

Raw Milk Outbreaks in Colorado 2006-2010

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Objectives

- **Discuss epidemiology of recent raw milk outbreaks in Colorado**
- **Discuss cow share operations and environmental findings**
- **Discuss ongoing public health considerations**

Raw Milk is a Risky Food

- Numerous raw milk outbreaks documented by CDC
- Potential Sources of contamination
 - Environmental contamination
 - Contamination during milk handling / processing
 - Udder contamination from infected animal



Pathogenic Agents in Milk

- **Campylobacter**
- **STEC**
- **Salmonella**
- **Listeria spp**
- **Staphylococcus aureus**
- **Clostridium perfringens**
- **Shigella spp**
- ❖ **Langer, et al EID Vol 18 No 3 March 2012**

Cow shares

- **Federal level: Illegal to sell raw milk for consumer use across state lines**
- **Sale of raw milk is illegal in Colorado**
- **Cow share operations are permitted**
 - **Purchase shares in a cow**
 - **Dairy manager operates herd**
 - **Shareholders (owners) receive raw milk**

Colorado cow share statute

Colorado Revised Statute 25-5.5-117

- **Cow shares may distribute raw milk to shareholders**
- **Recipients may not distribute further**
- **Prominent warning label on milk container or delivered with milk**
- **Must register with CDPHE**
- **Not inspected by CDPHE**
- **No requirements for milk testing**
- **Cow share operator may not make claims that imply endorsement by CDPHE**

Methods of Investigations in Raw Milk Outbreaks in Colorado

- **Epidemiology**
 - Case finding
 - Cohort study
- **Laboratory**
 - Human
 - Milk
- **Environmental**
 - Site visits

Comparison of raw milk outbreaks in Colorado, pre and post cow share statute

1996 – 2004 (9 yrs)

2 outbreaks

33 total ill

2005 – 2010 ytd (6 yrs)

5 outbreaks

143 total ill

0.2 outbreaks/yr → 0.8 outbreaks/yr

~17 ill / outbreak → ~29 ill / outbreak

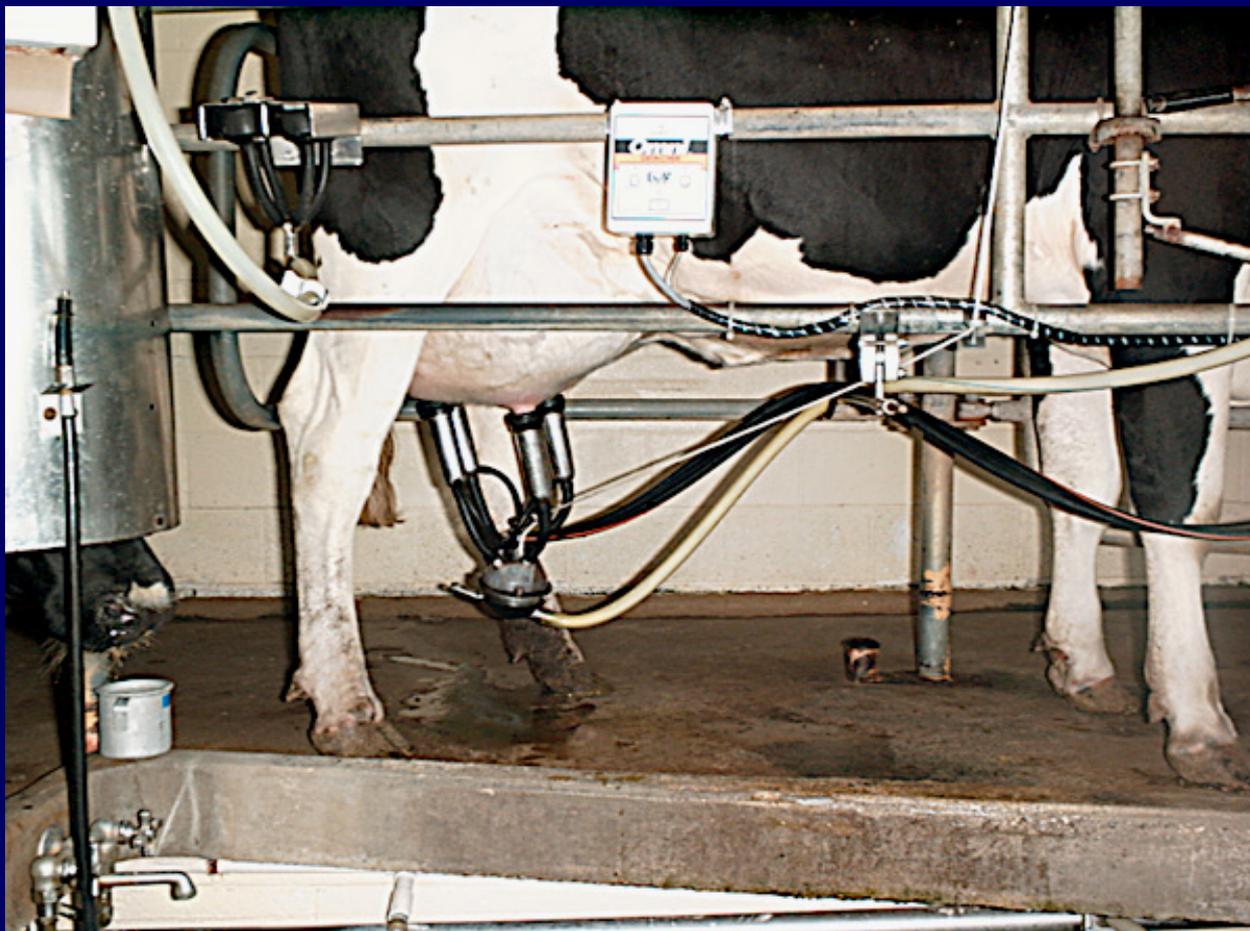
Larimer County 2005-06

- *Campylobacter jejuni*
- Cow share with 27 households
- 22 cases, 6 lab confirmed
- 31% of all interviewed were ill (22/71)
- Median age of cases 18 years (range 2-74 yrs)
- No evidence of major problems at dairy
- Milk testing found very low bacterial counts
- People still became ill

Environmental

- **Operator did change one practice after learning of a shareholder illness**
- **Previously he milked multiple cows at once using an in-line milker**
- **Milking claws automatically fall off of cow when milk flow is diminished**
- **Claws could potentially fall onto cow deck before suction is turned off by the operator**

Larimer County – 2005-06

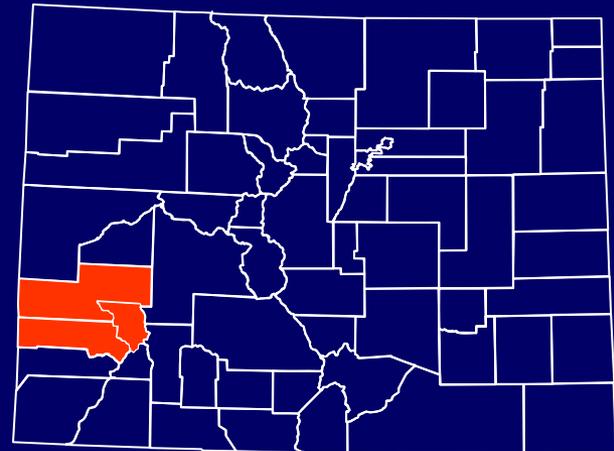


Larimer County – January 2006

- **Operator did recognize this as a potential for contamination**
- **Started milking one cow at a time so he could monitor more closely**

Montrose County 2009

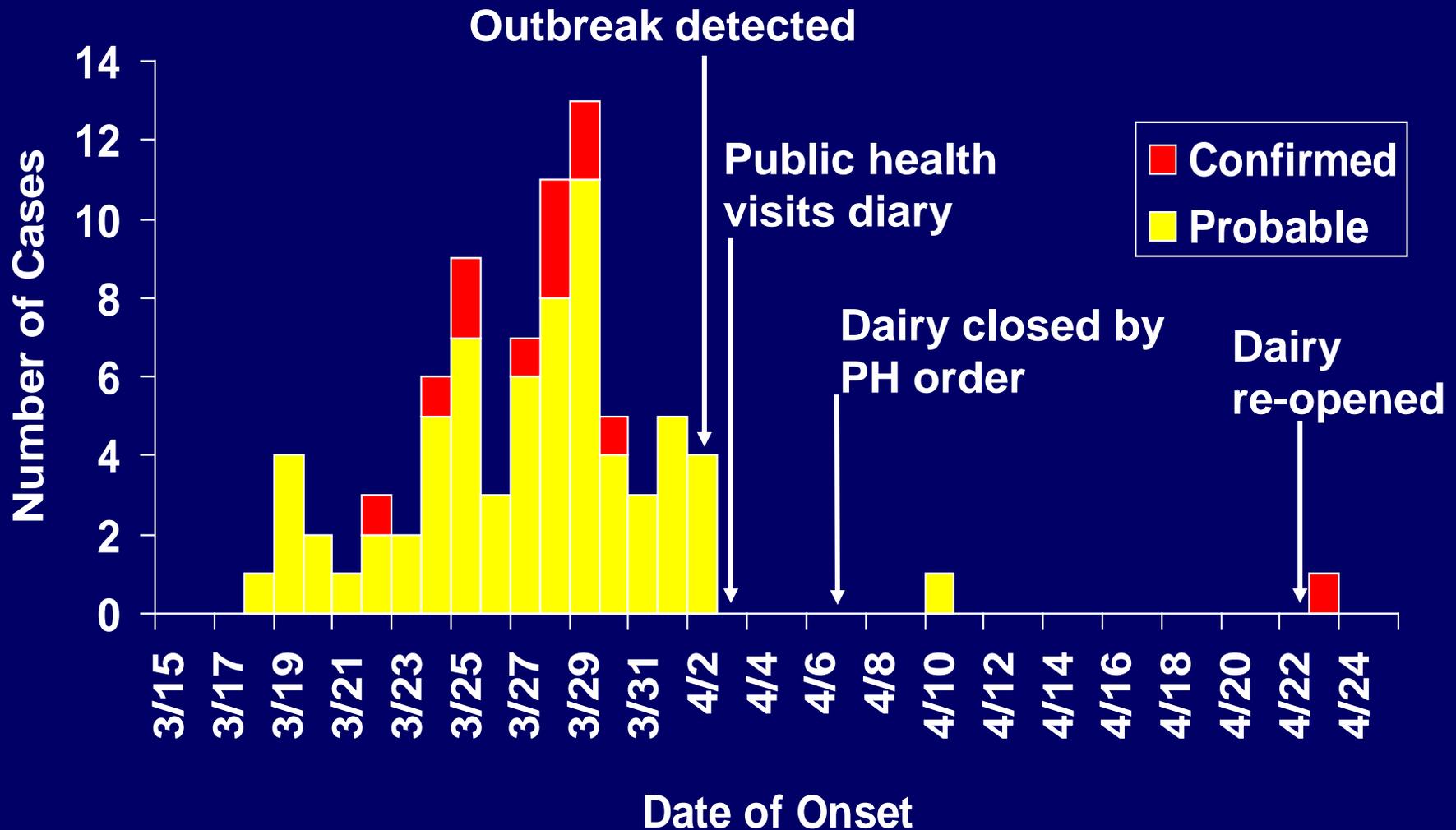
- **3 Campylobacter cases ascertained through routine disease surveillance**
- **3 contiguous Western Colorado counties**
- **Public Health makes unannounced visit to the dairy**
- **Many concerning sanitary findings**
- **Dairy closed by Public Health Order**



Results

- **159 (76%) shareholder households interviewed**
 - representing 372 household members
- **81 cases identified**
 - 12 confirmed
 - 69 probable
- **50 of the 151 (31%) households that had received product had at least one ill person who met case definition**

Campylobacter Outbreak Associated with Raw Milk from Cow Share, Colorado, 2009 (N = 81)



Case-Patient Demographics (N=81)

Median age (range) 32 years (1–79)

Female 36 (47%)

One person hospitalized

All recovered

Cohort Study

- **List of 208 shareholders and consumers obtained from dairy manager**
- **Attempted to call all persons**
- **Informed shareholders to discard milk**
- **Asked about illness and foods eaten from dairy**

Dose Response Relationship

Includes primary cases and well persons (n=349)

<u>Milk Servings</u>	<u>Ill</u>	<u>Well</u>	<u>Odds ratio</u>
None	10	65	Ref.
< 1 cup/day	11	95	0.75
1-2 cups/day	26	100	1.69
> 2 cups/day	11	31	2.31

Mantel-Haenszel chi square linear trend = 5.50
p=0.02

Laboratory Results

Human specimens

- 6 patient isolates received at state lab
- All confirmed *Campylobacter jejuni*
- Identical Pulse Field Gel Electrophoresis (PFGE) patterns
- No recent matches with CDC database

Milk testing

- Collected after outbreak identified
- Culture negative for *Campylobacter*

Environmental Findings

- **Per dairy website:**
 - **Operating standards “closely match the requirements of a Grade A dairy and could if necessary meet the scrutiny of the Colorado Department of Health**

Grade A Dairy



Milking Parlor



Boulder County 2010

- June 23rd – 39 y.o. male
Campylobacter case on CEDRS
- “My toddler son and I drank raw goat milk and got sick”
- “We obtained it from a friend”.
- Registered goat share in Longmont

Boulder County 2010

- **35 households interviewed**
 - 80% response rate
 - 71% were actual shareholders
- **Information gathered from a total of 82 individuals**

Results of Epi Investigation

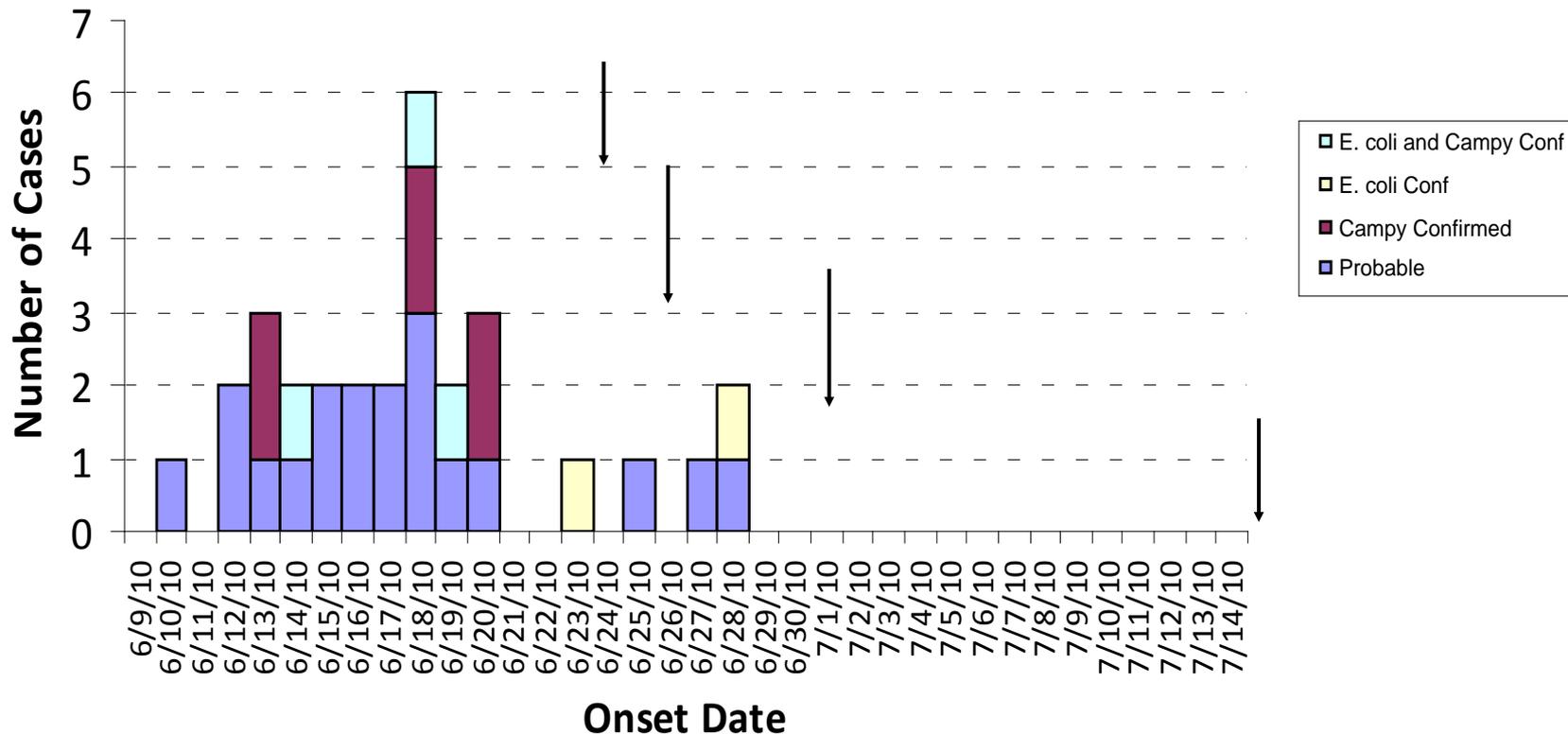
- 11 confirmed cases
- 19 probable cases
- 87% were a primary case
- 13% secondary spread of infection
- Mean age: 32 years
- Range: 4-73 years
- 45% female

Billy Goat Dairy Outbreak

Boulder County, CO

Gastrointestinal Illness Onset (N=30)

June 2010



Boulder County 2010

Unannounced visit by CDPHE and Boulder County to collect milk specimens, check refrigeration temperature, standard sanitation guidelines



Environmental

- Milk was warm—57F at 4 pm
- Milking apparatus fell on barn floor, was not cleaned before re-attaching to teat
- Infected teats on three goats being milked
- No hand washing sinks in milking area-employee observed washing hands in standing water
- Milk in system > hour before being placed in jars
- Milk not labeled as “raw”

Summary

- **Illnesses will continue to be identified likely due to consumption of raw milk**
- **Epidemiologic data**
 - Continue to monitor for raw milk consumption
 - Dose-response relationship
- **Environmental data**
 - Significant sanitary issues at dairies
- **Laboratory data**
 - Identify PFGE patterns for identifying common sources of exposure

Limitations

- **Milk cultures may be negative as sampling occurs after outbreak**
- **Relative risk for milk may not statistically significant**
 - **Dose-response relationship may be significant even when relative risk is not**

Conclusions

- **Public must understand that unpasteurized milk is a risky food**
- **Raw milk outbreaks will continue to occur**
- **Cow share operators should strive to meet minimum sanitary standards for milk production**
- **Raw milk must be properly labeled**

Public Health Considerations

- **Unpasteurized milk via cow shares can travel far**
 - Implications for outbreak detection
 - Case finding during outbreaks
- **Significant public health costs associated with outbreak investigation**
 - Multiple agencies involved
 - Assess costs during outbreak investigation
- **Considerations of vulnerable populations (children)**



Acknowledgements

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Milk for Further Distribution



Sample Case Definitions

- **Confirmed**
 - Culture-confirmed organism
 - Consumed products from and implicated dairy, and
 - Onset within a specified time period
- **Probable**
 - Compatible GI illness, and
 - Onset within specified time period, and
 - Epi-linked to confirmed case, or
 - Consumed products from dairy ≤ 10 days before onset

Colorado Grade A Dairy Standards

- **Operating standards continued:**
- **Milking Parlor:**
- **The milking parlor will have adequate lighting, properly distributed.**
- **There will be adequate ventilation to prevent condensation and to minimize odors.**
- **Gutters and floors will be made of good quality concrete and graded to drain.**
- **Walls and ceilings will be made of a suitably impervious material to ensure they are easily cleaned.**
- **Any feed storage area will be separated from the milking parlor by dust-tight doors.**
- **All areas of the milking parlor will be kept clean, free of manure and in good repair.**

Resources for Raw Milk Information

- **New and improved CDC website for Raw Milk:**

**[http://www.cdc.gov/foodsafety/rawmilk
/raw-milk-index.html](http://www.cdc.gov/foodsafety/rawmilk/raw-milk-index.html)**