



# STEC OUTBREAK AT THE SAN DIEGO COUNTY FAIR

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CACDC Annual Meeting



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**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 fair-grounds 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 <sup>1</sup>**



**Tightrope walker at the fairgrounds, circa 1936.**

[San Diego History Center](#)

# SAN DIEGO COUNTY FAIR



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](#)

# SAN DIEGO COUNTY FAIR 2019



- May 31 – July 4
- Del Mar Fairgrounds
- 140 food vendors
- 1,531,119 people attended
- Largest county fair,  
4<sup>th</sup> largest fair overall  
in the nation <sup>1,2</sup>



Del Mar Fairgrounds





Photo Credit: [KPBS](https://www.kpbs.com).



Photo Credit: [KPBS](#).

# SHIGA TOXIN-PRODUCING E. COLI (STEC)



- Shiga toxin-producing *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.

# SHIGA TOXIN-PRODUCING E. COLI (STEC)



LIVE WELL  
SAN DIEGO

- 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.

# SHIGA TOXIN-PRODUCING E. COLI (STEC)



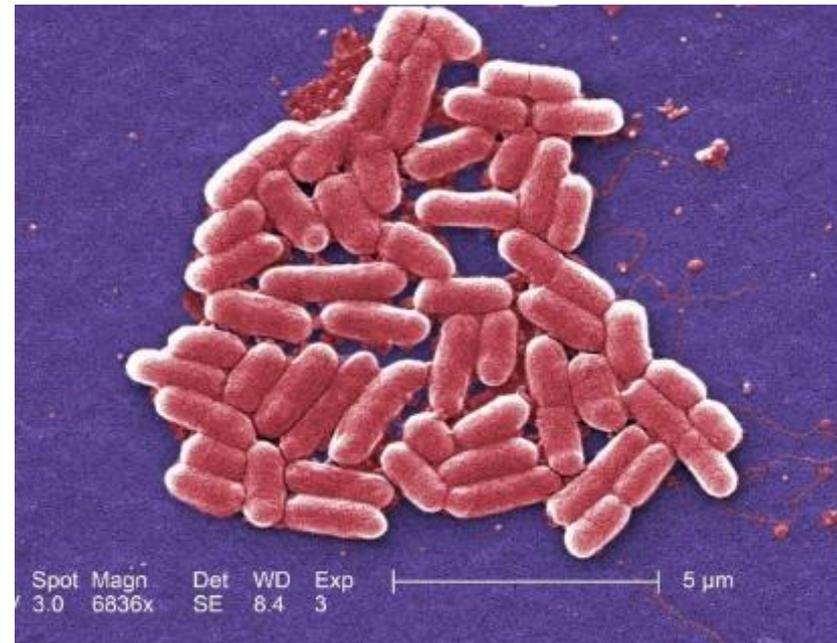
**Ruminants: asymptomatic transient reservoirs**

**Survives in the environment <sup>4</sup>**

**Fecal-oral. Low infectious dose <sup>5</sup>**

**Symptoms:**

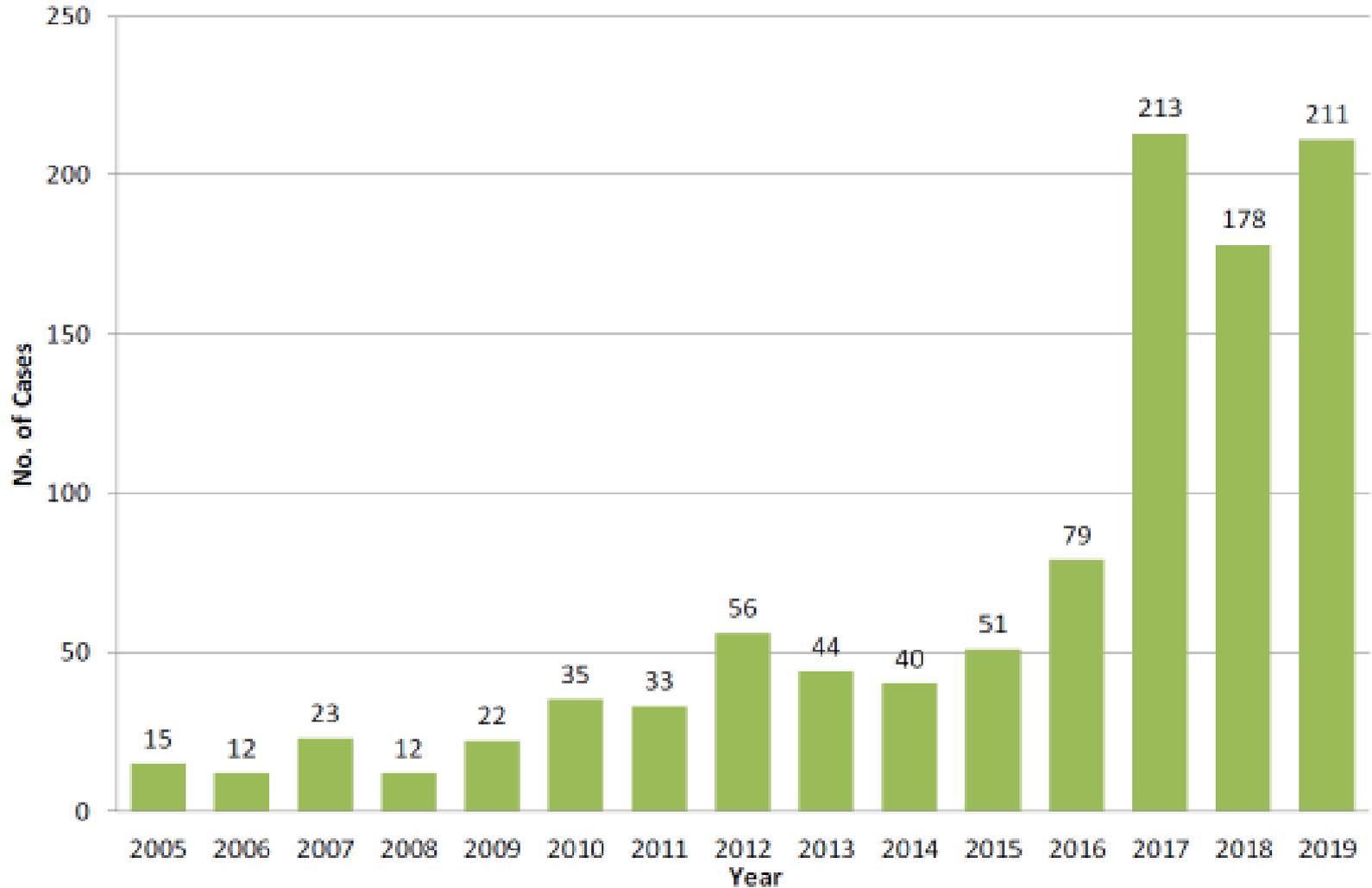
- **Fever**
- **Abdominal pain**
- **Bloody diarrhea**
- **Hemolytic uremic syndrome (HUS)**
  - **Children: 5 to 10% develop HUS <sup>3</sup>**



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

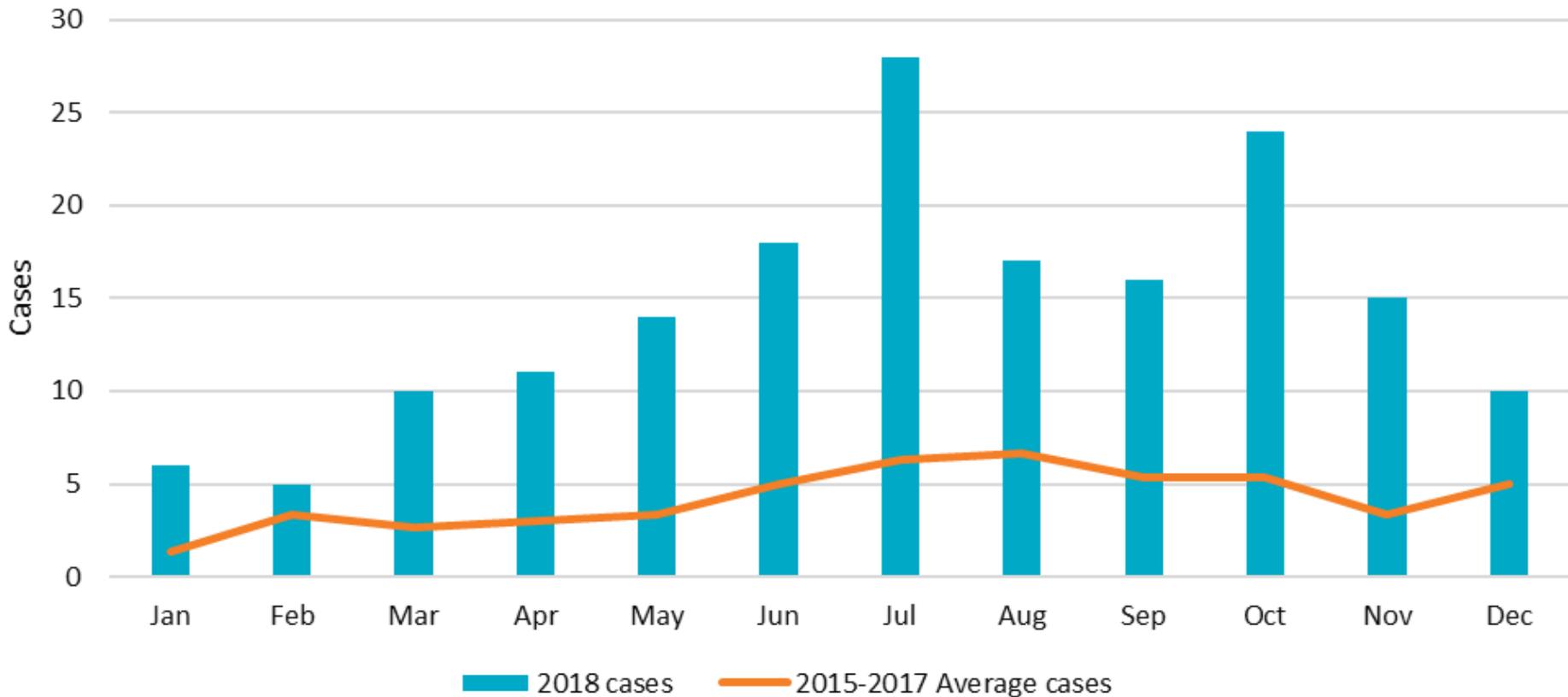
CDC

## Shigatoxin Producing Organisms\*, 2005-2019 YTD



\* Includes Shiga toxin-producing (STEC) and Shiga toxin-producing (STEC)-HUS

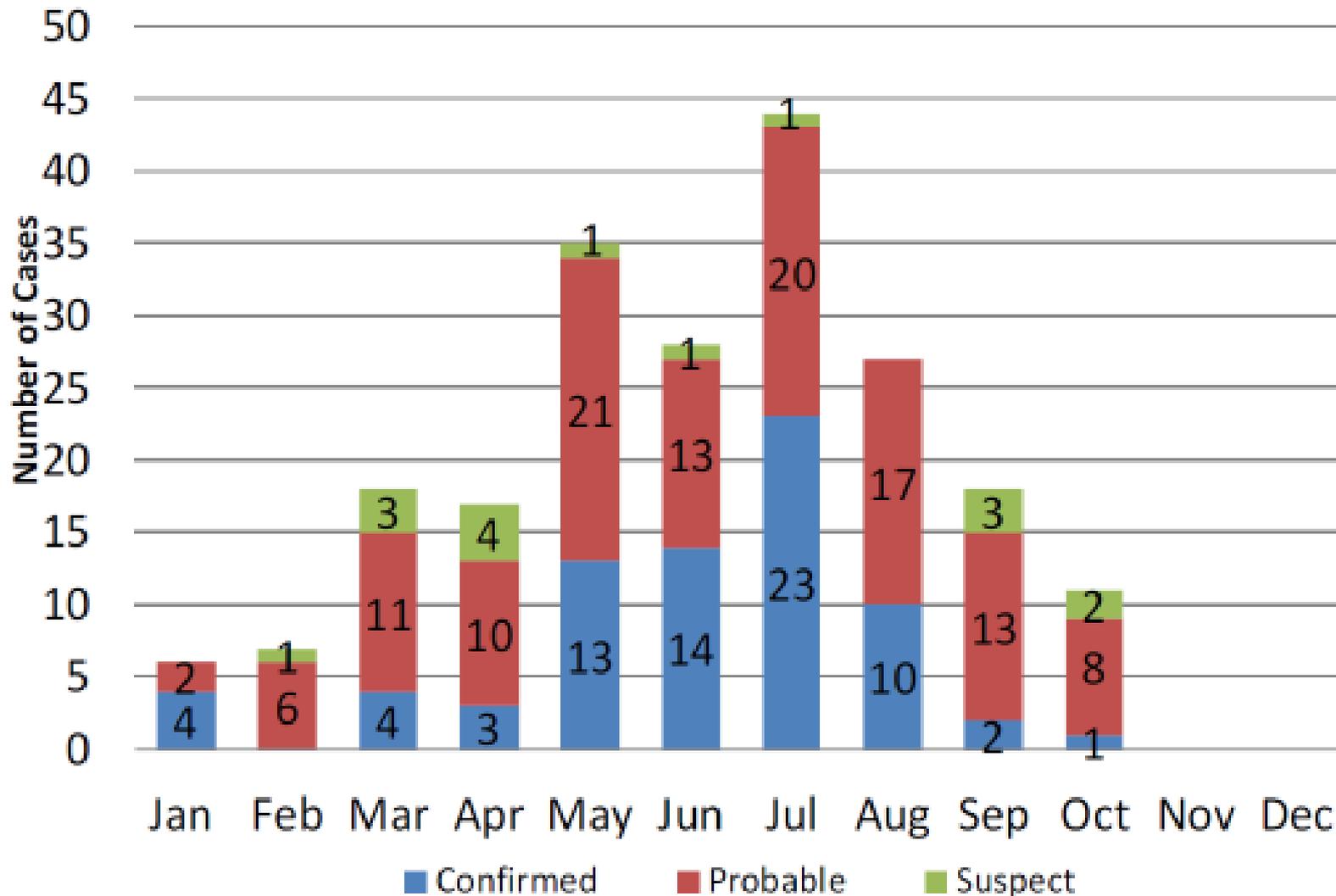
Figure 2. Shiga Toxin-Producing *E. coli* Cases by Month of Onset, San Diego County, 2018



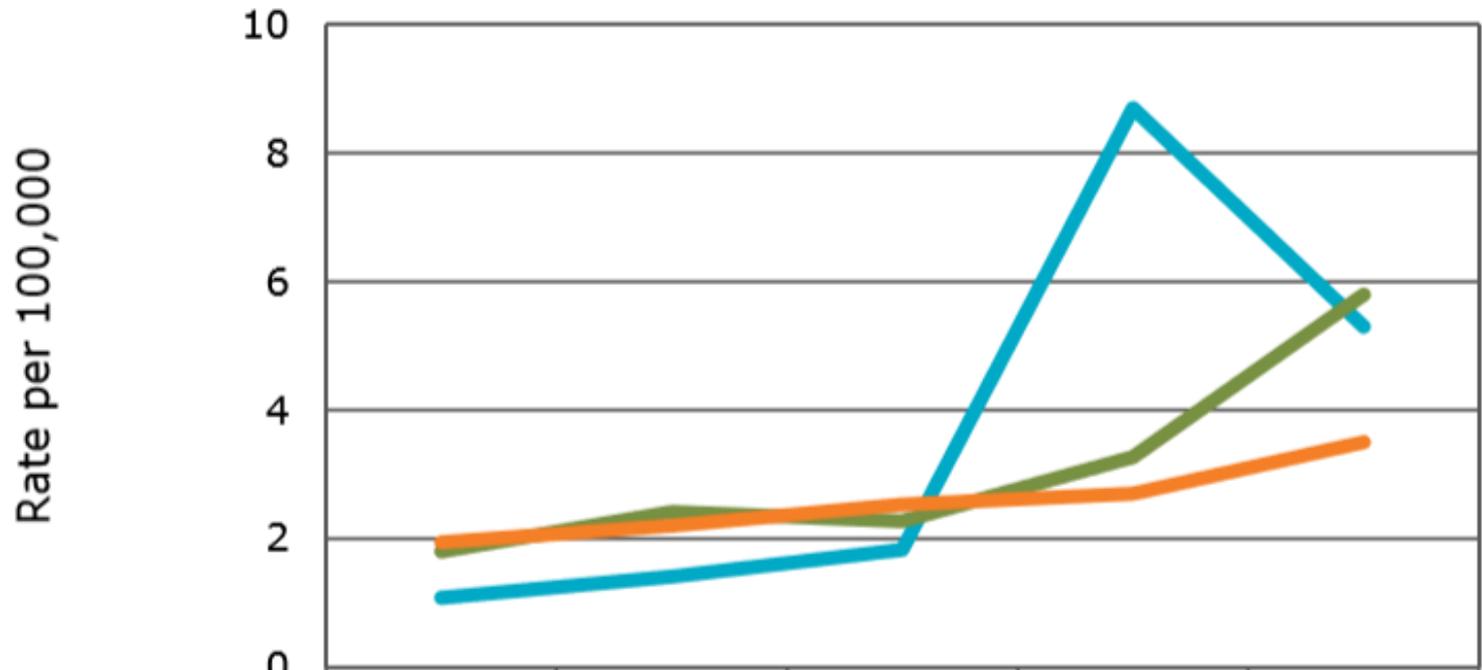
Grouped by calendar year. In 2017, there was a large outbreak of *E. coli* O157 in a military population; this outbreak was excluded from the 2015-2017 cases.

**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



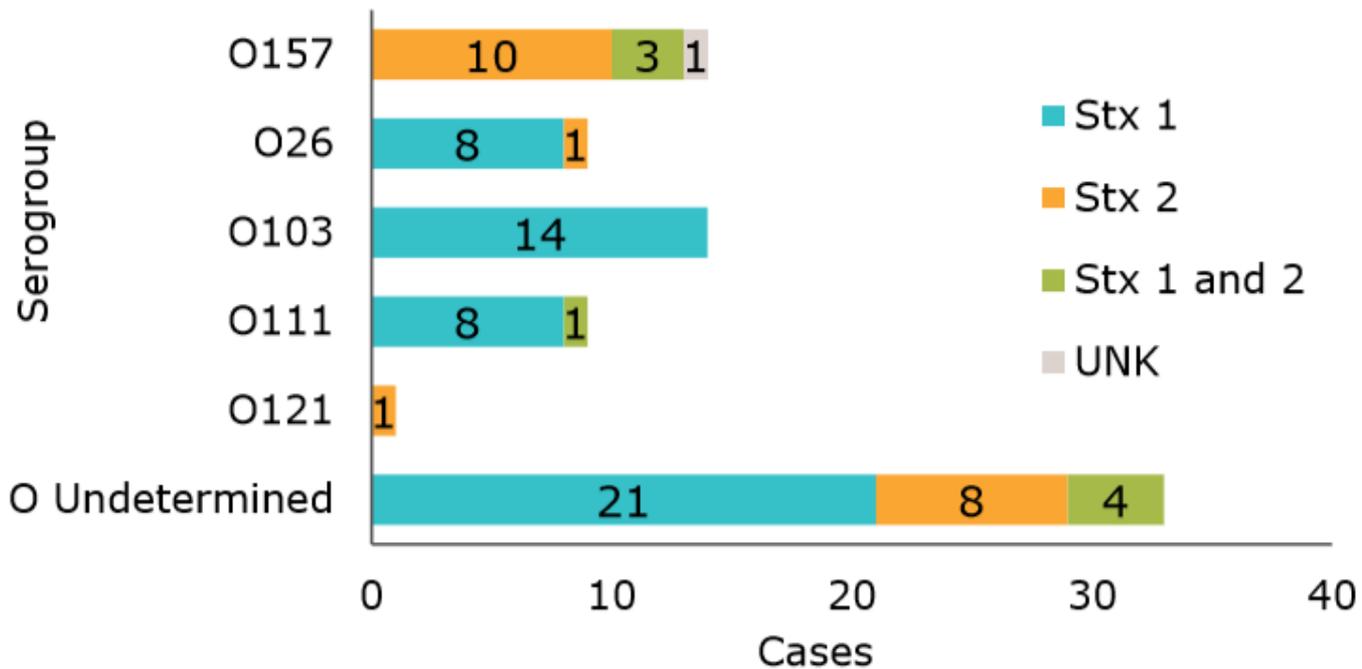
## Shiga Toxin-Producing *E. coli* Incidence, San Diego County, California, and United States, 2014-2018



	2014	2015	2016	2017	2018
San Diego County	1.1	1.4	1.8	8.7	5.3
California	1.8	2.4	2.3	3.3	5.8
United States	1.9	2.2	2.5	2.7	3.5

**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>

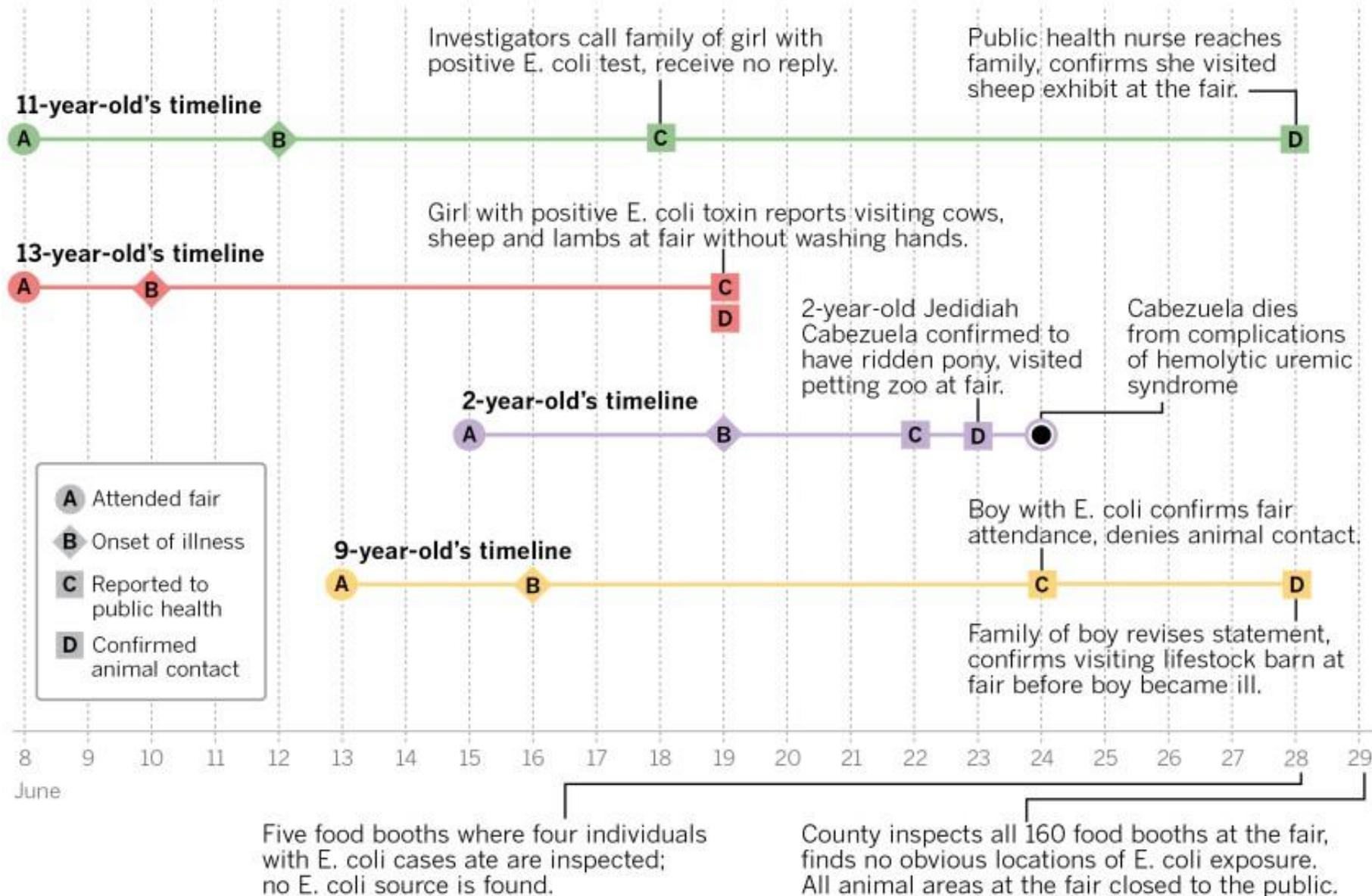
### Serogroups of Culture-Confirmed Shiga Toxin-Producing *E. coli* Cases by Shiga Toxin (Stx) Type, San Diego County, 2018



**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.





## 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



- **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**

E

BLUE MOON  
CROSSOVER

CHEVROLET  
BARN W

116

115

114

113

WORLD  
OF HORSES  
May 31-June 23

112

CHEVROLET  
LIVESTOCK BARN

111

100

101

102

CALIFORNIA  
GROWN  
presented by  
HOLLANDIA DAIRY

103

104

105

106

WYLAND WAY

110

109

LIVESTOCK  
JUDGING

LIVESTOCK WAY



THEME EXHIBIT







## **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.**

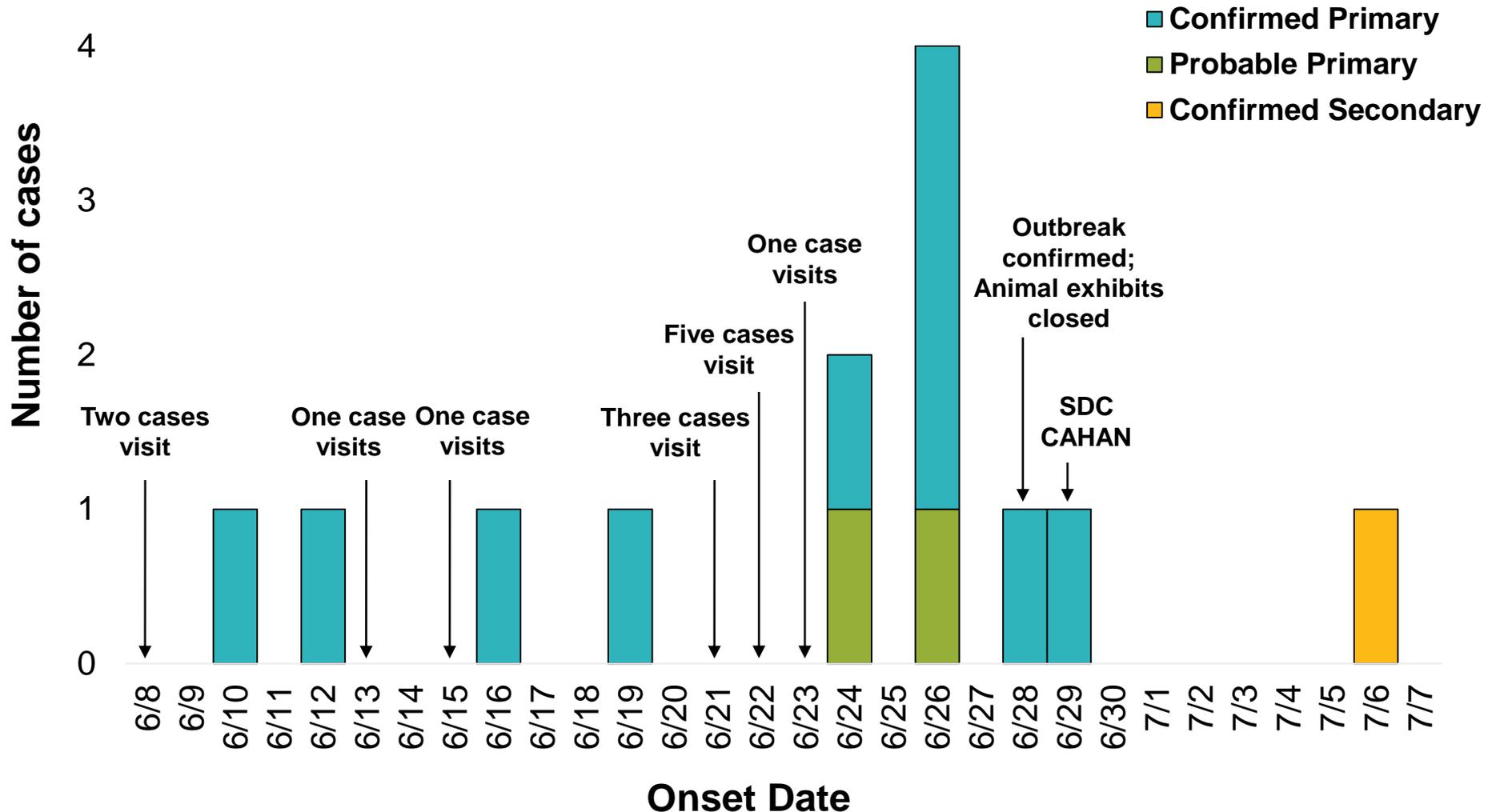


## 13 cases outbreak-related

- 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





## 10 outbreak-related cases match by PFGE

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

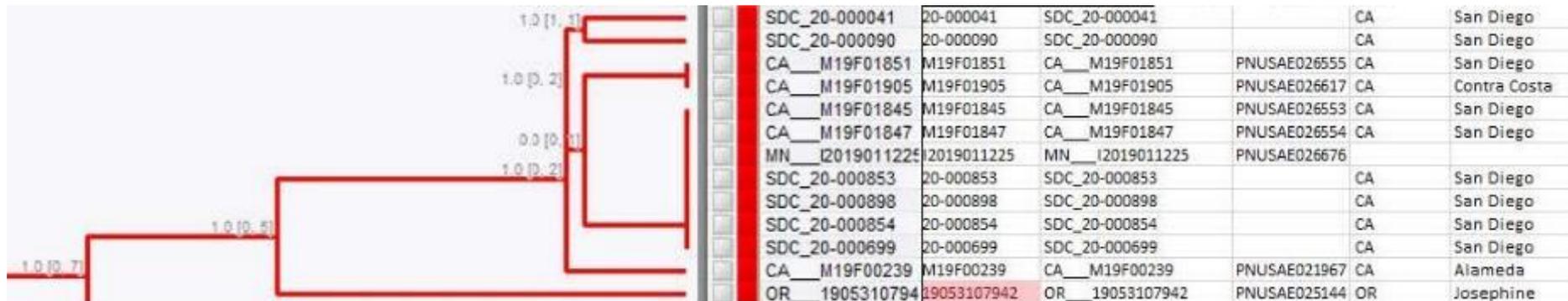
- Rare. 11 matches in PulseNet database
  - 2016 (1), 2017 (2), 2018 (5), 2019 (3)
  - CA (5), OR (5), IL (1)
- Median age: 7 years (1 – 66)
- Two California matches reported fair/petting zoo exposure

# HUMAN LAB RESULTS



**WGS: 12 cases within 0-2 alleles of each other. Outbreak clade.**

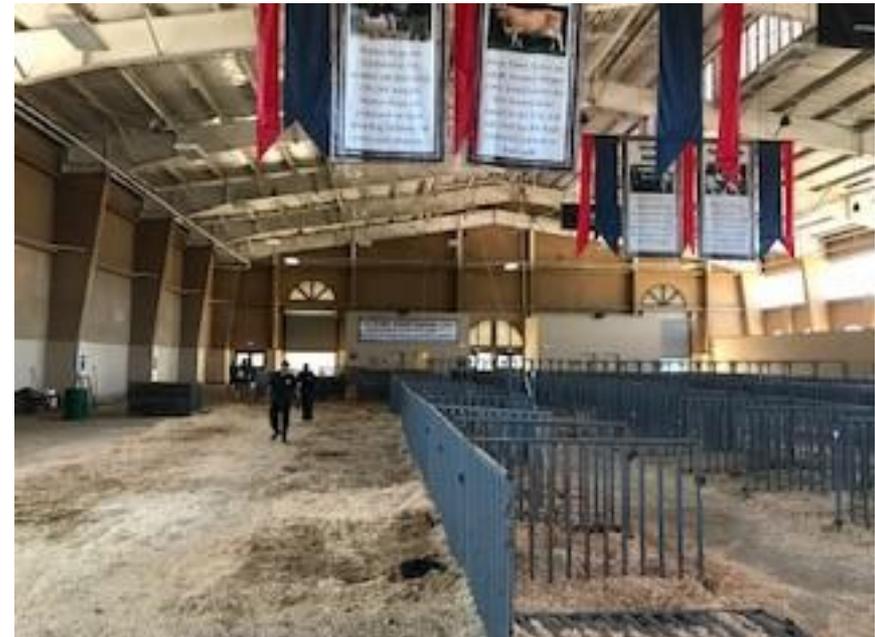
- 10 San Diego outbreak-related
  - 1 Contra Costa, attended Alameda County Fair on June 14
    - Petting zoo exposure
- 1 Alameda, loss to follow-up, collected in January





## Chevrolet Livestock Barn

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



**Chevrolet Livestock Barn, July 2<sup>nd</sup>, 2019.**  
**Brian Murphy**



## 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](#)

## Laboratory Result (n)

Date of Collection		7/1	7/2			
Source	Lab	Horse	Cattle	Goat	Sheep	Environ
FECES	CDPH MDL		Stx 2 STEC O-und (1) NEG (1)	NEG (10)	NEG (5)	
	COSD PHL	NEG (22)	Stx 1 & 2 (1) NEG (1)	Stx 1 (4) NEG (6)	Stx 1 (2) NEG (3)	
	CAHFS	NEG (22)	NEG (2)	NEG (10)	NEG (5)	
RECTUM	CAHFS	NEG (5)				
	COSD PHL	NEG (5)				
MILK	CAHFS		NEG (1)	NEG (3)		
SOIL	CDPH FDLB					NEG (15)
SURFACES*	CDPH FDLB					NEG (17)

\*barn walls, stall fencing and mats

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

## Laboratory Result (n)

Date of Collection		7/9		
Source	Lab	Cattle	Goat	Sheep
FECES	CDPH MDL			
	COSD PHL			
	CAHFS	NEG (2)	NEG (10)	NEG (5)
RECTUM	CAHFS			
	COSD PHL			
MILK	CAHFS		NEG (2)	
SOIL	CDPH FDLB			
SURFACES*	CDPH FDLB			

\*barn walls, stall fencing and mats

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

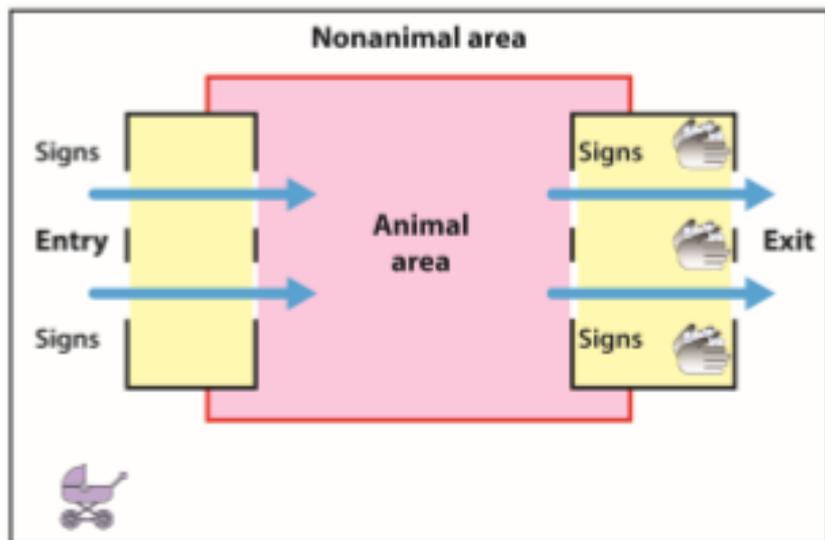


## How do we mitigate the risk of future outbreaks?

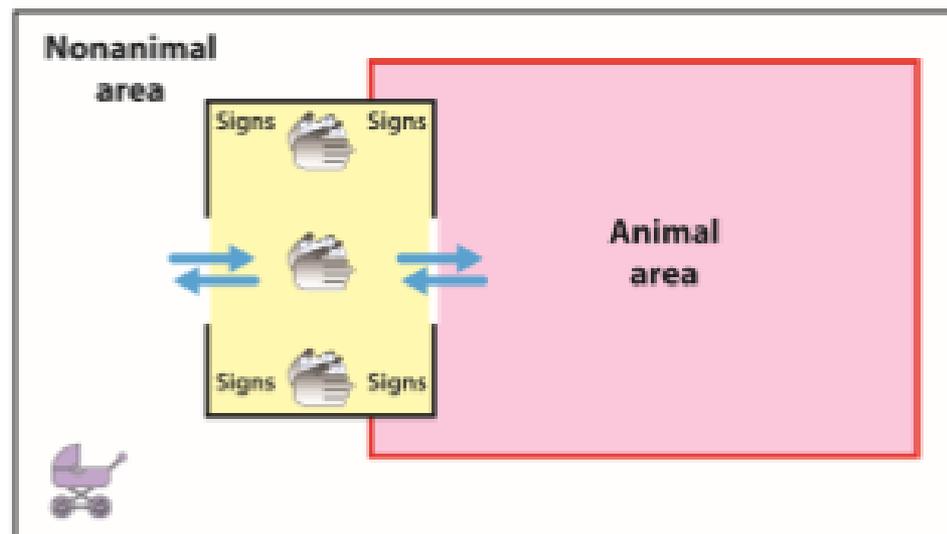
- **Information about the risks before entering petting zoos**
  - **English and Spanish**
  - **Young and/or immunocompromised**
- **Limit animal contact...**
  - **Duration?**
  - **Extent? (e.g., kissing, hugging)**
  - **Age? (e.g., must be older than 2 years)**
- **Handwashing stations**
  - **Consider height and thoroughness**



Design 1



Design 2



**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.<sup>1-3</sup> (Adapted from NASPHV Animal Contact Compendium 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.)



Transition into or out of animal area (single entry and exit shown in Design 2)



Storage for strollers and other personal items



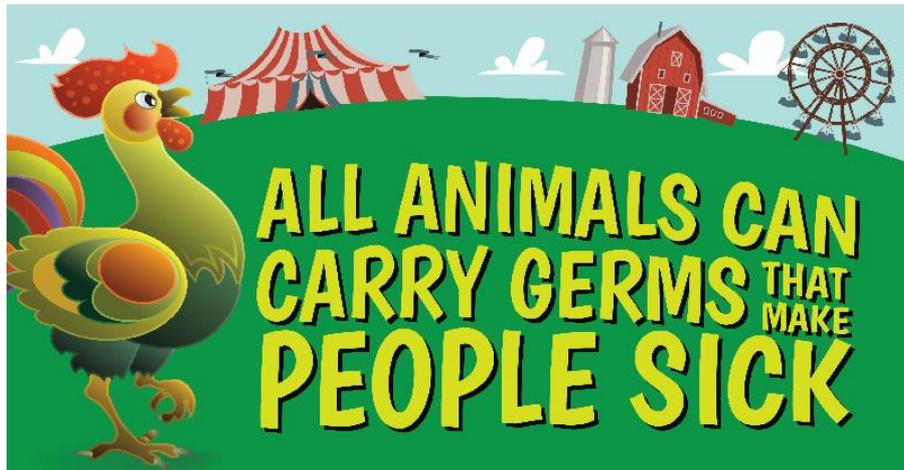
Flow of visitors



Hand-washing station

**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!

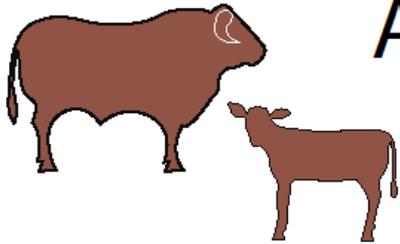
**Source: JAVMA.**

Downloaded 10/28/19 from:

<https://avmajournals.avma.org/doi/pdf/10.2460/javma.25>

[1.11.1268](https://doi.org/10.2460/javma.25)

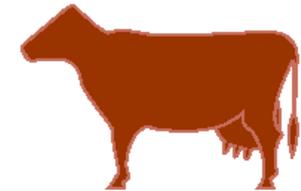
# ANIMAL HANDLING SAFETY TIPS



After Petting Animals,  
Wash Your Hands!



# ALWAYS

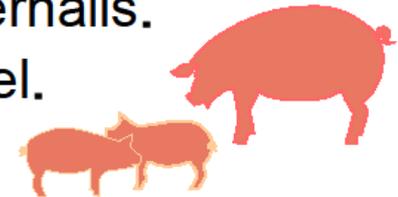
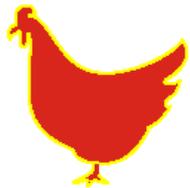


Use **SOAP** and **WATER**.

**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](https://www.cdfa.ca.gov/Fairs%20&%20Expositions/Information/Animal%20Exhibit%20Signage.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](https://www.cdfa.ca.gov/Fairs%20&%20Expositions/Information/Animal%20Exhibit%20Signage.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.cdca.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](https://www.cdfa.ca.gov/Fairs%20&%20Expositions/Information/Animal%20Exhibit%20Signage.asp)

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2. San Diego Fair. (2018). Retrieved from <https://sdfair.com/>
3. Grauke, Luke., Kudva, Indira., Yoon, Jang., Hunt, Carl., Williams, Christopher., Hovde, Carolyn. (2002). Gastrointestinal tract location of *Escherichia coli* O157:H7 in ruminants. *Applied and Environmental Microbiology*, 68, 2269-2277. doi:10.1128/AEM. 68.5.2269–2277.2002
4. National Association of State Public Health Veterinarians. Compendium of measures to prevent disease associated with animals in public setting, 2017. *J Am Vet Med Assoc* 2017;251:1268-1292.
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LIVE WELL  
SAN DIEGO

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