Tennessee Fair and Animal Exhibition Safety: Reducing Disease Risks for Visitors

Survey of Tennessee Fairs
Overview

- 3 Surveys:
  - *E. coli* O157 and *Salmonella* at TN fairs
  - Human behaviors and hand hygiene practices
  - Recent survey of TN fairs: Facilities and educational practices
Disease outbreaks associated with fairs and animal exhibits
Outbreaks of *Escherichia coli* O157:H7 Associated with Petting Zoos — North Carolina, Florida, and Arizona, 2004 and 2005

During 2004–2005, three outbreaks of *Escherichia coli* O157:H7 infections occurred among agricultural fair, festival, and petting zoo visitors in North Carolina, Florida, and Arizona. One hundred eight cases, including 15 cases of hemolytic uremic syndrome* (HUS), were reported in the North Carolina outbreak; 63 cases, including seven HUS cases, were reported in the Florida outbreak; and two cases were reported in Arizona. No fatalities occurred. Illnesses primarily affected children who visited petting zoos at these events. This report summarizes findings from these outbreak investigations, which indicated the need for adequate control measures to reduce zoonotic transmission of *E. coli* O157:H7.

North Carolina

On October 29, 2004, the North Carolina Division of Public Health (NCDPH) received a report of a cluster of three HUS cases among children who visited a petting zoo at the North Carolina State Fair (Figure). Approximately 800,000 visitors attended this fair during October 15–24, 2004. The fair had two petting zoos (petting zoos A and B).

NCDPH notified all local health departments to report cases of diarrhea illnesses. Isolates were sent to the North Carolina State University Veterinary Diagnostic Laboratory for *E. coli* serotype and *Shiga toxin* type analysis. Twenty-three *E. coli* O157:H7 isolates were collected from patients with HUS and from two patients who reported illness but were not diagnosed with HUS. Twenty patients (19%) were hospitalized, and 15 (14%) had HUS diagnosed.

Systematic environmental sampling of the fairgrounds identified 48 goat waste samples positive for *E. coli* O157:H7 by *polymerase chain reaction* (PCR) or culture. Of these, *PFGE* analysis detected 7 different PFGE patterns representing 18 goat samples. The majority of samples identified were from goat waste, but positive environmental samples were also identified from a goat cage and two goat pens in petting zoos A and B.

Figure A child stands near goats and goat droppings in a petting zoo at the 2004 North Carolina State Fair.

Photo/North Carolina Division of Public Health
How common are *E. coli* O157 and *Salmonella* at fairs?
Shiga-toxigenic *Escherichia coli* O157 in Agricultural Fair Livestock, United States

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- USDA State & county fair survey, Summer 2002
- Goal: estimate the prevalence of enteric pathogens in livestock at fairs
E. coli O157 & Salmonella prevalence

Salmonella:
• 29 (91%) of 32 fairs
• 558/2914 = 19.1% of livestock

E. coli O157:
• 31 (96.9%) of 32 fairs
• 233/2914 = 8.0% of livestock
  • 11.4% of 1,407 cattle
  • 1.2% of 1,102 swine
  • 3.6% of 364 sheep / goats
  • 5.2% of 154 fly pools
Are *E. coli* O157 and *Salmonella* common at Tennessee fairs?
Animal Fecal and Environmental Sampling at 3 TN Fairs

- Used same protocol as published study, August - September 2005

**Samples:**
- Animal fecal samples
- Environmental samples: bedding, swabs, soil

**Samples from:**
- Primary petting zoo
- Other animal areas, exhibits, barns

**Cultures:** *E. coli* O157 and *Salmonella*
### E. coli O157

<table>
<thead>
<tr>
<th></th>
<th>Fair A</th>
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<th>Fair B</th>
<th></th>
<th>Fair C</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Pos / Total</td>
<td>% Pos</td>
<td>Pos / Total</td>
<td>% Pos</td>
<td>Pos / Total</td>
<td>% Pos</td>
</tr>
<tr>
<td>Petting Zoo</td>
<td>2/32</td>
<td>6 %</td>
<td>0/9</td>
<td>0</td>
<td>0/13</td>
<td>0</td>
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<tr>
<td>Animal Exhibits</td>
<td>12/35</td>
<td>34%</td>
<td>4/27</td>
<td>15%</td>
<td>9/29</td>
<td>31%</td>
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</table>
# Salmonella

<table>
<thead>
<tr>
<th></th>
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<th>Fair C</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Pos / Total</td>
<td>% Pos</td>
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</tr>
<tr>
<td>Petting Zoo</td>
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<td>63 %</td>
<td>0/9</td>
</tr>
<tr>
<td>Animal Exhibits</td>
<td>8/35</td>
<td>23%</td>
<td>5/27</td>
</tr>
</tbody>
</table>
Conclusions: TN Fairs

- *E. coli* O157 and *Salmonella*
  - Isolated from one of three petting zoos
  - Common at animal exhibits
- Consistent with national study
What human behaviors and hand hygiene practices contribute to transmission?
Tennessee Department of Health study focusing on human behavior and hand hygiene (McMillian et al., ICEID 2006)

- Hypothesis– Human behavior contributes to transmission
- Observational study
- 6 Middle Tennessee petting zoos
- August – September 2005
- Observed visitors to petting zoos to determine if the following occurred:
  - Direct animal contact
  - Contact with environmental surfaces
  - Hand-to-face contact (i.e. mouth, nose, eyes)
  - Eating or drinking
  - Hand sanitizer use
Results:
Human behavior and hand hygiene
Observed 991 persons:

• 733 (74%) had direct animal contact
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- 862 (87%) contacted environmental surfaces
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• 486 (49%) with Hand-to-face contact
Observed 991 persons:

• 733 (74%) had direct animal contact

• 862 (87%) contacted environmental surfaces

• 486 (49%) with Hand-to-face contact

• 218 (22%) ate or drank
Hand Sanitizer Stations available at 5 (83%) of 6 fairs
Hand Sanitizer Use by Visitors Exiting Petting Zoos

Observed 1700 visitors exiting: 1054 (62%) did NOT use the available hand sanitizer.
Hand Sanitizer Use differed by age group

**Children**
- No: 58%
- Yes: 42%

**Adults**
- No: 65%
- Yes: 35%
Hand Sanitizer Use in Visitors by Petting Zoo

- Petting Zoo A: 13
- Petting Zoo B: 65
- Petting Zoo C: 57
- Petting Zoo D: 66
- Petting Zoo E: 29
Factors influencing hand sanitizer use:

- Presence and visibility of signage
- Visibility / location of hand sanitizer stations
- Number of hand sanitizer stations available
- Verbal hand hygiene reminders by petting zoo operators
Conclusions of observational study

- Risky human behaviors and inadequate hygiene place persons at risk of transmission

- Physical layout of facilities appears to contribute to hand hygiene compliance

- Venue layout is modifiable

- Preventive measures modifying risky human behaviors might reduce disease risks to visitors
What types of facilities and educational efforts are currently reported by TN fairs?
Public health and animals survey

1. How would you describe your facility or business?
   - County Fair
   - 4-H Fair
   - Agriculture Fair
   - Festival
   - Other: ______________________

2. Does your facility have any of the following animals? (Check all that apply)
   - Yes ☐ No ☐ Other: ______________________
   - Goat(s) ☐ Yes ☐ No ☐ Other: ______________________
   - Sheep ☐ Yes ☐ No ☐ Other: ______________________
   - Horse(s) ☐ Yes ☐ No ☐ Other: ______________________
   - Chickens ☐ Yes ☐ No ☐ Other: ______________________
   - Turkeys ☐ Yes ☐ No ☐ Other: ______________________
   - Rabbits ☐ Yes ☐ No ☐ Other: ______________________
   - Other: ______________________

3. Does your facility have animal exhibits where the public is encouraged or allowed to have direct contact with animals, e.g., petting zoo?
   - Yes ☐ No ☐ Other: ______________________
   - IF YES, please answer 3A and 3B. Refer to Question 4.

3A. Are hand washing facilities available to the public where they have direct contact with the animals?
   - Yes ☐ No ☐ Other: ______________________
   - IF YES, within the exhibit area?
     - Yes ☐ No ☐ Other: ______________________
   - At the end of the exhibit?
     - Yes ☐ No ☐ Other: ______________________
   - Located elsewhere on grounds, not associated with the exhibit?
     - Yes ☐ No ☐ Other: ______________________
   - Only near eating facilities or restrooms?
     - Yes ☐ No ☐ Other: ______________________
   - Other: ______________________

3B. What type of hand washing facilities are available to the public?
   - Yes ☐ No ☐ Other: ______________________
     - Running water ☐ Yes ☐ No ☐ Other: ______________________
     - Soap ☐ Yes ☐ No ☐ Other: ______________________
     - Disposable towels ☐ Yes ☐ No ☐ Other: ______________________
     - Hand sanitizer ☐ Yes ☐ No ☐ Other: ______________________

4. Does your facility have areas where animals are on exhibits or shown that are accessible to the public, e.g., horse show exhibit area?
   - Yes ☐ No ☐ Other: ______________________
   - IF YES, please answer 4A and 4B. Refer to Question 6.

4A. Do you keep lix in a designated area?
   - Yes ☐ No ☐ Other: ______________________

4B. Recommendations for reducing the risk of transmission of illness where the public has direct contact with animals in your facility or business?
   - Yes ☐ No ☐ Other: ______________________

Thank you for your help with this important survey.
Who completed the survey?

- Tennessee Department of Agriculture / Market Development Division mailed 2-page survey to 56 facilities

- 20 (36%) of 56 completed
  - 17 County fairs
  - 1 State fair
  - 2 Regional fairs
Results of survey
- 16 (80%) of 20 reported having ruminant livestock (sheep, goats, cattle)

- 15 (75%) of 20 reported having exhibits where the public is encouraged or allowed to have direct contact with animals (e.g., a petting zoo)
18 (90%) of 20 facilities reported that hand washing facilities are available to the public after direct contact with the animals.
Hand washing facilities available to the public – by type

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>% of Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running Water</td>
<td>70</td>
</tr>
<tr>
<td>Soap</td>
<td>60</td>
</tr>
<tr>
<td>Disposable Towels</td>
<td>60</td>
</tr>
<tr>
<td>Hand Sanitizer</td>
<td>65</td>
</tr>
</tbody>
</table>
Location of hand washing facilities

<table>
<thead>
<tr>
<th>Location</th>
<th>% of facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within exhibit area</td>
<td>50</td>
</tr>
<tr>
<td>At the exit of the exhibit</td>
<td>55</td>
</tr>
<tr>
<td>Location other than exhibit</td>
<td>45</td>
</tr>
<tr>
<td>Only near eating facilities</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>15</td>
</tr>
</tbody>
</table>
85% reported instructing visitors with signage to wash hands after touching animals
65% of facilities reported instructing visitors about the risks of illness following contact with animals.
Methods reported for instructing visitors about the **risks of illness** following animal contact

![Bar chart showing methods of instruction]

- **Posters/Signs**: 60%
- **Verbally**: 25%
- **Leaflets/brochures**: 10%
80% of facilities reported instructing visitors not to eat or drink in the animal area.
Methods reported for instructing of visitors not to eat or drink in the animal area.

- **Posters/Signs**: 75%
- **Verbally**: 25%
- **Leaflets/brochures**: 5%
Are **animal areas** designed to be separate from areas where food or beverages are prepared, served, or consumed?

Yes, 100%
Are exhibits designed to reduce visitor contact with animal manure or bedding?
Aware of the **CDC recommendations** for reducing the risk of disease transmission at venues where the public has contact with animals?
Recommendations

- Provide training for staff; information / education for visitors about risks
- Venue design - minimize risk
- Handwashing
- Special populations
Conclusions: Surveys in Tennessee

1. Prevalence of pathogens:
   - Tennessee fairs are comparable to fairs nationally, *E. coli* O157 and *Salmonella* common
   - Colonize livestock and contaminate environment

2. Observational study:
   - Visitors to Tennessee petting zoos engage in modifiable behavioral risk factors:
     - Touching face
     - Eating and drinking while in petting zoo
     - Verbal cues to practice hand hygiene
   - Venue layout is modifiable
     - Location of signage, food vendors and hand sanitizer stations
Conclusions: Surveys in Tennessee

3. Tennessee fairs report that:

- Most have ruminant livestock and direct contact exhibits

- Hand hygiene is accessible, could be better located at exit of animal exhibit

- Visitors are advised to practice hand hygiene, education with signs rather than verbal cues

- Food and animal exhibits separate, most manage manure to keep it away from public

- Good awareness that recommendations exist
Questions?