



Campylobacteriosis Outbreak Associated with Unpasteurized Milk— Reno County and Butler County, August–December 2007

Outbreak Investigators

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Background

On November 9, 2007, a Butler County health care provider reported a case of campylobacteriosis to the Office of Surveillance and Epidemiology (OSE) at the Kansas Department of Health and Environment (KDHE). The health care provider listed unpasteurized milk as the likely cause of illness, and reported the milk had been shared among several families.

The Butler County Health Department (BCHD) and OSE began a joint outbreak investigation immediately. The purpose of the investigation was to identify the source of exposure, determine the extent of the outbreak, and to implement appropriate prevention and control measures.

The campylobacteriosis case's family reported purchasing unpasteurized milk from a dairy in Reno County. After some difficulty in pinpointing its address, the dairy was identified by the Reno County Health Department (RCHD) and the Kansas Department of Agriculture (KDA). The dairy had been previously implicated as the source of a Reno County resident's August 2007 *Campylobacter* infection.

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Methods

Epidemiologic

A cohort study was conducted on the five families that shared unpasteurized milk and cheese purchased October 26. Family members were interviewed by BCHD. Clinical information was collected, and exposure to the unpasteurized dairy products was assessed.

In addition to the August 2007 campylobacteriosis case identified prior to the outbreak investigation, three Reno County residents tested positive for *Campylobacter* after the outbreak investigation began. Case interviews were conducted by RCHD on all four laboratory-confirmed cases. Both BCHD and RCHD used OSE's Enteric Questionnaire for all interviews.

Statewide, local health departments routinely assess all cases of campylobacteriosis for exposure to unpasteurized dairy products by using the same standard questionnaire. This practice continued throughout the outbreak investigation.

Environmental

The dairy is subjected to regular, routine inspections from KDA. A scheduled inspection was conducted on August 22, shortly after a laboratory-confirmed case of campylobacteriosis reported purchasing and drinking its milk. On November 19, following the additional reports of campylobacteriosis, KDA visited the dairy again. The cattle holding areas, holding pens, milking parlor, milk room storage area, milking equipment, milk tank, and farm water supply were reviewed during each inspection. In addition, the dairy was questioned on its compliance with Kansas law, which stipulates that the advertising and sale of raw milk must take place on the farm where it is produced.

Laboratory

Laboratory testing was offered to symptomatic members of the five Butler County families. Two individuals, both from the same household, submitted a stool specimen to the Kansas Department of Health and Environmental Laboratories (KDHEL) for testing.

Two *Campylobacter* isolates detected by private laboratories were forwarded to KDHEL for confirmatory testing and Pulsed-Field Gel Electrophoresis (PFGE). Three additional isolates were not analyzed; due to delays in reporting cases to OSE and RCHD, the private laboratories destroyed the isolates before a testing request could be made.

Milk and cheese samples were collected from ill individuals and submitted to the Minnesota Department of Agriculture (MDA) for testing. Monthly standard bacterial plate counts and somatic cell counts were conducted on samples of the dairy's milk by KDA.

Public Health Interventions

This outbreak was detected in the weeks following another outbreak of campylobacteriosis in western Kansas wherein 68 individuals were sickened by unpasteurized cheese. A joint KDHE/KDA press release was issued to notify the public of both incidents, and to stress the risk associated with consuming unpasteurized dairy products.

Results

Epidemiologic

Cohort Study

Members of each Butler County family reported illness after exposure to the milk (Table 1). Cases were defined as individuals reporting diarrheal illness following ingestion of unpasteurized milk from the implicated dairy. Symptoms reported among the 16 cases included diarrhea (100%), stomach ache (100%), fever/chills (81%), nausea (71%), muscle aches (64%), vomiting (31%), and bloody diarrhea (13%). Duration of illness was available for nine cases—illness ranged from six to nine days (median = 6 days.) Cases ranged in age from one to 46 years (median age = 13 years). Nine of the 16 cases were female. None of the cases were hospitalized.

Table 1. Diarrheal illness following unpasteurized milk exposure by household, Butler County, 2007

Household	Total Members	Members ill after drinking milk
B	6	4/4 (100%)
C	7	4/5 (80%)
D	4	3/4 (75%)
E	7	3/7 (43%)
F	9	2/8 (25%)
All	33	16/28 (61%)

Members of one Butler County household consumed cheese in addition to milk—eating cheese was not associated with illness.

Case interviews

Illnesses among members of four Reno County households were also associated with the outbreak (Table 2). A confirmed case was defined as an individual that tested positive for *Campylobacter*. One member of each Reno County household was a laboratory-confirmed case of campylobacteriosis. Probable cases — household members with similar diarrheal illness — were identified but not interviewed. The number of non-ill individuals in each household was not determined. Dates of illness ranged from August

to December. The households reported purchasing milk, cream, and cheese from the dairy; only cheese was not associated with illness. Precise dates of purchase were not known for each household, but cases reported purchasing dairy products within about a week of their illness onset. Two cases were hospitalized during the course of their illness.

Table 2. Diarrheal illness following dairy product exposure by household, Reno County, 2007

Household	Illness Onset*	Cases	
		Confirmed	Probable
A	August 7	1	2
G	October 27	1	3
H	October 30	1	0
I	December 30	1	0
All		4	5

**Illness onset dates were reported by confirmed cases only.*

Statewide, 211 cases of campylobacteriosis were detected from August 1 — twelve days before the first dairy-associated case was reported — to December 31. Only those cases listed above reported exposure to the Reno County dairy’s products.

Environmental

Both inspections confirmed that the dairy was operating satisfactorily, and within the limitations of Kansas law.

Laboratory

Two ill members of one Butler County household submitted stool specimens to KDHEL. *Campylobacter jejuni* was isolated from each specimen. PFGE analysis confirmed that these two isolates were indistinguishable from the *Campylobacter* strain isolated by a private laboratory. The three Butler County *Campylobacter jejuni* isolates, representing two households exposed to the same dairy product, featured the same PFGE pattern: CJs013.

The only other *Campylobacter jejuni* isolate forwarded to KDHEL was found to have a different PFGE pattern: CJs015. This isolate was taken from a Reno County citizen who consumed cream from the dairy in late December.

Milk, cheddar cheese, and pepper cheese purchased by a Butler County household were submitted to MDA for testing, along with another milk sample from a Reno County household. *Campylobacter* was not found in any of the food samples.

Routine milk testing by KDA was unremarkable. Standard bacterial plate counts and somatic cell counts were within normal levels. No tests for *Campylobacter* were conducted; the KDA laboratory is not equipped for pathogen isolation.

Discussion

Campylobacter infection is one of the leading causes of gastrointestinal illness in all ages, causing up to 14% of diarrhea worldwide. It is estimated that 2.5 million cases occur each year, resulting in 13,000 hospitalizations and 124 deaths.¹ Many cases go unreported, as they may be asymptomatic, mild or self-limiting.

Symptoms of *Campylobacter* infection include diarrhea, vomiting, fever and abdominal cramping and usually appear within 2 to 5 days of exposure, lasting about one week. In less common instances, severe or prolonged illness or relapses can occur.² Post-infectious syndromes, such as reactive arthritis and Guillian-Barre syndrome, can also occur.

Large outbreaks have been associated with drinking fecally contaminated unpasteurized milk or water from shallow wells contaminated by animal feces.³ In 2006, unpasteurized milk or milk products were the vehicle identified in seven outbreaks of *Campylobacter* infection, which resulted in 100 cases, seven hospitalizations and one death.⁴ Milk and milk products are excellent vehicles for infection, because their fat content protects pathogens from gastric acid. Pasteurization minimizes pathogens in milk.⁵

Although it is against federal law to sell raw milk across state lines, Kansas law allows raw milk and raw milk products to be sold or donated directly to the final consumer if the transaction takes place on the dairy farm where the raw milk was produced. All containers and signs on the farm must indicate the milk is “raw, unpasteurized.” There can be no advertising other than the sign erected on the farm, and door-to-door sales and/or delivery of raw milk are prohibited. All milk sold in retail stores must be pasteurized.

From August 2007 through December 2007, the Reno County dairy’s unpasteurized products were implicated as the cause of illness in 25 individuals: seven laboratory-confirmed cases of campylobacteriosis and 18 probable cases. Disease transmission occurred even though the dairy cattle appeared healthy, and despite the dairy’s satisfactory operating practices. This outbreak underscores the inherent dangers of

¹ Braam HP. *Campylobacter enteritis*. In: Heymann, DL, ed. *Control of Communicable Disease Manual*. 18th ed. Washington DC:APHA, 2004: 81-84

² Ibid.

³ Mead PS, Slutsker L, Dietz V et al. Food-Related Illness and Death in the United States. *EID*,1999;5(5), September-October

⁴ Summary Statistics for Foodborne Outbreaks, CDC, 2006. Available at: http://www.cdc.gov/foodborneoutbreaks/documents/2006_line_list/2006_line_list.pdf

⁵ Potter ME, Kaufman AF et al. Unpasteurized Milk- The Hazards of a Health Fetish. *JAMA* 1984; 252:2048.

unpasteurized dairy product consumption; even cows that appear healthy may excrete *Campylobacter* into their milk.⁶

Limitations

Although infection was epidemiologically associated with the dairy's products, *Campylobacter* was not isolated from the implicated foods. There was a significant delay from the purchase of the dairy products to laboratory testing; as the raw milk spoiled, it created an environment that likely killed any detectable pathogens. Attempts to recover *Campylobacter* directly from food products are often unsuccessful, even under optimal conditions.⁷ No environmental testing was conducted to isolate *Campylobacter* directly from the dairy cows.

The cohort study and the case interviews were subject to recall bias — those questioned may not have correctly remembered the details of their illness. Probable Reno County cases were indentified but not interviewed. The number of non-ill individuals in each affected Reno County household was not determined.

Recommendations

To prevent future outbreaks of *Campylobacter* infection, consumers should be educated on the risks associated with raw milk consumption, and taught to avoid consumption of unpasteurized dairy products.

The current Kansas state regulations, which allow on-site sale and donation of unpasteurized milk, should be revised to prohibit the sale of unpasteurized milk or milk products.

Acknowledgements

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⁶ CDC. Epidemiologic Notes and Reports *Campylobacter* Outbreak Associated with Raw Milk Provided on a Dairy Tour – California. MMWR 1986;35(19):311-2

⁷ U.S. Food and Drug Administration. Foodborne Pathogenic Microorganisms and Natural Toxins Handbook. Available at: <http://www.cfsan.fda.gov/~mow/chap4.html>