmonella* was defined as self-reported diarrhea with onset during Aug. 2-18, 2012 among prisoners and staff in either prison A or B. A confirmed case was defined as *Salmonella* isolated from a stool sample during the period of testing (Aug. 7-Sept. 25).
- All food items that were served in the cafeteria and commissaries, between Aug. 2-5 in prison A and between Aug. 7-11 in prison B, were possibly exposed.

- Inmates working in the kitchen were monitored and required to submit stool samples for *Salmonella* testing. If *Salmonella* was identified in any kitchen worker, kitchen duties were immediately discontinued and workers were required to submit weekly stool samples until all signs of *Salmonella* were gone.
- ADH environmental health workers also conducted a series of environmental investigations and food item testing in both prisons to make sure kitchen workers and prison staff were up to par with the Arkansas State Board of Health's Rules and Regulations Pertaining to Food Establishments. Kitchen and food storage inspections, interviews, and video surveillance were used to monitor food preparation in both prisons.
- Environmental health workers also inspected three hen houses, egg processing equipment, and eggs produced at prison B. These eggs were used in the food in prison B and also supplied to other prisons including prison A.

## Results:

- Case-control studies:
  - Investigators identified 309 probable and 51 confirmed cases at prison A and 133 probable and 85 confirmed cases at prison B. Nineteen additional confirmed cases were identified by stool culture among inmate kitchen workers who were not interviewed.
  - In prisons A and B, the majority of those interviewed who reported eating chicken salad were more likely to have a probable or confirmed case of *Salmonella*. Given the timing of the chicken salad meal and the correlation between those who consumed this meal and became infected, the outbreak in prison A was attributed to consuming chicken salad. In prison B, 23 other food items, as well as chicken salad, were shown to be associated with probable or confirmed illness. Therefore the outbreak in prison B was likely spread by contamination of multiple foods, in addition, person-to-person transmission may have also perpetuated the outbreak.
- Laboratory results:
  - The ADPHL cultured stool samples from 333 inmates; 174 inmates had positive stool cultures for *Salmonella*.
  - The ADPHL identified 15 PFGE patterns from *Salmonella* isolated from the 155 positive stool cultures. Seven of the patterns were common to both prisons and represented 78 percent of all stool specimens yielding *Salmonella*.
- Environmental investigations:
  - ADH environmental health workers found several violations in prison A including insufficient hand washing; poor freezing, cooling, and reheating practices; moldy ceilings; and unsanitary or cracked equipment, food storage containers, food preparation surfaces, walls, and floors. Violations in prison B included neglect of temperature monitoring during cooking and uncleanable, cracked floors and food storage containers.
  - Interviews and surveillance found that chicken in prison A was not refrigerated and stored properly before being used in the chicken salad.
  - Inmates in both facilities were unsupervised and did not have food safety training. Both prisons were also infested with rodents and cockroaches.
  - In Arkansas, prisons are required to follow the same regulations as commercial food establishments and are subject to periodic inspection by ADH environmental health

- workers. Although both prisons passed ADH inspections less than six-months before the outbreaks, further review showed that the inspections did not fully comply with ADH guidelines for commercial food establishments.
- Inspection of prison B's hen houses revealed a faulty outdoor egg washer, which had been replaced with an indoor washer in August 2012.
  - Food item testing:
    - Eggs collected from one of prison B's hen houses (the other two hen houses were demolished during September–December 2012, so eggs could not be sampled) were found to contain both *Salmonella* Adelaide and *Salmonella* Cerro. All other items tested negative for *Salmonella*, with the exception of raw, frozen chicken from prison B, which tested positive for *Salmonella* Enteritidis, a *Salmonella* serotype not identified in stool specimens from inmates at either prison.
  - It had been concluded that unsanitary eggs, insufficient hand washing practices, unsafe and unclean equipment, food preparation surfaces, and cooling or heating practices, and person-to-person contact were the main factors that led to the *Salmonella* outbreaks in both prisons. ADH issued recommendations, guidelines, and food safety training for inmates in order to prevent future outbreaks.

## Lessons Learned:

- Important interdepartmental and federal partnerships fostered during the outbreaks helped Arkansas succeed in containing both outbreaks. The existing relationship between Arkansas's epidemiology program, preparedness team, and lab allowed the state to quickly and effectively test inmates and staff. New relationships fostered between prison, infection control, and nursing staff also allowed for rapid testing. Having CDC and CSTE as federal partners was instrumental in having enough staff capacity to handle record levels of *Salmonella*.
- Testing usually stops after the first serotype of *Salmonella* is discovered, however, guidelines for when and how to test for multiple serotypes are needed.
- Different safety processes in prisons served as a public health barrier. In prison B, leadership believed that many reported symptomatic inmates were faking their illness to get into the infirmary. In prison A, in order to be excused from food services duties, a prisoner had to receive a note from the infirmary confirming their illness. Prison A also established a copay system for prisoners going to the infirmary, so those who did not have enough money could not be excused from work duties.
- Both prisons lacked policies whereby sick or infectious inmates were excused from food service duties.
- Prisons need specific guidelines for specimen handling and food collection during suspected outbreaks. Staff in prison B initially provided the ADH with hardboiled eggs which killed off any possible signs of infection.

## For More Information:

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# State Story



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## **Citations**

1. Gicquelais R, Morris J, Matthews S, *et al.* "Multiple-Serotype Salmonella Outbreaks in Two State Prisons – Arkansas, August 2012." *MMWR*. 2014. 63:169-173.