



Colorado Department
of Public Health
and Environment

Investigation of an *Escherichia coli* O111 Outbreak at a State-run Correctional Facility (Colorado, 2010)

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WestON
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Investigation Partners

- Colorado Department of Public Health and Environment
 - Communicable Disease Epidemiology Program
 - Regional Epidemiologists
 - Occupational Health & Safety Surveillance Program
 - Div of Environmental Health and Sustainability
 - Laboratory Services Division
- Colorado State University, High Plains Intermountain Center for Agricultural Health and Safety (HICAHS)
- USDA Agricultural Research Service Laboratory
- National Institute of Occupational Safety and Health Western States Office (NIOSH/WSO)
- Colorado Department of Corrections
- Colorado Correctional Industries (Dairy operators)

Successful Collaboration

- Highlights integration of public health, occupational health, and agricultural health
- Optimizing expertise and resources through partnership

Background: *E. coli* O111

Shiga-toxin producing *E. coli* (STEC)

Symptoms	Diarrhea (can be bloody), abdominal pain, sometimes vomiting and fever; can progress to hemolytic uremic syndrome
Incubation Period	2 – 10 days (avg 3-4)
Duration	Up to 2 weeks (can shed for longer, especially children)
Transmission	Contaminated food/water; fecal-oral (animal-to-human, human-to-human)
Reservoir	Gut of cattle, dairy cows, goats, horses, other animals
Special Considerations	Risk factors not well understood; Outbreaks have occurred in restaurants, camps, child care centers, contaminated beef (other countries), animal contact

State Correctional Facility

- Minimum-restrictive facility, 2 beds/cell
- 500 male offenders in five units
- Offenders share common restroom/shower facilities within units; common dining area for entire facility
- Unique features:
 - Designated work center -- all offenders participate in vocational training or work at the facility
 - Central kitchen (inmates) - Culinary arts kitchen (Staff/visitors)
 - Wild Horse Inmate Program (WHIP) staffed by offenders (n = 50); About 3000 horses, mules, donkeys
 - Dairy operation staffed by offenders (n = 70) that provides milk to all state-run correctional facilities; About 1000 dairy cows and 900 calves; Operates 24/7/365

Detecting the Outbreak

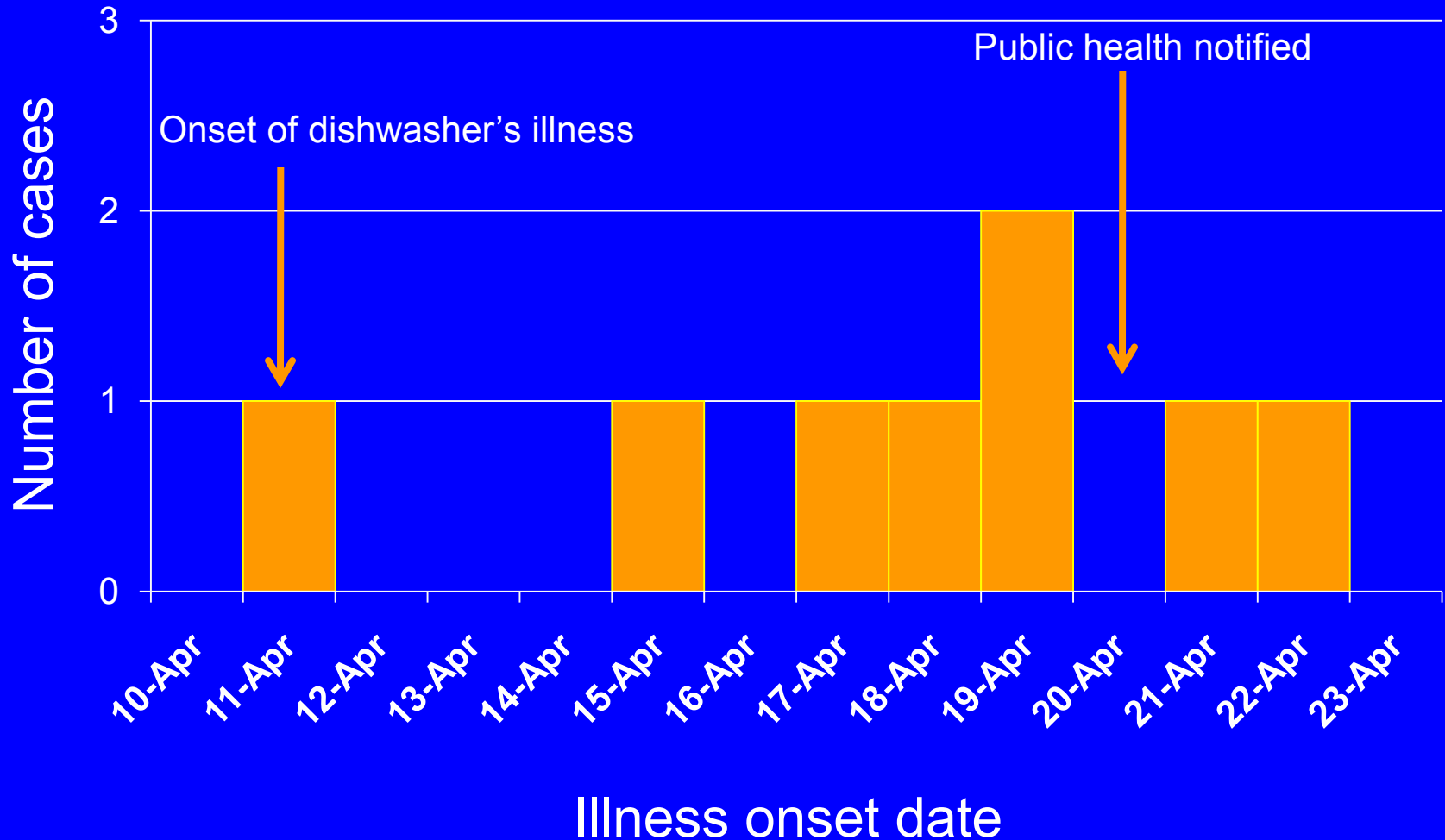
- ❑ April 20, 2010: Call from Dept of Corrections reporting 3 offenders ill with bloody diarrhea
 - Onsets April 18 and 19
 - April 21: All 3 positive for STEC
- ❑ Prior STEC history at this facility:
 - 2003: one case of *E. coli* O157 in offender who worked in dairy
 - 2008: one case of *E. coli* O111 in offender who worked in horse training program

Initial Investigation

- Surveillance and case identification
 - Cell-to-cell checks
 - Food service worker interviews
- Illness prevalence study (interviews)
 - 100 randomly selected inmates (20% of population)
- No compatible illness in other centers or among staff

Case Epidemic Curve:

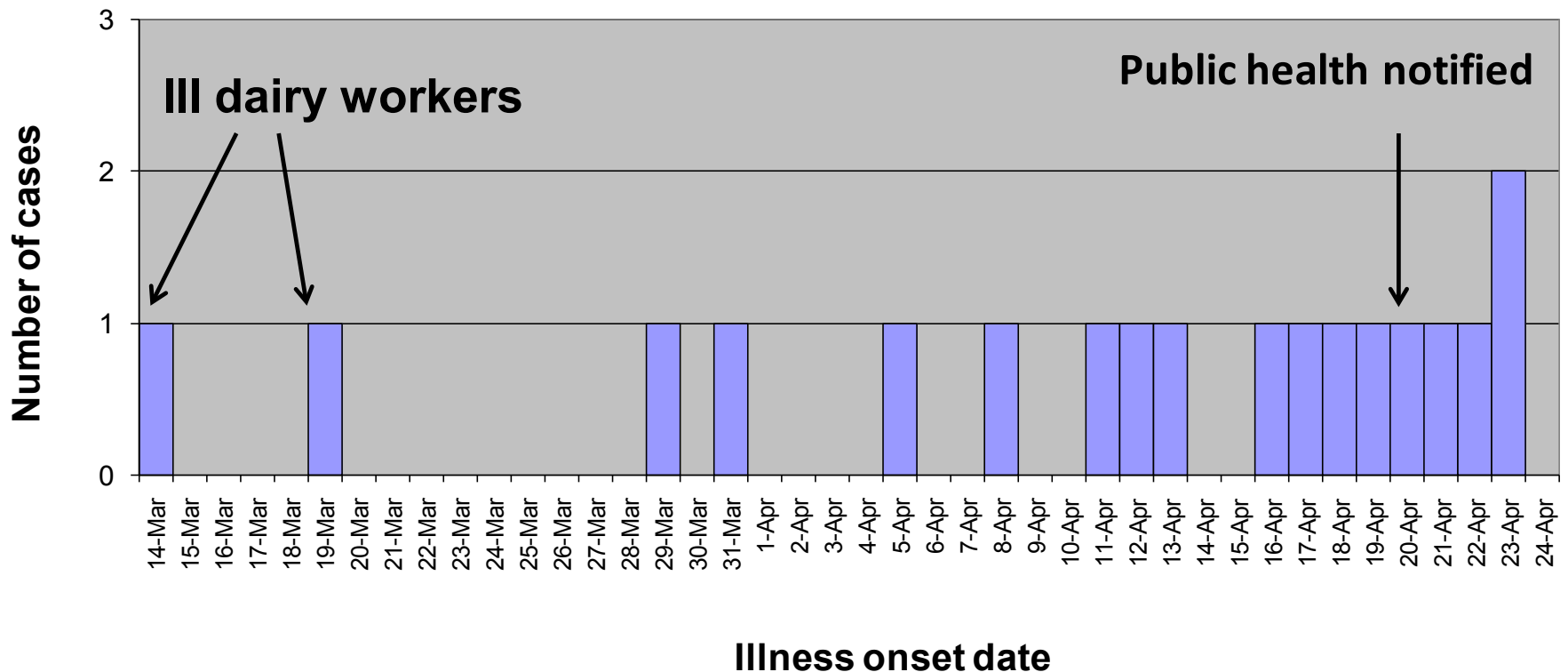
Illness onset dates of confirmed cases (n = 8)



Epidemic Curve:

Illness prevalence study (n = 18)

18/100 (18%) met suspect case definition



Investigation Methods – Environmental Health (EH)

- CDPHE Division of Environmental Health and Sustainability (DEHS)
 - Health and sanitation regulatory authority over entire facility, including dairy
 - Inspected kitchens and living areas
- Wild Horse Inmate Program – test horse manure
 - 2008 case of O111 in offender who worked in this program; could horses be the source???

EH Observations

Person-person propagated outbreak, associated with food prep/handling, due to

- Ill offenders in food service jobs worked while ill
- Lack of hand soap in common bathroom facilities (offenders provide own soap)
- Dairy workers wearing work clothes/shoes in kitchen prep and dining areas; bringing (soiled) coolers for lunches and water jugs into kitchen

Lab Results



- Human:
 - All specimens confirmed as *E. coli* O111:NM
 - All were PCR positive for Shiga toxin 1 only
 - PFGE:
 - 6/8 have identical pattern; 2 slightly different
 - No other PFGE matches in Colorado
 - 2008 O111 case had different PFGE pattern
- 30 horse fecal material samples
 - All negative

July 2010 – 2 more cases!

- Both live in same unit, work in recreation and heavy equipment
- Confirmed *E. coli* O111:NM with predominant outbreak PFGE pattern
- Response:
 - Increase surveillance, especially in food handlers (5 ill food handlers discovered working; all tested negative)
 - EH visit to facility
 - Water tests (from taps – no violations)
 - Proceed with dairy cow testing

Dairy Testing

- Partnered with USDA Agricultural Research Services laboratory in Nebraska
 - 100 dairy cow fecal samples, 26 wipe samples
- Results:
 - 3 fecal samples positive for *E. coli* O111:H8
 - Positive for Shiga toxin 1 only
 - PFGE (at CDPHE lab) nearly identical to human isolates

Occupational Site Visit – October 2010

Purpose:

- ❑ ID potential transmission pathways between the dairy and the correctional facility;
- ❑ Provide recommendations to prevent animal-human and human-human transmission in the dairy work setting

Methods:

- ❑ Work-practices review & facility inspection: Observed workers performing their regular work duties, during shift transitions
- ❑ Evaluated worker training procedures, personal protective equipment (PPE) practices, procedures for meals/breaks, availability of hand washing/cleaning facilities

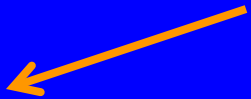
Correctional Facility



Dairy Operation



Wild Horse Training Area



(1 mile)





Notable Findings

- ❑ Care of the animals and quality of milk is utmost priority at the dairy and among workers
- ❑ Milk processing and packaging areas
 - Strict adherence to contamination control (gloves, clean areas) and equipment maintenance



Work-practice Findings

❑ No efforts in place to isolate potential areas of contamination

- With few exceptions (milking and processing/packages), no rules about travelling around the grounds.
- “Clean” areas not defined. <MAP>



❑ Lack of training on working with animals, health/hygiene, very inconsistent PPE use

- Inmates can use/modify PPE (gloves/coveralls/boots) based on comfort & preferences
- Prison wear ‘greens’ can be worn both in the dairy and in the prison
- Clothes laundering services are limited (1x/week)



CDOC

CDOC

Control panel with red and blue lights and buttons.

Considerations

- Focus primarily on administrative, work flow, and low-cost PPE modifications specific to the dairy, as opposed to facility redesign or capital improvements
 - Minimal resources and time available to implement changes
 - Unique worker, security, space limitations in a prison setting
 - Emphasize human – animal connection

Work-site Recommendations

- Worker orientation and health education
 - Train all workers on risks & methods to prevent enteric illness
 - Incorporate training materials on proper hygiene and PPE use
- Establish and designate *contamination, transition, and “clean” zones*
 - Ensure workers/others do not travel through a contaminated area before changing into their PPE or after changing into their prison greens
 - Ensure food/beverages consumed in designated clean areas and not transported through contaminated areas

Work-site Recommendations

□ PPE

- Ensure PPE requirements are unambiguously defined and mandatory (including boots and rubber gloves)
- Educate workers on the importance of PPE use
- Obtain 'seasonal' PPE to prevent PPE modification

□ Hand-washing policies and sanitation

- Provide hand sanitizer/soap in the dairy
- Make it mandatory (entry/exit/eating)

Overall Conclusions

- ❑ April-July 2010:
 - ❑ 10 confirmed cases of E.coli O111
- ❑ Likely cause:
 - Offender dairy workers exposed to cow fecal material, resulting in contamination of the correctional facility premises
 - Outbreak likely propagated by ill food handlers and environmental contamination of common areas
- ❑ An integrated public health response offered comprehensive strategies to reduce the risk of disease transmission

Comprehensive Recommendations

- ❑ Enforce a sick policy for food handlers
- ❑ Encourage hand-washing (with soap) among all offenders
- ❑ Waive medical fees for offenders during a cluster/outbreak
- ❑ Implement work-practice recommendations within the dairy operation

On-going Opportunities for Collaboration

- AgriSafe Network

Represents health professionals who provide occupational health and safety services to farmers and their families.

Providers in 10 States + Australia

Members in 17 States, Canada, Australia

www.agrisafe.org



Thank You



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