

Zoonotic Disease Detectives



Agenda

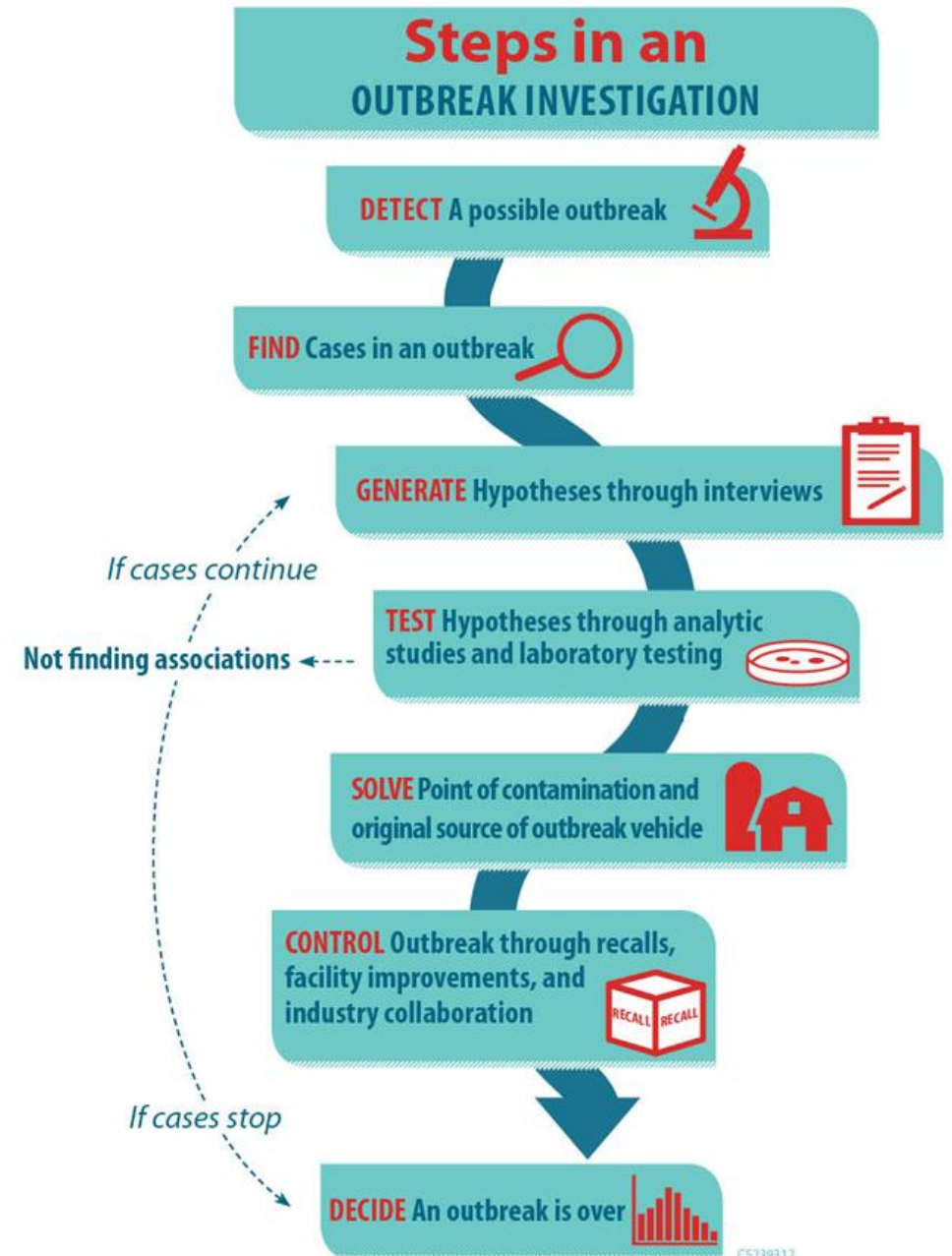
- Introductions
- Discuss steps in an outbreak investigation
- Outbreak scenario and activities
- Discussion of real-life outbreak investigation
- Conclusion

Foodborne and Zoonotic Outbreak Investigations

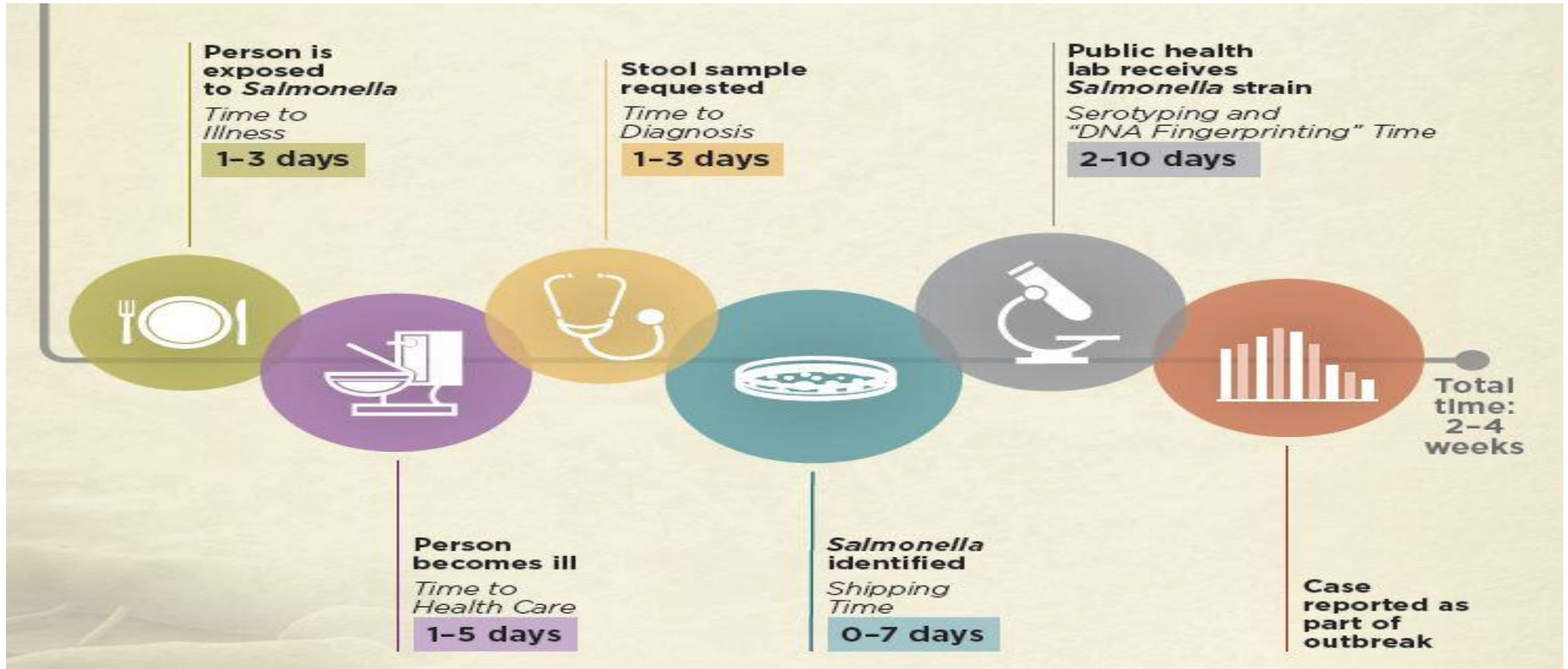


Steps in an Outbreak Investigation

1. Detect a possible outbreak
2. Find additional ill people
3. Generate hypotheses about the cause
4. Test hypotheses with studies and/or microbiologic testing
5. Pinpoint the cause
6. Take actions to stop the outbreak
7. Confirm the outbreak is over and communicate the results



Timeline for Reporting Cases of *Salmonella* Infection



Detecting Outbreaks with PulseNet

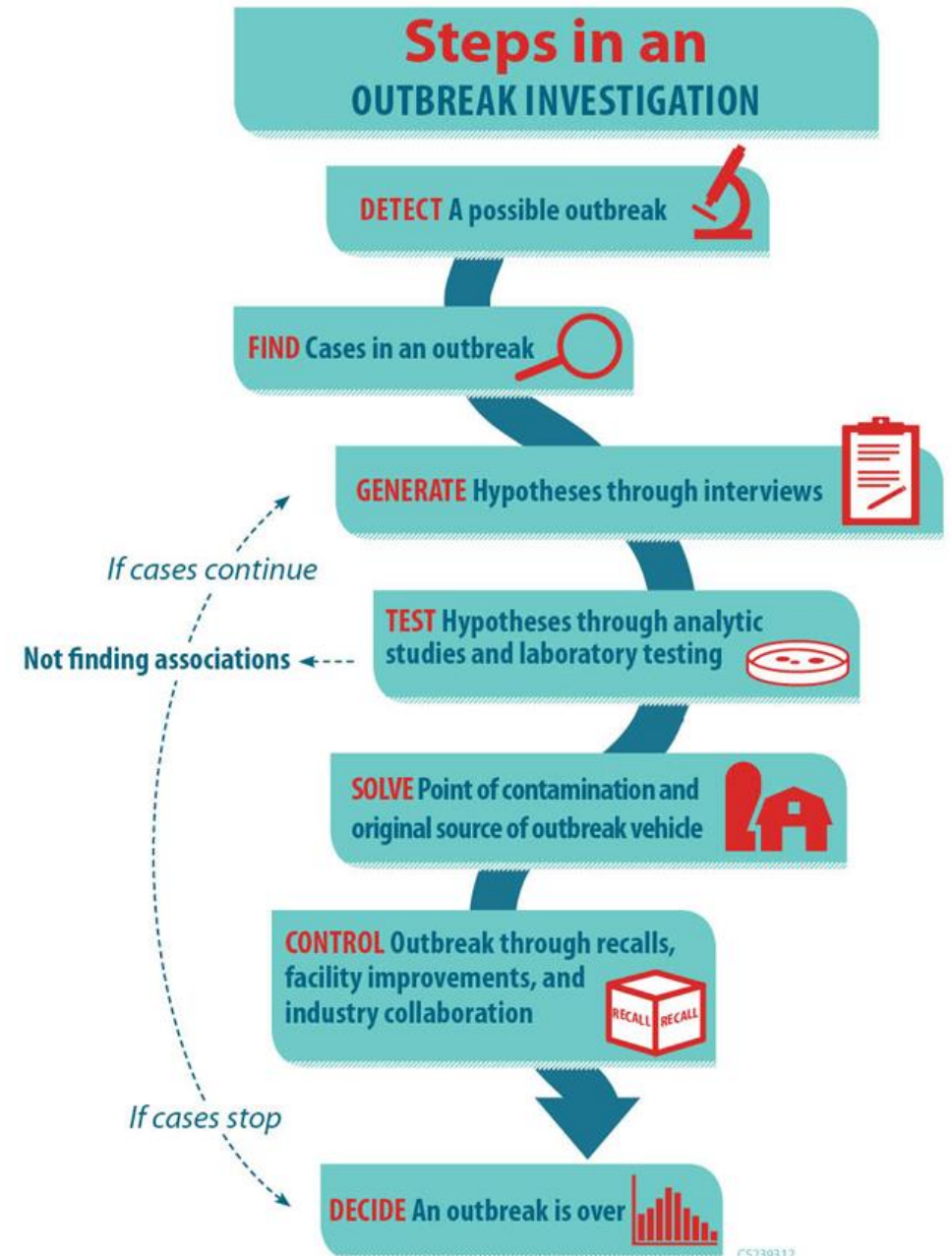
- Subtyping enteric bacteria is essential to identifying highly disseminated outbreaks
- PulseNet laboratory network established in 1996
- Bacteria collected from ill people undergo DNA “fingerprinting” using pulse-field gel electrophoresis (PFGE)



Bacteria with the same “fingerprint” are *more likely* to come from a common source

Steps in an Outbreak Investigation

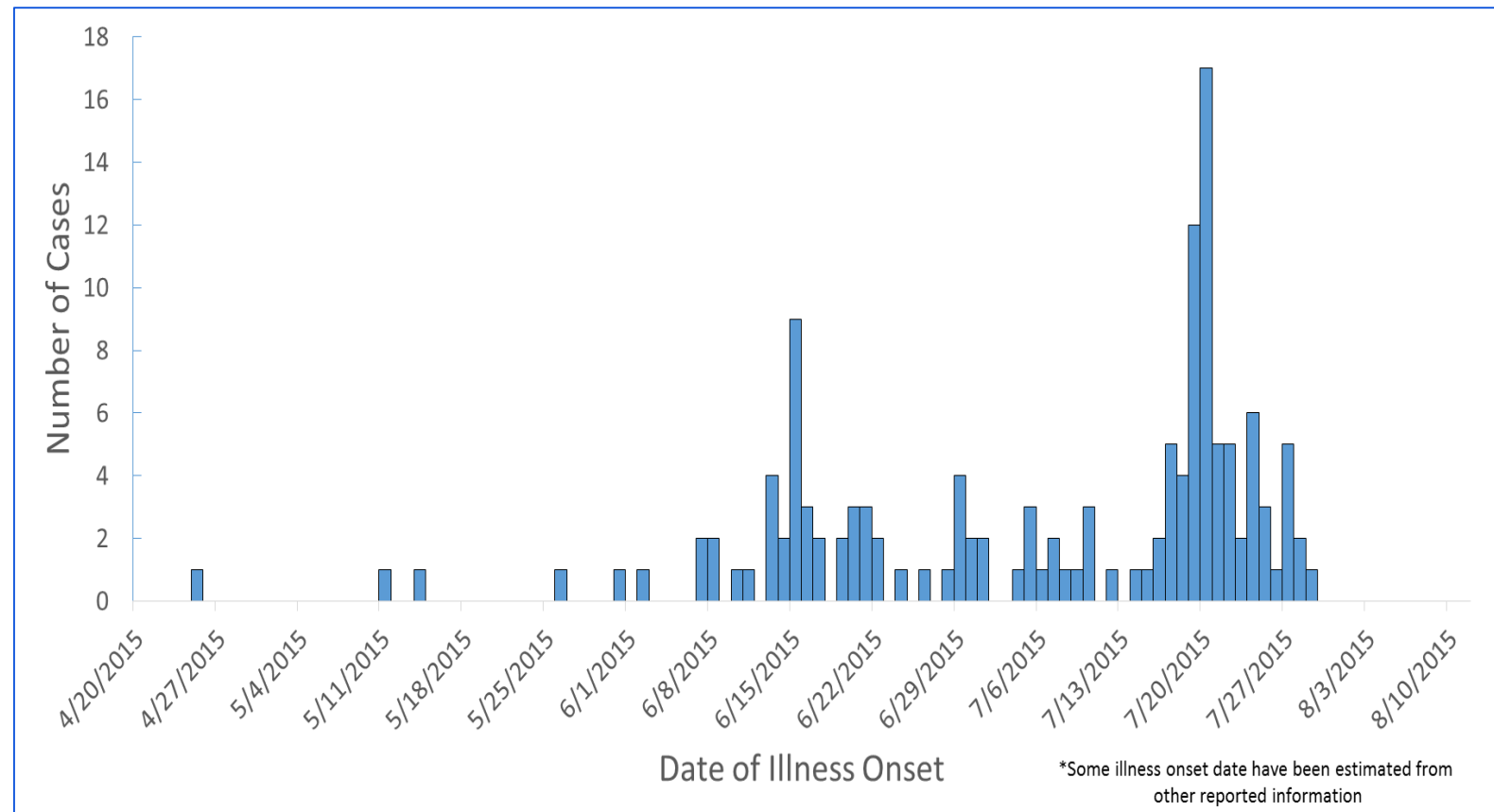
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Epidemiologic Information

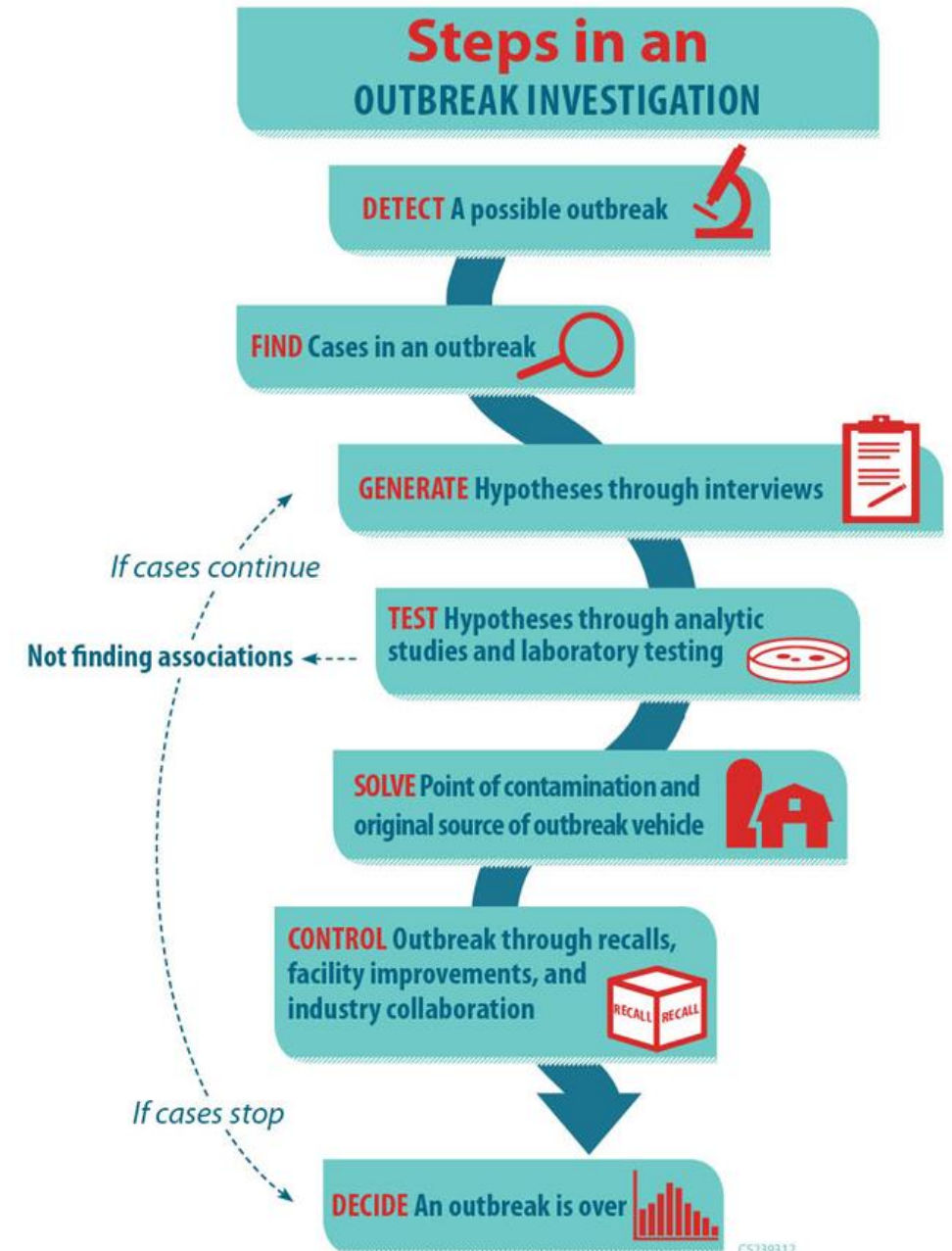
- 45% female
- Median age 35 years
 - (range 1–90)
- 15% hospitalized
- No deaths
- Illness onset dates:
 - April 25 – July 25

People Infected with the Outbreak Strain of *Salmonella*, by date of illness onset

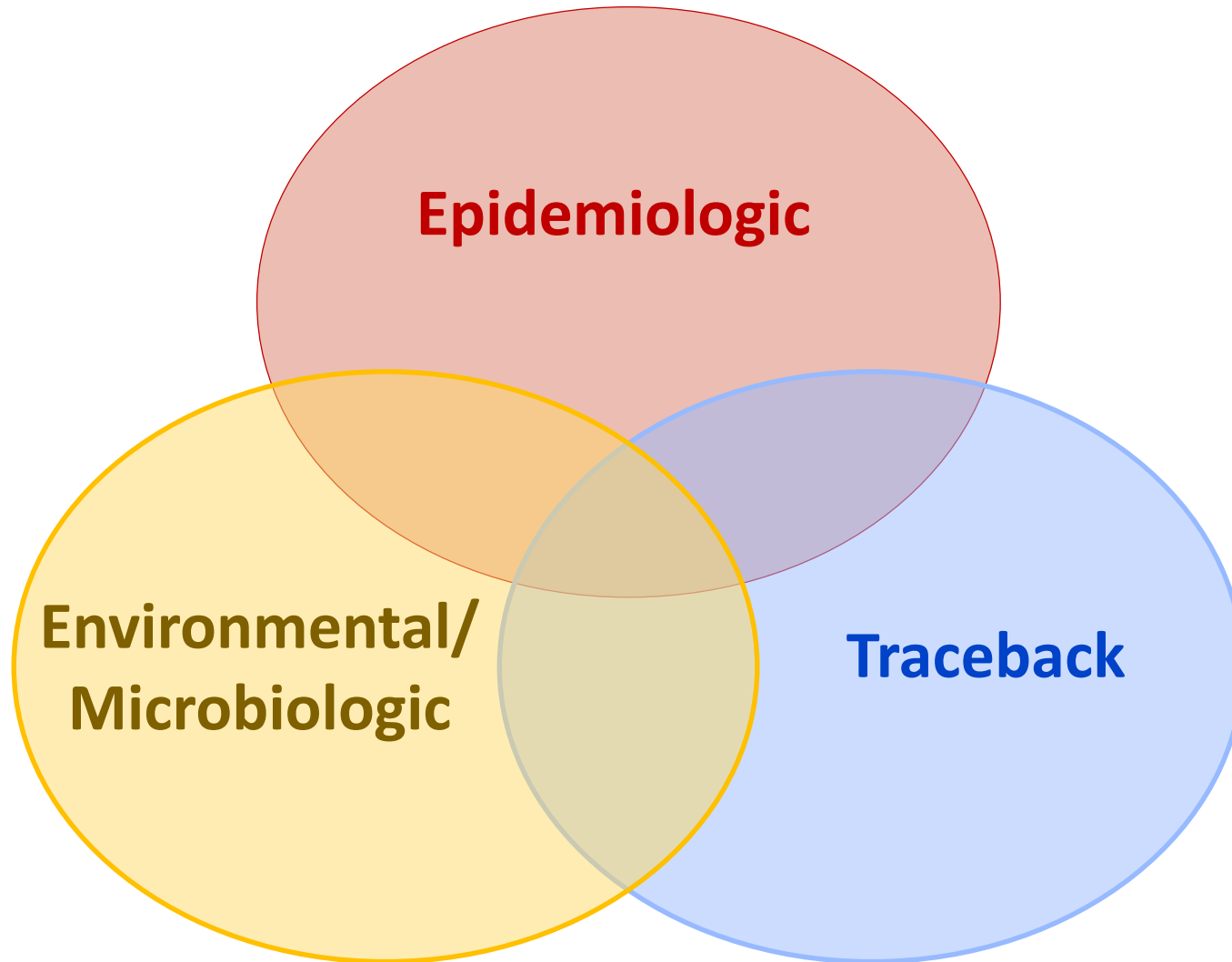


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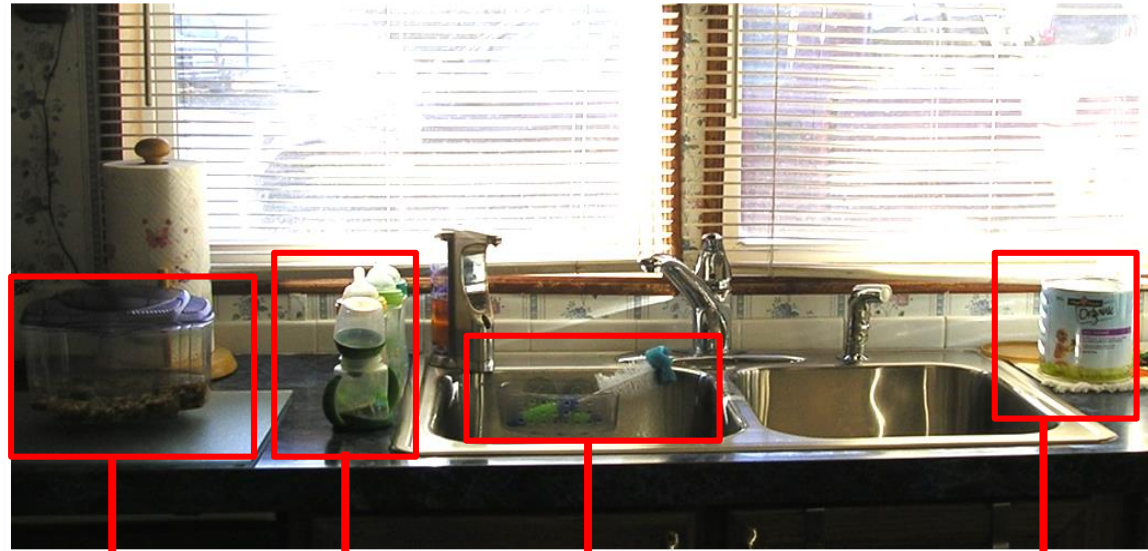
How Do We Link a Food or Animal Exposure to Illnesses?



Zoonotic Disease Transmission



Direct Contact



Aquarium

**Baby
Bottles**

**Bottle
Brushes**

**Baby
Formula**

Indirect Contact

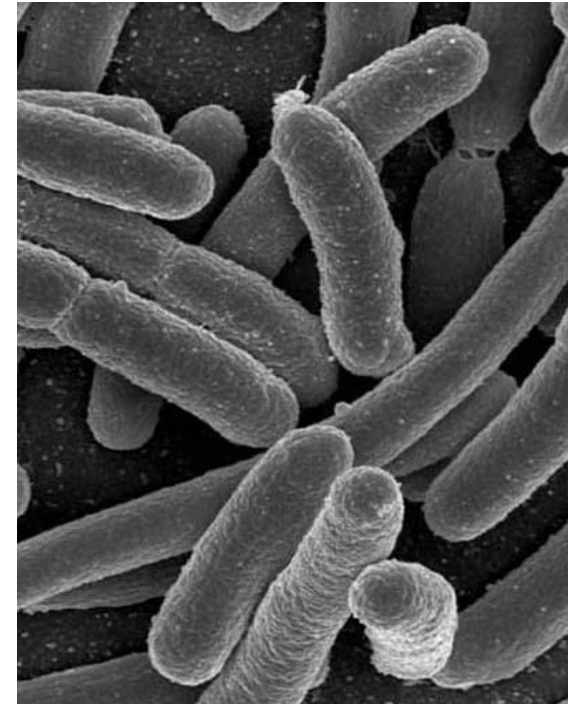


A Real-life Example – How would you solve this outbreak?



Shiga toxin-producing *E. coli*

- Causes illness in humans
 - Diarrhea, abdominal cramps, and vomiting
 - Bloody diarrhea
 - Hemolytic Uremic Syndrome (HUS)
- Some people have a higher risk of getting sick
 - Young children
 - People with weakened immune system
 - Elderly
- Very low infectious dose
- Incubation period: 2-10 days
- Bacteria can be found in the gut of healthy cattle
 - Shedding can increase if an animal is stressed
 - Young animals shed more frequently than adults
- Can survive in the environment for > 42 weeks



Goat Dairy Farm

- Family owned farm in rural area of a Northeastern US state
 - Milking herd of 150
 - >500 gallons of milk per week at peak
- Produce cheeses, soaps, caramel candies, and milk
 - Sold at farm store, farmers' markets, or small country stores
 - Licensed to sell raw milk
- Open houses held during kidding season



News

FOR IMMEDIATE RELEASE

March 24, [REDACTED]

[REDACTED] Department of Public Health

Contact: Maura [REDACTED]

[REDACTED] 509-7270

DPH Investigates E. Coli Outbreak Related to [REDACTED] Goat Farm

[REDACTED] The [REDACTED] Department of Public Health (DPH) today said it is investigating an outbreak of seven confirmed cases of E.coli and two cases of Hemolytic Uremic Syndrome (HUS). Patients sickened in this outbreak range in age from 2 to 25. DPH has confirmed at this point that six of the seven patients recently visited [REDACTED] Dairy Farm, a goat farm in [REDACTED]. As a precaution, [REDACTED] is currently not permitting the public to visit the animals.

“Earlier today, DPH was informed of several patients from [REDACTED] who have become ill with E.coli,” said DPH Commissioner [REDACTED]. “We are closely monitoring the situation and working with our partners at the CDC and other relevant stakeholders. We will continue to work diligently to provide the public with the information it needs as we investigate.”

E.coli is a bacterium that is found in animal and human feces and in foods. The particular strain a bacteria found in this outbreak is E.coli O157. Typical symptoms can include abdominal cramping, watery diarrhea, frequently bloody, vomiting, and a low-grade fever. Symptoms usually resolve over several days. The best way to prevent the spread of infection is to wash your hands thoroughly after contact with animals and after going to the bathroom and by thoroughly cooking meats and washing fruits and vegetables. E.coli can easily spread, especially among household members, if proper handwashing is not consistently used.

Outbreak Detection

- A state health department informed CDC that they have identified 7 ill persons infected with *E. coli* O157; 2 children developed Hemolytic Uremic Syndrome
- Visited a goat dairy farm

Activity #1

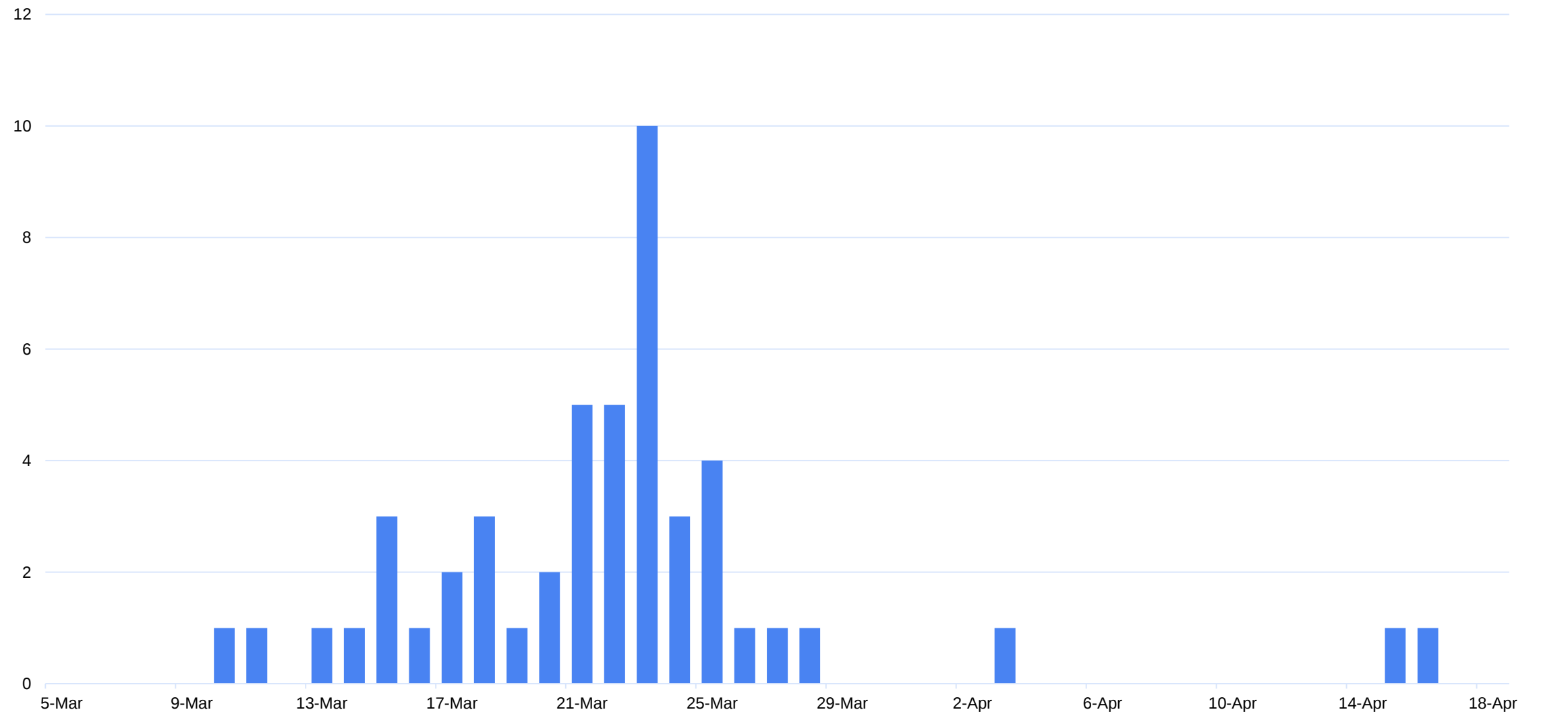
- **Make an epidemic curve**

Sample Blank Epidemic Curve --- Fill In the Case Counts

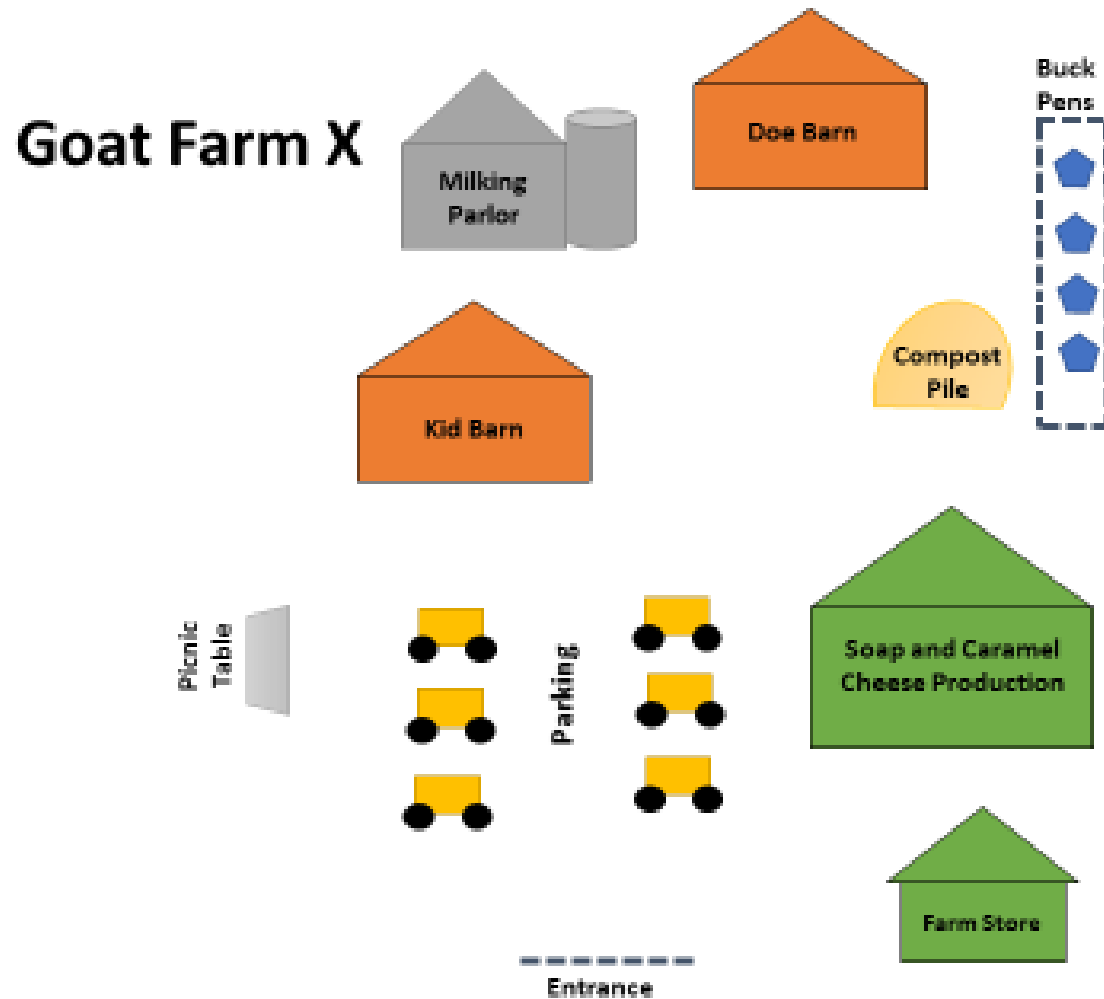


Illness Onset Dates of Cases					
Case Number	Illness Onset	Case Number	Illness Onset	Case Number	Illness Onset
001	3/7/2016	018	3/21/2016	035	3/23/2016
002	3/10/2016	019	3/21/2016	036	3/23/2016
003	3/11/2016	020	3/21/2016	037	3/23/2016
004	3/13/2016	021	3/21/2016	038	3/24/2016
005	3/14/2016	022	3/21/2016	039	3/24/2016
006	3/15/2016	023	3/22/2016	340	3/24/2016
007	3/15/2016	024	3/22/2016	041	3/25/2016
008	3/15/2016	025	3/22/2016	042	3/25/2016
009	3/16/2016	026	3/22/2016	043	3/25/2016
010	3/17/2016	027	3/22/2016	044	3/25/2016
011	3/17/2016	028	3/23/2016	045	3/26/2016
012	3/18/2016	029	3/23/2016	046	3/27/2016
013	3/18/2016	030	3/23/2016	047	3/28/2016
014	3/18/2016	031	3/23/2016	048	4/3/2016
015	3/19/2016	032	3/23/2016	049	4/15/2016
016	3/20/2016	033	3/23/2016	050	4/16/2016
017	3/20/2016	034	3/23/2016		

People infected with the outbreak strain of E. coli O157, by date of illness onset — March, 2016
(n=50)



Exercise # 2: Where to collect samples?



- Milking Parlor
- Doe Barn
- Kid Barn
- Buck Pens
- Compost Pile
- Picnic Table
- Soap/Caramel/Cheese Production Building
- Farm Store

Exercise # 3: What would be your recommendation?

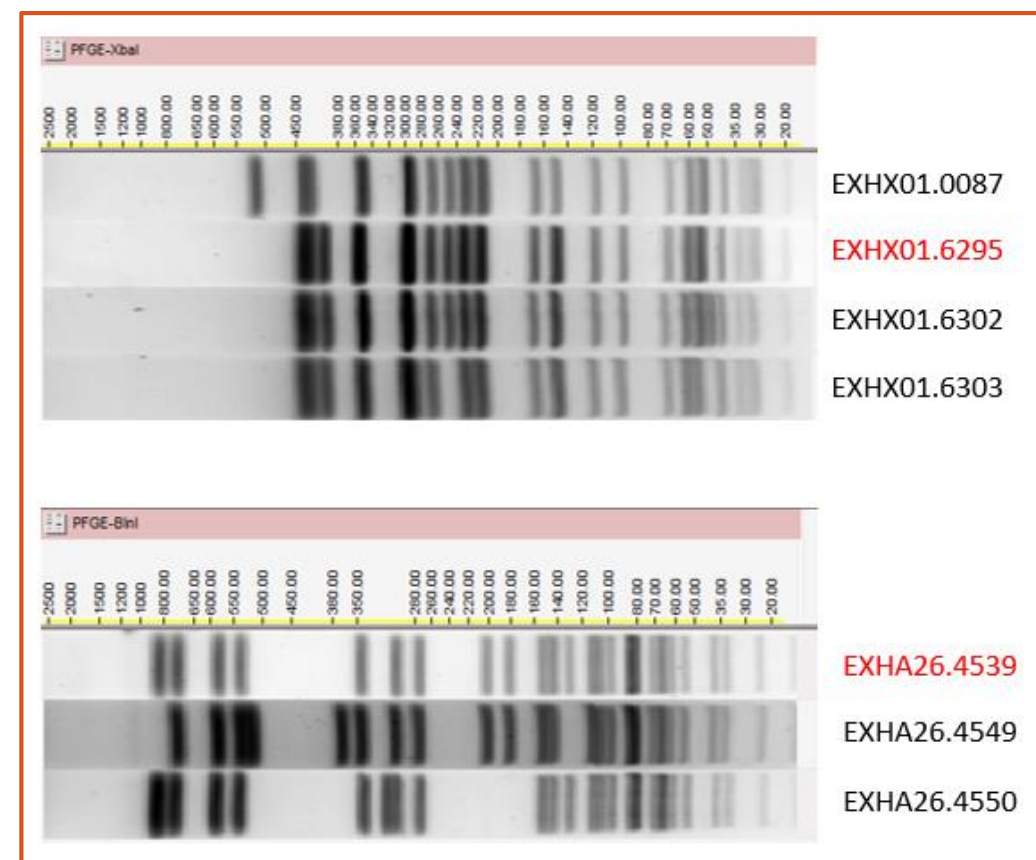
- **Provide at least 3 actions that should be taken to prevent further illness and similar outbreaks**
- For example, would you...
 - Close the farm?
 - Euthanize the animals?
 - Destroy the food?
 - Not allow agritourism?
 - Not allow raw milk for human consumption?
- **Be creative and prepared to discuss your recommendations**

Now...the Real Story!



Outbreak investigation results

- Identified 50 cases: 49 lab-confirmed, 1 physician-diagnosed HUS
 - Hospitalized: 11 (22%)
 - Developed HUS: 3 (6%)
- Median Age: 5 years (range: <1–50 years)
 - <5 years: 23 (47%)
- Female: 25 (51%)



Environmental sampling – What we really did

- **Specimens were collected with sterile cotton tipped swab and transported in Cary Blair solid media**
 - **Locations:** kid barn, doe barn, farm store, farm grounds
 - **Surfaces:** pens (birthing, kid, doe), floor, gutters, bedding, hay bales for sitting, rafters, troughs, walls inside pens, grain holder
 - **Animals:** kids and does in kid barn and doe barn
- **Two water samples collected in sterile bottles**
 - Locations: water trough in doe barn, water runoff going down the fill from doe barn
- **Bedding and stool collected in a stool collection cup using a sterile tongue depressor**

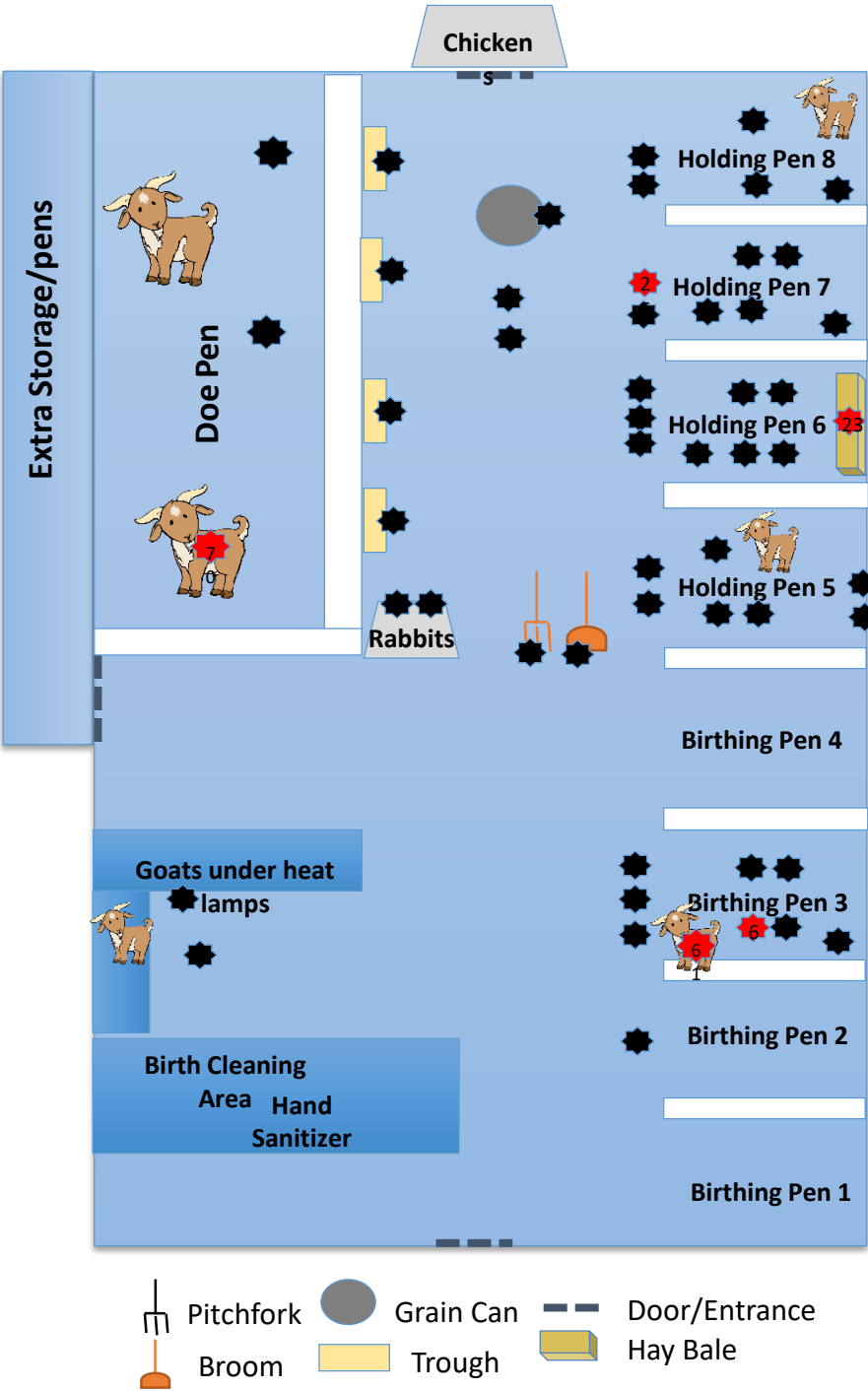


Results of Environmental and Animal Sampling

- 3 Environmental samples & 2 animal samples match the main outbreak strain
- 35 clinical samples
 - 28/35 (80%) match main strain
- Chevre, cheddar cheese, unpasteurized milk collected by CT DoAg
 - All negative for *E.coli* O157
- Pasteurizer on premises tested for time and temperature



Kid Barn



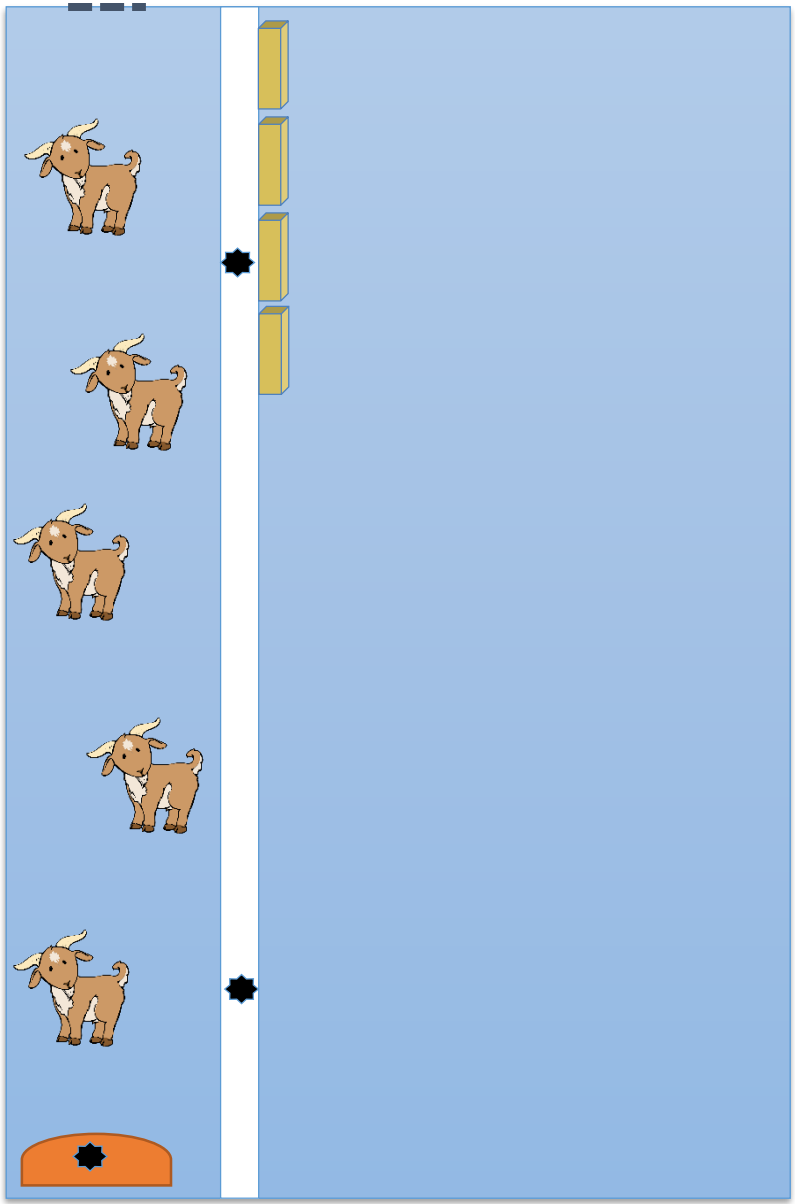
E.coli positive

- 6: bedding
- 23: hay bale
- 26: floor in front of pen gate
- 61: kid buck
- 70: doe

No *E.coli* isolated



Doe Barn

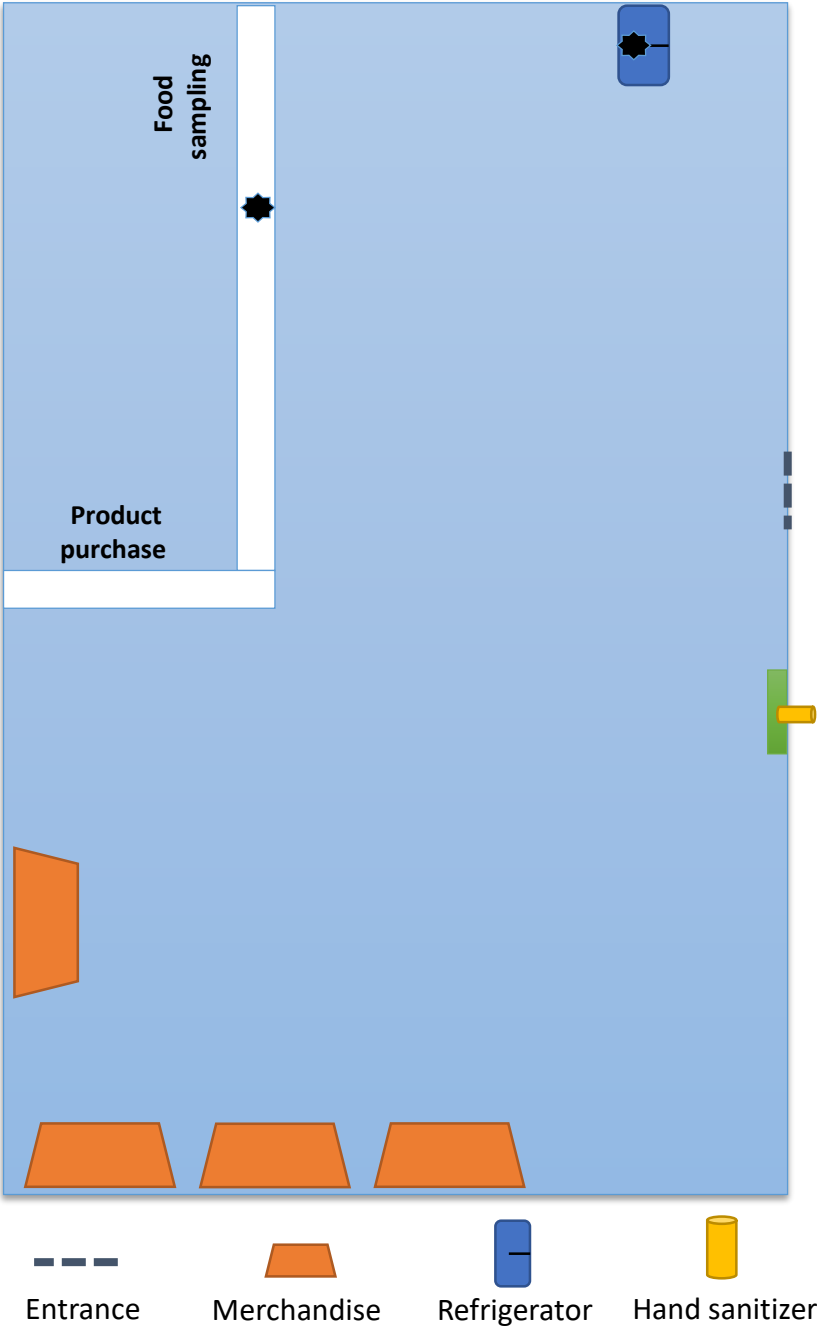


-  Water Trough
-  Door to Pasture
-  Hay Bale

 No *E.coli* isolated



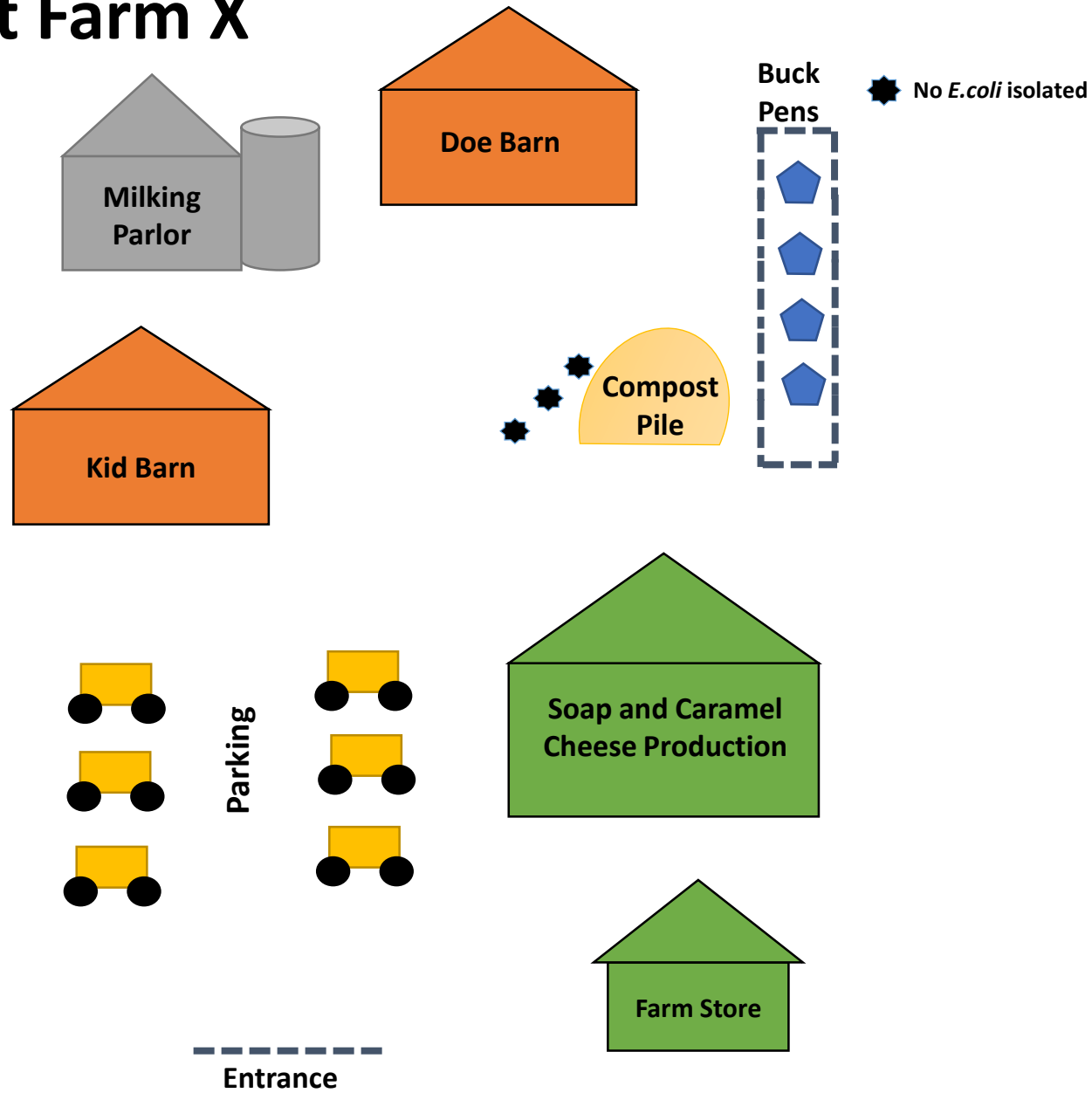
Farm Store



★ No *E.coli* isolated



Goat Farm X



Our public health messaging and activities

- Farm was closed to public and first press release on 3/24
- Visitor Education
 - Hand hygiene
- Staff Training
- Facility Design
 - Encourages hand hygiene – signage, hand washing stations
 - Use of materials that can be disinfected
 - Unidirectional visitor flow
 - Prompt removal of manure/birthing products
 - Designated area for animal feed
- Animal Areas
 - Do not allow eating, drinking, strollers, pacifiers, etc

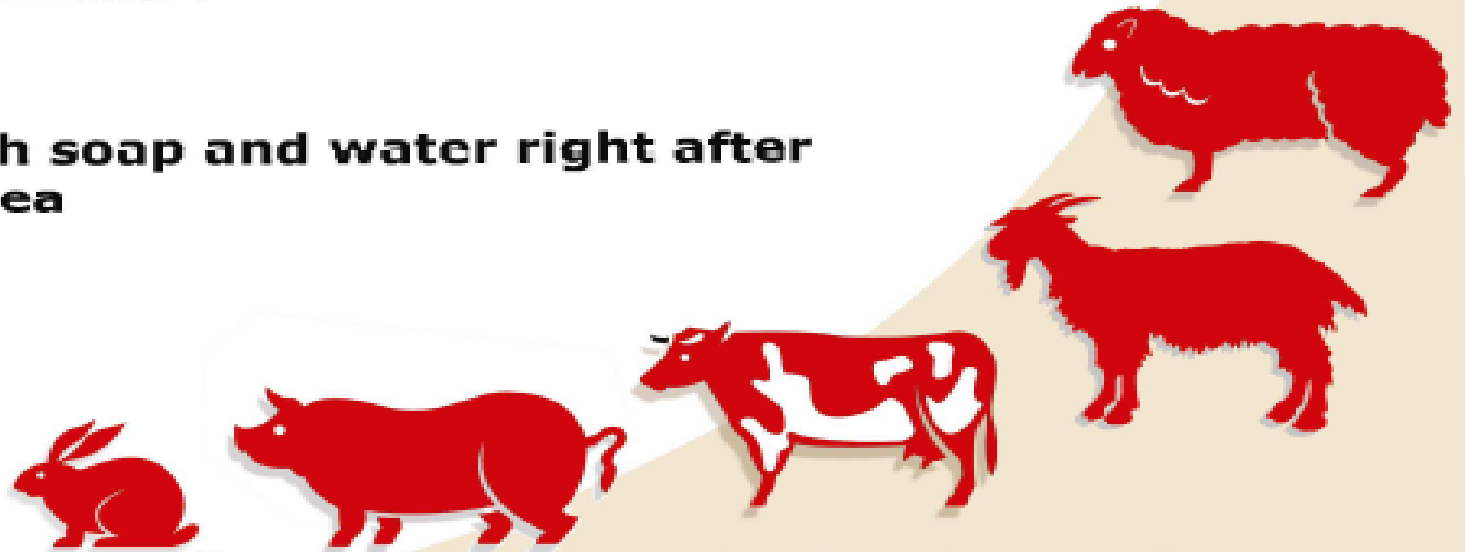


Know that animals carry germs that can make people sick

Never eat, drink, or put things into your mouth in animal areas

Older adults, pregnant women, and young children should be extra careful around animals

Wash your hands with soap and water right after visiting the animal area



How to be Safe Around Animals!



