



*A Raw Milk Outbreak Investigation Spring 2010: the Lab, the Epi, and the Law*

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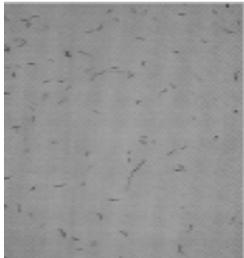
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**Campylobacter – the basics**



- Gram-negative, non-sporeforming, motile rod
- Curved, spiral or S shaped
- Microaerophilic – 5% O<sub>2</sub>, 10% CO<sub>2</sub>, 85% N<sub>2</sub>
- 15 species
- Susceptible to drying, low pH, heating, freezing, prolonged storage
- Survive 2-4 weeks in moist low O<sub>2</sub> at 4°C




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**Campylobacter – Epidemiology and Transmission**

- Primarily zoonotic (see table)
- Causes ~2.4 million cases of gastroenteritis annually
  - Extraintestinal infections: bacteremia, meningitis, pneumonia, miscarriage, URI, peritonitis, myocarditis, abortion, hepatitis, cholecystitis, reactive arthritis, Guillian Barre
  - Infective dose: 400 – 500 organisms, also based on host factors




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## **Campylobacter - Reservoirs**

Species	Humans	Cattle	Sheep	Pigs	Wild Birds	Poultry	Pets
<i>C. jejuni</i>	X	X			X	X	X
<i>C. doylei</i>	X						
<i>C. coli</i>				X	X	X	
<i>C. fetus</i>		X	X				
<i>C. upsaliensis</i>						X	X
<i>C. lari</i>					X		X
<i>C. hyointestinalis</i>		X		X		X	X




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## **Campylobacter – Epidemiology and Transmission**

- *C. jejuni*, *C. coli*, and *C. lari* responsible for 99% of cases; *C. jejuni* 90%
- Most cases are sporadic; outbreaks occur
- Transmission
  - Undercooked chicken
  - Contaminated water
  - Raw milk
  - Animal contact
  - Travelers diarrhea
  - Shellfish, fruits and vegetables
- Carrier state




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## **Food animals and products**

- 20 – 100% of retail chickens ( $10^2$  –  $10^4/g$ )
- 24% of sheep carcasses
- 22% of swine carcasses
- 94% of eviscerated turkeys




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### **Detection – Clinical laboratory**

- Transport media for stools if > 2 h delay
  - Refrigerate Cary Blair at 4°C
- Detection
  - Routine culture – media selection, incubation temperature
  - Enrichment culture
  - Filtration
  - Antigen detection
- Identification - presumptive



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### **Detection – Food laboratory**

- Organism usually present in low numbers
- Enrichment
- Detection
  - Culture
  - PCR



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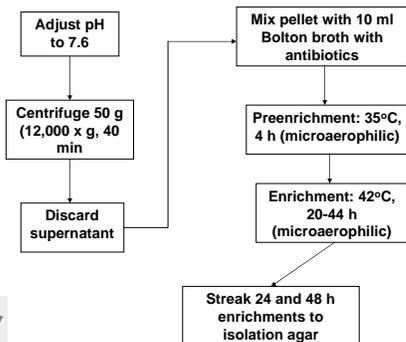
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### **Milk Products**



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## Overview

- *Campylobacter* in foodborne illness
- Two outbreaks of *Campylobacter jejuni* linked to raw milk
  - March 2010
  - May 2010
- Why do people drink raw milk?
- Disease reporting



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## The Role of *Campylobacter* in Foodborne Illness

- Estimated 9% of foodborne illnesses in US each year are due to *Campylobacter* (Scallan et al. EID Jan 2011)
- 4<sup>th</sup> out of 31 major pathogens
- *Campylobacter jejuni* – the Campy spp most commonly seen in FBI
- Campy is responsible for an estimated
  - 15% of hospitalizations due to FBI
  - 5.6% of deaths due to FBI



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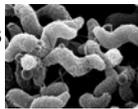
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## *Kampylos, bacter, jejuni*

Campylobacteriosis – more sporadic than outbreak type of disease

### Sources of *Campylobacter*

- Animal reservoirs: pigs, cattle, dogs, cats, birds...
- Raw or undercooked poultry
- Water, food contaminated with animal feces
- Unpasteurized milk, dairy products



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## ***Infections from Raw Milk***

- Brucellosis
- Tuberculosis
- Campylobacteriosis
- *E coli* O157:H7
- Listeriosis
- Salmonellosis
- Streptococcus
- Yersiniosis

In 46 raw milk associated outbreaks between 1973 and 1992 in the US, 40 outbreaks (87%) occurred in states where the intrastate sale of raw milk was legal (Headrick et al. 1998, Am J Public Health)



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## ***Clinical Campy***

- Diarrhea (often bloody), abdominal pain, fever, nausea, vomiting, malaise
- Incubation period: 2–5 days (range, 1–10 days)
- Duration: 1–2 weeks
- Most recover uneventfully, but some experience relapse or prolonged illness
- Young, elderly, and immunocompromised vulnerable



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## ***March 2010 Campylobacter Outbreak in Michigan***

First reports of illness

- March 16, 2010, reports of GI illness in 2 households from 2 counties in SE MI
- Food history of consuming raw milk and yogurt
- Raw dairy products were obtained from the same dairy cooperative



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### **Case Finding**

- Active surveillance initiated
- LHDs recontacted recent Campy cases to ask about raw milk
- LHDs sought other dairy co-op members who were ill



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### **Survey Tools**

- Michigan Disease Surveillance System case investigation report form
- Supplemental survey re dairy foods purchased from Co-op
  - Milk, cream, sour cream, buttermilk, yogurt, kefir, butter, cheese
  - Type & size of container/package, opened or not
  - Brand
  - Where purchased/obtained
  - Date of purchase, receipts

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### **Outbreak Case Definitions**

- Confirmed cases: culture-confirmed *Campylobacter jejuni* with illness onset date between March 1 and 18, 2010, who reported consumption of raw dairy 7 days prior to illness onset
- Probable cases: diarrheal illness between March 1 and 18, 2010, who reported consumption of raw dairy 7 days prior to illness onset and were epi-linked to a confirmed case or had a positive test result from an antigen-based non-culture test



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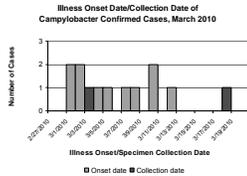
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## Description of Campy Cases

- 25 ill people with illness onset dates from March 1–18, 2010
- 13 culture-confirmed, 12 probables (epi-linked)
- Age range 1.5–55 years (mean 16 years; median 8 years). 60% ≤16 years old
- 68% males
- Cases came from 6 jurisdictions (City of Detroit, Macomb, Monroe, Oakland, Washtenaw, and Wayne Counties)




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## Description of Campy Cases (2)

- Symptoms of confirmed cases:
  - 100% diarrhea (62% bloody)
  - 92% fever (mean 102°F)
  - 77% abd. pain
- Duration of illness ranged from 2 to 13 days (mean 6 days; median 5 days)
- No one hospitalized
- Attack rates of diarrheal illness in households ranged from 14 to 89% of HH members (mean 49%)




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## Exposure History of Cases



Milk photos thanks to Washtenaw Co. Health Department

Gordon Watson photo

- 9/10 households reported obtaining raw dairy products from same dairy Co-op
- 1 person had raw milk at a friend's
- 11/13 had raw milk; 2/13 had kefir made from raw milk
- 3 HHs also bought other food items from Co-op (gr beef, eggs, kielbasa, cheddar cheese); 2/3 HHs stated ill children had milk only

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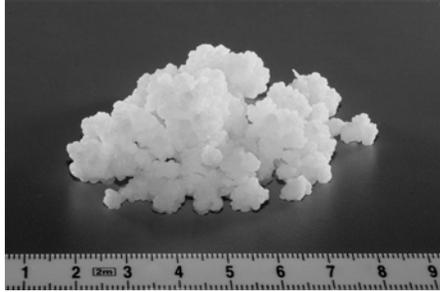
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### ***Kefir Grains***



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### ***Dairy Co-op***

- Co-op operated a cow-share program
- Members buy a share for access to unpasteurized dairy products
- Co-op delivers goods to drop-off points once a week
- Unpasteurized milk originated from an Indiana dairy
- Interstate transfer of unpasteurized milk
- When notified re illnesses Co-op contacted all members, tested milk, & suspended delivery for one week

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### ***Testing of Milk Samples***

- 7 raw dairy samples (6 milk, 1 cream) from 5 HHs were collected under chain of custody & sent to the State Lab
- All products distributed from same dairy co-op
- Products were distributed to cow-share members on 2/26/2010 & 3/5/2010
- 2 samples also shipped to CDC & 4 went to an independent lab
- All were negative for *Campylobacter*



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## Communications & Coordination

- Local health departments
- Labs
- MDARD/FDA
- Legal
- State health departments of Indiana, Illinois, Ohio
- Press offices at MDCH & MDARD/FDA to coordinate messages
- Media & public

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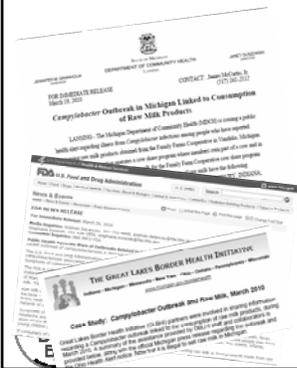
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## Communications & Coordination (2)



- March 19 – MDCH released a public health alert
- MDCH updates of investigation posted on HAN
- MDCH notified neighboring states to look for cases; conference call with IN, IL
- March 26 – FDA press release
- Great Lakes Border Health

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## Second Campylobacter Outbreak May 2010

- 9 confirmed *C jejuni* & 2 probable cases in SW Michigan
- 5 different households
- Hx of drinking raw milk from same co-op (different from #1)
- Median age 28 years (range 2–40 years)
- 45% were  $\leq 6$  years



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## Why do People Drink Raw Milk?



UW-Madison 2005–2007 survey of raw milk drinkers

- 10/12 were college-educated professionals, health conscious
- Back-to-nature philosophy
- Believe that raw milk is more nutritious, tastes better
- Health reasons – GI problems, psoriasis, allergies, nervous system problems
- Support small family farms
- Know source of their food

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## Disease Reporting & Case Definitions

- *Campylobacter* infection is not a nationally notifiable disease
- Campy is reportable in Michigan
- Confirmed case definition :
  - isolation of *Campylobacter* from any clinical specimen
- Probable case:
  - clinically compatible case, epi linked to a confirmed case, or
  - clinically compatible case with a positive antigen-based *Campylobacter* assay test result



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## May 4, 2011, Letter from CDC to State and Territorial Epidemiologists & Veterinarians re Raw Milk

“The Ongoing Public Health Hazard of Consuming Raw Milk”

- For distribution to those involved with raw milk issues
- Reminder of the dangers of consuming raw milk
- State regulators should continue to support pasteurization and consider further restricting or prohibiting the sale and distribution of raw milk and other unpasteurized dairy products in their states

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## **Conclusions**

- Outbreaks due to raw milk consumption still happening
- People are taking risks in drinking raw milk (especially children), despite laws and warnings
- Public health messages must be relevant to the health-conscious, well-educated people who are making the choice to consume raw dairy products

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## **Acknowledgements**

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|--|---|
| <ul style="list-style-type: none"> <li>• Detroit Department of Health and Wellness Promotion</li> <li>• Macomb County Health Department</li> <li>• Monroe County Department of Public Health</li> <li>• Oakland County Department of Health &amp; Human Services Division</li> <li>• Washtenaw County Public Health</li> <li>• Wayne County Health Department</li> <li>• Kalamazoo County Health &amp; Community Services</li> </ul> | <ul style="list-style-type: none"> <li>• Katie Arends, MDCH</li> <li>• Sally Bidol, MDCH</li> <li>• Joyce Lai, MDCH</li> <li>• Carla Marten, MDCH</li> <li>• Jim Collins, MDCH</li> <li>• Melinda Wilkins, MDCH</li> <li>• MDCH Bureau of Labs</li> <li>• CDC National Campylobacter Reference Lab</li> <li>• IEH Laboratories</li> <li>• MDARD</li> <li>• FDA</li> </ul> |
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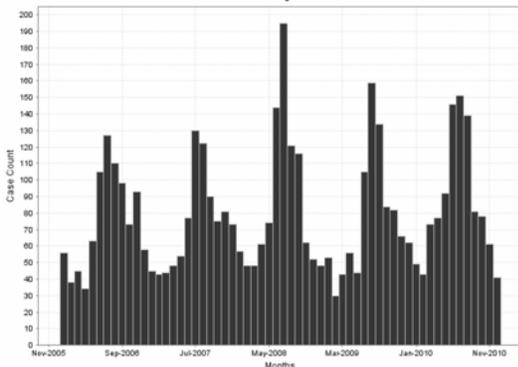
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**Confirmed Campylobacter 2006–2010 in MI**  
Case Counts by Month




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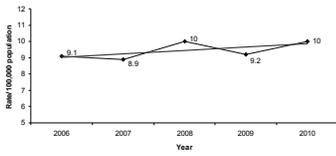
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## Campy Trends in Michigan

Rates of Confirmed Campylobacter Cases in Michigan, 2006-2010



Data source, MDSS



### Campy Counts

- 5-year average, 951 cases annually
- Range, 882–1031 cases

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## 2010 Michigan Campylobacter Outbreak Investigations: The Lab, the Epi, and the Law



Susan Esser  
Dairy Section Manager  
Food and Dairy Division  
May 25, 2011

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## Background on Michigan Dairy

- Dairy industry is the largest segment of Michigan agriculture
- Michigan ranks 8<sup>th</sup> nationally in milk production
- Dairy has \$5.9 billion impact on Michigan's economy



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## **Michigan's Dairy Program**

### Licenses

Dairy Farms: 2,200

Milk Processing Plants: 83

Other Dairy Facilities: 39

Milk Hauler/Samplers,  
Milk Tank Truck & Milk  
Transportation Companies:  
1,563



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## **Michigan's Dairy Program**

- MDARD staff conducts milk safety inspections of all dairy licensees: 7,136 inspections FY10

- 12 dairy inspectors located statewide

- FY10 law violations resulted in 91 dairy farm permit suspensions and removal of 1,442,294 pounds of suspect milk from the market



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## **Michigan's Dairy Program**

- Milk Pasteurization Systems Evaluations

- Milk Testing Laboratory Evaluations

- Milk Sanitation and Enforcement Audits on Dairy Farms and Dairy Plants for Interstate Shipment of Milk

- USDA Audits and Dairy Product Grading



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## ***Michigan's Dairy Laws***

MDARD staff works closely with new and expanding dairy facilities to assure milk safety compliance with Michigan's dairy laws. Michigan has two dairy laws:

### **Grade A Milk Law of 2001**

- Adopts the national milk safety model ordinance called the Pasteurized Milk Ordinance (PMO)
- Covers milk products like fluid milk, yogurt, cottage cheese, milk powder

### **Manufacturing Milk Law of 2001**

- Covers products like cheese and ice cream

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## ***Michigan's Dairy Laws***

- Both the Grade A Milk Law and the Manufacturing Milk Law state that only pasteurized milk and milk products shall be offered for sale or sold to the final consumer or to restaurants, grocery stores or similar establishments.
- Michigan law does not specifically prohibit dairy farmers from drinking the milk they produce on their farms.
- Michigan's dairy laws do not address cow share programs.
- FDA prohibits the sale of raw milk across state lines.

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## ***Raw Milk***

Among individual states, variability exists regarding raw milk regulations:

- Retail sale of raw milk is legal in 10 states.
- Farm sale of raw milk is legal in 15 other states.
- Some states provide for legal cow share programs.
- Some states do not address cow shares.
- Other states prohibit raw milk sales entirely.

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## ***Raw Milk***

- Discussion is currently being facilitated by Michigan Food & Farming Systems regarding consumer access to fresh unprocessed whole milk in Michigan.
- The workgroup is comprised of members from various perspectives on the issue.
- The group desires clear direction with clear public policy regarding consumer access. Discussion is ongoing.



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