STECC OUTBREAK AT THE SAN DIEGO COUNTY FAIR

Eric McDonald, MD, MPH, Medical Director
Epidemiology and Immunization Services Branch
County of San Diego Health & Human Services Agency

CACDC Annual Meeting

October 30, 2019
No financial interests to disclose.

No Non-FDA approved medications will be discussed.
HISTORY OF FAIRS

- First fair in colonial America - intermittent fairs in Trenton Township since 1745 when King George II granted a royal charter allowing them to buy and sell livestock and other merchandise.

- Established in 1765, the Hants County Exhibition (Windsor, Nova Scotia) is the oldest continuously run agricultural fair in North America.

- “Oldest” American fair?
  - York, PA - 1765
  - Burton, OH – 1798 “jollification” became a “county fair” in 1823
  - Pittsfield, MA – 1807
  - Watertown, NY – 1818 “continuously operating”

- In 1841, New York organized the first state agricultural fair in Syracuse. 47 states have a state fair. (CT, RI and MA don't have them.)

- Established in 1875, Dixon May Fair is the oldest district fair and fairgrounds in California
SAN DIEGO COUNTY FAIR

Founded in 1880 as the San Diego County Horticultural and Agricultural Display

- Promoted local agricultural Array of exhibitions

- Scientific show once featured a daily miniature atomic bomb blast

Tightrope walker at the fairgrounds, circa 1936.

San Diego History Center
Local fairs became State agencies in 1904 when the legislature formally organized district agricultural associations to promote and encourage local agricultural and home industry.

The 22nd District Agricultural Association, the sponsor of the San Diego County Fair, was formed as a result of this legislation.

Patrons at the San Diego County Fair, circa 1920.  
[San Diego History Center](https://www.sandiegohistory.org)
SAN DIEGO COUNTY FAIR 2019

- May 31 – July 4
- Del Mar Fairgrounds
- 140 food vendors
- 1,531,119 people attended
- Largest county fair, 4th largest fair overall in the nation

Del Mar Fairgrounds
Shiga toxin-producing \textit{Escherichia coli} (STEC) are estimated to cause more than 265,000 illnesses each year in the United States.

STEC can cause illness that ranges from mild diarrhea to bloody diarrhea and life-threatening hemolytic uremic syndrome (HUS).

STEC are categorized into serogroups by their somatic O antigen.
The STEC serogroup most commonly identified and associated with severe illness and hospitalization in the United States is *E. coli* O157; however, there are over 50 other serogroups that can also cause illness.

The majority of infections are not reported to public health, because many individuals do not seek health care or are not tested.

In recent years, the number of clinical laboratories that use tests that detect Shiga toxin or Shiga toxin genes has increased, resulting in increased detection of both O157 and non-O157 STEC infections.
Ruminants: asymptomatic transient reservoirs

Survives in the environment

Fecal-oral. Low infectious dose

Symptoms:

- Fever
- Abdominal pain
- Bloody diarrhea
- Hemolytic uremic syndrome (HUS)
  - Children: 5 to 10% develop HUS

*SHIGA TOXIN-PRODUCING E. COLI (STEC)*

*E. coli O157:H7 under electron microscope.*

*CDC*
Grouped by calendar year. In 2017, there was a large outbreak of *E. coli* O157 in a military population; this outbreak was excluded from the 2015-2017 cases.

**Source:** COSD. Downloaded 10/28/19 from 2018 Annual CD Report at: https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/Epidemiology/San%20Diego%20County%20Annual%20Communicable%20Disease%20Report%202018.pdf
Shiga Toxin Producing Organisms* 2019 YTD by Report Month and Resolution Status

Number of Cases

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

Confirmed  Probable  Suspect

Created by the Epidemiology & Immunization Services Branch on 10/21/19
### Shiga Toxin-Producing *E. coli* Incidence, San Diego County, California, and United States, 2014-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>San Diego County</th>
<th>California</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>1.1</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>2015</td>
<td>1.4</td>
<td>2.4</td>
<td>2.2</td>
</tr>
<tr>
<td>2016</td>
<td>1.8</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>2017</td>
<td>8.7</td>
<td>3.3</td>
<td>2.7</td>
</tr>
<tr>
<td>2018</td>
<td>5.3</td>
<td>5.8</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**Source:** COSD. Downloaded 10/28/19 from 2018 Annual CD Report at: [https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/Epidemiology/San%20Diego%20County%20Annual%20Communicable%20Disease%20Report%202018.pdf](https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/Epidemiology/San%20Diego%20County%20Annual%20Communicable%20Disease%20Report%202018.pdf)
Source: COSD. Downloaded 10/28/19 from 2018 Annual CD Report at: https://www.sandiegocounty.gov/content/dam/sdc/hhsa/programs/phs/Epidemiology/San%20Diego%20County%20Annual%20Communicable%20Disease%20Report%202018.pdf
Tracking the E. coli outbreak

These timelines represent the first four shiga toxin-producing E. coli cases detected in the outbreak at the San Diego County Fair this summer, which killed a 2-year-old boy and produced 11 confirmed cases.

11-year-old’s timeline

A

B

C

D

Investigators call family of girl with positive E. coli test, receive no reply.

Public health nurse reaches family, confirms she visited sheep exhibit at the fair.

13-year-old’s timeline

A

B

C

D

Girl with positive E. coli toxin reports visiting cows, sheep and lambs at fair without washing hands.

Cabezuela dies from complications of hemolytic uremic syndrome

2-year-old Jedidiah Cabezuela confirmed to have ridden pony, visited petting zoo at fair.

2-year-old’s timeline

A

B

C

D

Boy with E. coli confirms fair attendance, denies animal contact.

9-year-old’s timeline

A

B

C

D

Family of boy revises statement, confirms visiting livestock barn at fair before boy became ill.

Five food booths where four individuals with E. coli cases ate are inspected; no E. coli source is found.

County inspects all 160 food booths at the fair, finds no obvious locations of E. coli exposure. All animal areas at the fair closed to the public.

Source: County of San Diego Health and Human Services Agency

MICHELLE GUERRERO U-T
Identified fourth case of STEC with fair exposure

At that point, we knew....

- 2-year-old with HUS; death
- Two positive for Stx 2; two *E. coli* O157
- All visited ~3 days before symptom onset
- No food or vendor in common
- All reported contact, and/or exposure to a building, with livestock

Officials closed petting zoo and livestock barn to the public
CASE FINDING

- Emergency department physicians: report + test patients with bloody diarrhea and fair exposure
- Local health alert
- Press release and county website
- Cases re-interviewed
- Every STEC report = person under investigation
Identified via culture and/or culture-independent diagnostic tests

California Department of Public Health (CDPH) Microbial Diseases Laboratory (MDL) and County of San Diego (COSD) Public Health Laboratory (PHL):

- Culture confirmation
- Pulse-field gel electrophoresis (PFGE)
- Whole genome sequencing (WGS)
Team dispatched on Tuesday, July 2

- Veterinarian from California Department of Food & Agriculture (CDFA)
- Epidemiologist, disease investigator, nurse from COSD Health & Human Services Agency
- Inspected animal facilities
  - Layout, set up and breakdown, decontamination

Department of Environmental Health Food and Housing Division inspected 140 food vendors
California Grown Building, Chevrolet Livestock Barn, Chevrolet Barn W

- 15 soil specimens
- 17 surface swabs
  - barn walls, fencing and mats
- CDPH Food and Drug Laboratory Branch (FDLB)
ANIMAL LAB INVESTIGATION

Equine (pony ride)

- 22 fecal specimens
- 5 rectal swabs
- California Animal Health & Food Safety (CAHFS) Laboratory and COSD PHL

Goats, cattle and sheep (petting zoo, California Grown building)

- 17 fecal specimens
- 4 milk specimens
- CAHFS Laboratory, COSD PHL and CDPH MDL
- Two rounds of testing
Interviewed with CDPH case report form

Supplemental questionnaire focused on fair exposures

- Exposure details obtained from parent(s)
- “At minimum touched a cow….”; “Wasn’t with them the whole time…”
- Layout of animal exhibits not immediately clear
  - One big petting zoo? Two Chevrolet barns?
Confirmed:

- Case with isolation of *E. coli* O157 or HUS with fair attendance

Probable:

- Clinically compatible + Stx CIDT, OR
- Clinically compatible + STEC CIDT, OR
- Clinically compatible + epidemiological link to a confirmed or probable case
OUTBREAK DEFINITION

Primary:
- Case that visited the Del Mar Fairgrounds during the 10 days before illness onset.

Secondary:
- Epidemiologically linked case to an outbreak-associated confirmed case and did not visit the Del Mar Fairgrounds during the 10 days before illness onset.
13 cases outbreak-related

- 10 confirmed primary, 1 confirmed secondary, 2 probable primary
- 6 males, 7 females
- Median age: 6 years (1 – 51)
  - 83% of primary cases <15 years
- Attendance: June 8 - June 23
- Onsets: June 10 - July 6
- Hospitalizations: 3; HUS: 2; Deaths: 1
  - 15% with HUS. Higher than expected. Undiagnosed STEC?
Outbreak-associated cases of *E. coli* O157 by onset date

6/10/2019-7/6/2019, N = 13

- **Confirmed Primary**
- **Probable Primary**
- **Confirmed Secondary**

Outbreak confirmed; Animal exhibits closed

SDC CAHAN

Created by the Epidemiology & Immunization Services Branch on 8/7
10 outbreak-related cases match by PFGE

PFGE pattern Xbal/BlnI combination EXHX01.0200/EXHA26.0626

- Rare. 11 matches in PulseNet database
  - 2016 (1), 2017 (2), 2018 (5), 2019 (3)
  - CA (5), OR (5), IL (1)
- Median age: 7 years (1 – 66)
- Two California matches reported fair/petting zoo exposure
WGS: 12 cases within 0-2 alleles of each other. Outbreak clade.

- 10 San Diego outbreak-related
- 1 Contra Costa, attended Alameda County Fair on June 14
  - Petting zoo exposure
- 1 Alameda, loss to follow-up, collected in January
ENVIRONMENTAL RESULTS

Chevrolet Livestock Barn

- Competitive livestock
- Weekly turnover
- Exhibitions completed June 30th
  - No animals for testing
- Shavings replaced and manure disposed of daily
- Dirt floor
  - Top layer scraped off weekly

Chevrolet Livestock Barn, July 2nd, 2019.
Brian Murphy
ENVIRONMENTAL RESULTS

California Grown Building Petting Zoo

- Petting zoo livestock
- No turnover
- Available for testing
- Quarantined until two negative specimens
- Shavings replaced and manure disposed of daily
- Concrete floor
  - Daily disinfection

Woman feeding goats in the petting zoo, 2019. Times of San Diego
<table>
<thead>
<tr>
<th>Source</th>
<th>Lab</th>
<th>7/1</th>
<th>7/2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FECES</strong></td>
<td></td>
<td>Horse</td>
<td>Cattle</td>
</tr>
<tr>
<td></td>
<td>CDPH MDL</td>
<td>Stx 2 STEC O-und (1)</td>
<td>NEG (1)</td>
</tr>
<tr>
<td></td>
<td>COSD PHL</td>
<td>NEG (22)</td>
<td>Stx 1 &amp; 2 (1)</td>
</tr>
<tr>
<td></td>
<td>CAHFS</td>
<td>NEG (22)</td>
<td>NEG (2)</td>
</tr>
<tr>
<td><strong>RECTUM</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAHFS</td>
<td>NEG (5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COSD PHL</td>
<td>NEG (5)</td>
<td></td>
</tr>
<tr>
<td><strong>MILK</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAHFS</td>
<td>NEG (1)</td>
<td>NEG (3)</td>
</tr>
<tr>
<td><strong>SOIL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CDPH FDLB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*<em>SURFACES</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* barn walls, stall fencing and mats

Created by Epidemiology & Immunization Services Branch on 8/7/2019.
<table>
<thead>
<tr>
<th>Date of Collection</th>
<th>7/9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FECES</strong></td>
<td></td>
</tr>
<tr>
<td>CDPH MDL</td>
<td></td>
</tr>
<tr>
<td>COSD PHL</td>
<td></td>
</tr>
<tr>
<td>CAHFS</td>
<td>NEG (2)</td>
</tr>
<tr>
<td><strong>RECTUM</strong></td>
<td></td>
</tr>
<tr>
<td>CAHFS</td>
<td></td>
</tr>
<tr>
<td>COSD PHL</td>
<td></td>
</tr>
<tr>
<td><strong>MILK</strong></td>
<td></td>
</tr>
<tr>
<td>CAHFS</td>
<td></td>
</tr>
<tr>
<td><strong>SOIL</strong></td>
<td></td>
</tr>
<tr>
<td>CDPH FDLB</td>
<td></td>
</tr>
<tr>
<td>*<em>SURFACES</em></td>
<td></td>
</tr>
<tr>
<td>CDPH FDLB</td>
<td></td>
</tr>
</tbody>
</table>

*barn walls, stall fencing and mats

Created by Epidemiology & Immunization Services Branch on 8/7/2019.
DISCUSSION

How do we mitigate the risk of future outbreaks?

- Information about the risks before entering petting zoos
  - English and Spanish
  - Young and/or immunocompromised
- Limit animal contact…
  - Duration?
  - Extent? (e.g., kissing, hugging)
  - Age? (e.g., must be older than 2 years)
- Handwashing stations
  - Consider height and thoroughness
Figure 3—Examples of 2 designs for facilities with animal exhibit areas, including clearly designated animal areas, nonanimal areas, and transition areas with handwashing stations and signs.1–3 (Adapted from NASPHV Animal Contact Committee 2013. Compendium of measures to prevent disease associated with animals in public settings, 2013. J Am Vet Med Assoc 2013;243:1270–1288. Reprinted with permission.)

Source: JAVMA. Downloaded 10/28/19 from: https://avmajournals.avma.org/doi/pdf/10.2460/javma.251.11.1268
All animals can carry germs that make people sick.

Some people are more likely to get sick: babies, toddlers, pregnant women, older adults, and those with weakened immune systems.

Stay Healthy:
- No food, drinks, baby bottles, pacifiers, toys, or strollers in animal areas.
- Watch kids & those with intellectual disabilities around animals.
- Make sure kids don’t put their fingers or other things in their mouths.
- Wash hands with soap & water right after visiting the animals.

Stop germs!

Source: JAVMA.
Downloaded 10/28/19 from: https://avmajournals.avma.org/doi/pdf/10.2460/javma.251.11.1268
ANIMAL HANDLING SAFETY TIPS

After Petting Animals, Wash Your Hands!

ALWAYS

Use SOAP and WATER.
RUB hands together for 20 seconds.
WASH backs of hands, lower forearms, wrists, between fingers, and under fingernails.
DRY hands with a clean paper towel.

Source: CDFA. Downloaded 10/28/19 from: https://www.cdfa.ca.gov/Fairs_&_Expositions/Information/Animal_Exhibit_Signage.asp
For Your Safety

DO NOT bring these items into the animal area

Please watch your children

Wash your hands as soon as you exit!

Source: CDFA. Downloaded 10/28/19 from: https://www.cdfa.ca.gov/Fairs_&_Expositions/Information/Animal_Exhibit_Signage.asp
Thanks for Visiting!

To protect your children and yourself:

Children and adults must wash their hands upon exiting!

Source: CDFA. Downloaded 10/28/19 from: https://www.cdfa.ca.gov/Fairs_&_Expositions/Information/Animal_Exhibit_Signage.asp
For Your Safety
After Visiting Animal Areas
ALWAYS
Wash Your Hands

* Use soap and water
* Work up a good lather
* Rub hands together for 20 seconds or sing “Happy Birthday” twice!
* Remember to wash between fingers, under fingernails, back of hands, wrists, and lower arm
* Dry hands with clean paper towels

Please help your children

Source: CDFA. Downloaded 10/28/19 from: https://www.cdfa.ca.gov/Fairs_&_Expositions/Information/Animal_Exhibit_Signage.asp
REFERENCES

For more information contact:

**Eric C. McDonald, MD, MPH, FACEP**  
Medical Director, Epidemiology and Immunizations Services  
Public Health Services  
County of San Diego Health and Human Services Agency

3851 Rosecrans Street (MS-P578)  
San Diego, CA 92110  
Phone: (619) 692-8436  
Fax: (858) 715-6458  
Email: eric.mcdonald@sdcounty.ca.gov