Salmonella Outbreak at a Multi-Site Preschool Program

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Salmonella

• Non typhoidal *Salmonella* causes an estimated 4 million infections each year in the U.S.
  – generally causes self-limited diarrheal illness
  – may have serious sequelae, including death

• Foodborne transmission accounts for >95% of U.S. salmonellosis outbreaks
  – foods of animal origin or produce source
  – foodhandler contamination uncommon
BACKGROUND

• In Oct. 2008, Los Angeles County Dept. Public Health (LAC DPH) was notified of illness at a multi-site preschool program.

• 5 centers reported staff with illness and 4/5 centers had children with an undiagnosed gastrointestinal illness.
METHODS

• Case definition

An individual ill between 10/13 and 10/23/08 (11/04/08 for secondary cases) with either:
  – laboratory confirmed *Salmonella* Javiana, or
  – fever and diarrhea, or
  – fever or diarrhea with at least two of the following symptoms:
    • nausea, vomiting, myalgia, headache or fatigue.
METHODS

• Cases were identified through interview and mandated disease reporting.

• LAC DPH Laboratory performed culture, serotyping and PFGE.

• LAC DPH Environmental Health inspected the central kitchen that prepared and delivered all food to 28 sites. Meal preparation and food sources were reviewed.
METHODS

• Kitchen staff were interviewed and submitted one stool for screening culture

• All ill preschool and kitchen staff were removed from work until cleared by stool culture

• A case-control study among preschool staff included food and symptom history and was analyzed with SAS 9.1
  – Controls were employees with no symptoms and no laboratory test or negative laboratory test for S. Javiana.
RESULTS-IMPACT

- There were 595 cases; 308 were confirmed and 286 were presumptive (10 secondary cases)
  - 438 children
  - 144 staff and volunteers
  - 13 kitchen workers
- Four adults and 26 children were hospitalized; one had bacteremia.
- Illness in 27% of total enrollment of 1613 preschool students
Figure 1. Illness Onset for Laboratory Confirmed Cases with Recorded Onsets by Children, Adult Staff, and Kitchen Staff (n=220)
RESULTS

• The serotype was *Salmonella* Javiana
• The outbreak isolate pattern was unique in the PulseNet database.
• No other jurisdictions in California had increase in S. Javiana or any isolates with the outbreak PFGE pattern, and all cases in LAC with this S. Javiana pattern were associated with the outbreak.
PFGE RESULTS

1  2     3     4      5     6    7     8     9    10   11   12
<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Children</th>
<th>Adults</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Percent</td>
<td>n</td>
</tr>
<tr>
<td>Total reporting symptoms</td>
<td>386</td>
<td>100%</td>
<td>66</td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diarrhea*</td>
<td>380</td>
<td>98%</td>
<td>66</td>
</tr>
<tr>
<td>Fever</td>
<td>347</td>
<td>90%</td>
<td>39</td>
</tr>
<tr>
<td>Cramps</td>
<td>315</td>
<td>82%</td>
<td>60</td>
</tr>
<tr>
<td>Vomiting</td>
<td>265</td>
<td>69%</td>
<td>34</td>
</tr>
<tr>
<td>Nausea</td>
<td>232</td>
<td>60%</td>
<td>48</td>
</tr>
<tr>
<td>Chills</td>
<td>226</td>
<td>59%</td>
<td>37</td>
</tr>
<tr>
<td>Symptoms duration**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration (days)</td>
<td>5.0</td>
<td>Mean</td>
<td>1-18</td>
</tr>
</tbody>
</table>

*6 lab confirmed child cases with GI or fever symptoms excluding diarrhea (2% of total)
**Children only (n=332)
RESULTS

- The first lab confirmed non kitchen worker case had symptom onset on 10/14/08.
- The preschools were all closed for the weekend plus 3 more days to allow for thorough cleaning and to help stop spread among the children.
- Because 1613 children were enrolled at the time of the outbreak, we enforced clearance procedures only for symptomatic children with sensitive occupation in the household.
- Letter sent to parents.
RESULTS

• Kitchen inspection showed unclean surfaces and utensils and it was closed for evidence of rodents.

• The kitchen remained closed voluntarily for cleaning, rodent abatement and for education of kitchen staff about food safety.
<table>
<thead>
<tr>
<th>Demographics of staff participating in the case-control study (N=255)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Mean age, years (SD)</td>
</tr>
</tbody>
</table>
RESULTS-CASE CONTROL

- Persons eating on 10/14 had significant risk of illness (p=0.04, attack rate of 82%)
  - no specific meal or food item was implicated.
  - Breakfast (p=0.05)
  - Milk (p=0.056)
RESULTS - CASE CONTROL -2

• One staff member reported taking home leftover watermelon which she fed to her child, who became ill the next day.

• A non-food staff person aided an ill food worker 10/13, and became ill 10/14.

• Interviews revealed this ill kitchen worker cut up watermelon 10/13 to be served on 10/14. Other kitchen staff who were ill later that week also continued work despite having paid sick leave.
Figure 2. Illness Onset for Laboratory Confirmed Cases with Recorded Onsets by Children, Adult Staff, and Kitchen Staff (n=220)

- **Kitchen Staff**
- **Adult Staff (age 18+ yrs)**
- **Children (Age 0-10 yrs)**

Watermelon Served 12PM

Kitchen Worker ill

Cases

Date (October)

10/12 (Su) 10/13 (M) 10/14 (Tu) 10/15 (W) 10/16 (Th) 10/17 (F) 10/18 (S) 10/19 (Su) 10/20 (M) 10/21 (Tu) 10/22 (W) 10/23 (Th) 10/24 (F) 10/25 (Sa) 10/26 (Su) 10/27 (M)
Numerous control measures were taken including:
- closing the kitchen and the preschool sites for terminal cleaning
- removal of ill food handlers until cleared of infection
- recommendations for better hand hygiene were made.

Control measures appear to have been very effective in preventing further spread of salmonellosis, as only 10 secondary cases were discovered in case households.
LIMITATIONS

• Recall bias since adult staff and volunteers were interviewed two to three weeks after the outbreak

• Unable to interview most children’s families to confirm onset dates and symptoms

• Kitchen staff were not forthcoming with their symptoms when interviewed prior to stool specimen results
CONCLUSION

• The likely outbreak source was an ill food worker who worked despite having paid sick leave, but no epidemiologic evidence.

• Intervention and education efforts by ACDC, Environmental Health, Community Health Services and the preschool administration were successful in containing the outbreak.
RECOMMENDATIONS

• The preschool organization must take a more active role enforcing food safety practices
  • PIC was unaware of ill foodworkers
• Better education of food workers
• Enforcement of food safety regulations
DISCUSSION

• Cannot always find epidemiologic evidence to support hypothesis
• Others knew ill person was working, but did not notify PIC
• Food workers not knowledgeable about illness and food safety
• Acutely ill persons may cause huge outbreaks!
REFERENCES


OTHER ACTIVITIES

• Because of rodent infestation, samples of stool from *Rattus rattus* were collected from the interior and exterior of the building and sent for culture in the PHL. Results were negative for *Salmonella* species.

• A kitchen worker had a sample of bread she had purchased at the workplace. The bread from El Salvador was also negative for *Salmonella* species.
## Table B. Food Items Eaten by Adults on Tuesday (10/14) by Controls and Lab Confirmed Cases with Symptoms Onset of Wednesday (10/15)

<table>
<thead>
<tr>
<th>Food Items Eaten Tuesday</th>
<th>Cases (N=12)</th>
<th></th>
<th>Controls (N=17)</th>
<th></th>
<th></th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Any Foods</strong></td>
<td>50% 12 100%</td>
<td>71% 12 71%</td>
<td></td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast</td>
<td>63% 10 83%</td>
<td>50% 6 50%</td>
<td></td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk (breakfast)</td>
<td>77% 10 83%</td>
<td>25% 3 25%</td>
<td></td>
<td>&lt;0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>French Toast</td>
<td>67% 10 83%</td>
<td>42% 5 42%</td>
<td></td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Juice</td>
<td>67% 10 83%</td>
<td>42% 5 42%</td>
<td></td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td>55% 12 100%</td>
<td>83% 10 83%</td>
<td></td>
<td>0.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Rice</td>
<td>63% 12 100%</td>
<td>58% 7 58%</td>
<td></td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beef Broccoli</td>
<td>57% 12 100%</td>
<td>75% 9 75%</td>
<td></td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watermelon</td>
<td>60% 12 100%</td>
<td>67% 8 67%</td>
<td></td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk (lunch)</td>
<td>62% 8 67%</td>
<td>42% 5 42%</td>
<td></td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td>60% 12 100%</td>
<td>67% 8 67%</td>
<td></td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ranch</td>
<td>67% 12 100%</td>
<td>50% 6 50%</td>
<td></td>
<td>&lt;0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrot</td>
<td>60% 12 100%</td>
<td>67% 8 67%</td>
<td></td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread Sticks</td>
<td>63% 12 100%</td>
<td>58% 7 58%</td>
<td></td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk (snack)</td>
<td>62% 8 67%</td>
<td>42% 5 42%</td>
<td></td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Any Milk</strong></td>
<td>61% 11 92%</td>
<td>58% 7 58%</td>
<td></td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
State regulations require specific follow up for cases with sensitive occupation or situation (SOS) (California Code of Regulations, Title 17, Section 2612). Preschool is considered to be a sensitive situation. We were able to conduct clearance on all those who prepared or served food to the children, including all teachers and aides. Because of the very large number of children (1639 enrolled at the time of the outbreak), we modified our clearance procedure for the children. We only required clearance for those who had been symptomatic and had SOS in the household. This action was discussed and approved by California DPH. There were no apparent secondary cases from the preschool, and 10 persons became ill from contact to cases within the household.
PREVENTION ACTIVITIES

- Closure of Head Start classes at all locations for environmental cleaning of the facilities
- Closure of the central kitchen by DPH Environmental Health for cleaning, health education and rodent abatement
- Stool culture screening with removal of infected staff, especially kitchen staff
- Removal of ill children from classes until recovered from diarrheal symptoms (note that most ill children were not culture confirmed unless their households included someone involved in a sensitive occupation or situation)
- Exclusion from work and culture clearance of anyone working in a sensitive occupation or situation residing in case households
- Provision of a draft letter to be used to inform parents, plus additional technical information to help answer parents’ questions
- Distribution of information about the control of norovirus and salmonellosis to the directors of all Head Start centers, including brochures and letters with specific recommendations
- Presentations by Community Health Services staff to provide health education to staff at each site prior to reopening on 10/21/08
Table 3. Confirmed and presumptive cases

<table>
<thead>
<tr>
<th></th>
<th>Confirmed</th>
<th>Presumptive</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>177</td>
<td>261</td>
<td>438</td>
</tr>
<tr>
<td>Adults*</td>
<td>120</td>
<td>24</td>
<td>144</td>
</tr>
<tr>
<td>Kitchen staff</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>309</strong></td>
<td><strong>285</strong></td>
<td><strong>594</strong></td>
</tr>
</tbody>
</table>

*excluding kitchen staff