

RAW MILK OUTBREAK: CANADIAN EXPERIENCE

It is impossible to produce sterile milk directly from an animal source. Sources of contamination include commensal or pathogenic flora of the udder or teat canal, the animal's skin, fecal soiling of the udder, contaminated milking equipment, water used to clean the milking equipment, and milk storage containers. In addition, commensal or pathogenic organisms from milkers, insects, rodents, birds, and other animals may enter milk.

The consumption of unpasteurized or raw milk has always been dangerous and the same holds true today. Pasteurization of milk kills most potential pathogenic organisms but does not sterilize the milk.ⁱ

The following pathogens have been cultured in raw milk: Enterotoxigenic *Staphylococcus aureus*, *Campylobacter jejuni*, *Salmonella* species, *E. Coli* (EHEC) (ETEC), *Listeria monocytogenes*, *Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Brucella* species (abortus-cattle melitensis-goats), *Coxiella burnetii*, *Yersinia enterocolitica*, *Streptococcal* species.

The elimination of gross contamination of milk during milking, improved storage and processing times and conditions have been helpful in reducing the bacterial load in milk but pasteurization is the key safety measure.ⁱⁱ

Historically

The city of Toronto passed a bylaw in 1915 requiring the pasteurization of all milk sold in the City. In 1920 with the co-operation of various city hospitals, the Hospital for Sick Children in Toronto studied TB infected children admitted in Toronto hospitals over the next 13 years. The study was supported by the National Research Council of Canada. 500 Children were investigated, 9.6% of them suffered extra pulmonary tuberculosis. The infecting organism was proved to be the bovine type and was recovered from infected bones, joints, glands, kidneys, meninges, tonsils and skin. The exposure history of the patients invariably revealed that the child had been fed raw milk. It was also found that not a single case of bovine TB was found in those children living in Toronto and drinking only pasteurized milk.

In 1935 at the annual meeting of the Canadian Medical Association a resolution endorsing the compulsory pasteurization of all milk offered for sale was passed. The American Medical Association endorsed compulsory milk pasteurization the same year.

In 1938 Ontario passed the legislation to require all milk sold or distributed in Ontario to be pasteurized. At that time milk-borne outbreaks constituted 25% of all food and water borne outbreaks in North America.ⁱⁱⁱ

Since 1938 milk borne outbreaks in Ontario have become rare.

It is often difficult to prove causation because of lack of product to test and the ubiquitous nature of the organisms but with improved PCR testing proving causation rather than simply reporting association is starting to help determine some of the exposure-disease connections.

Recent Example: Outbreak Summary

The Simcoe Muskoka District Health Unit (SMDHU) investigated an outbreak of *Escherichia coli* 0157:H7 in April of 2005 that was linked to raw unpasteurized cow's milk distributed and consumed by three families who reside in Simcoe County and the Greater Toronto Area. Two children under 10 years of age and two adults presented hospital emergency departments with bloody diarrhea and severe abdominal cramps. Two of the ill persons required hospitalization.

E. coli 0157:H7 was first isolated from a 22-year-old male and his 24-year-old sister who presented to hospital during the first week of April. Additional cases of *E. coli* 0157:H7 were identified in an eight year-old male from Barrie and a seven year-old female from Toronto, who also presented to hospital emergency departments during the same week.

All four ill persons were investigated by SMDHU and Toronto Public Health and had a food history that included the recent consumption of raw unpasteurized cow's milk during the time prior to the onset of their symptoms. There were no other common links and exposures among the four persons. Raw unpasteurized milk was reportedly obtained from a person routinely distributing three-litre glass jars of unpasteurized milk from a delivery vehicle in the south end of Barrie. Two raw milk samples were obtained from two of the families affected by the disease and were sent for testing to the provincial Central Public Health Laboratory in Toronto. *E. coli* 0157:H7 bacteria was detected in one of the milk samples. DNA typing (with Pulse Field Gel Electrophoresis method) indicated that the *E. coli* 0157:H7 bacteria from the four persons and the one milk sample were genetically related to each other.

The laboratory evidence and outbreak investigation indicate that the most probable cause of *E. coli* 0157:H7 illness in all four cases was the consumption of contaminated raw milk associated with a single source supply. SMDHU continues to work with other public health units and the Ministry of Health and Long Term Care in identifying other persons with illness linked to this outbreak and the source of the raw unpasteurized milk. No additional associated *E. coli* 0157:H7 cases have been identified in the province of Ontario by public health agencies since the outbreak.

Since 1938 the numbers of infections related to raw milk exposure are small and records of raw milk related out breaks have not been well documented in Ontario over many of the earlier years. Since 2005 iPHIS has given us the capability of producing a summary. The table below confirmed the cases of enteric illness that were exposed to unpasteurized milk and raw milk cheese from 2005 to 2007 in Ontario. Following that, the table shows data summarized by organism and health unit area.

ⁱ Leedon, J.M., Milk of Nonhuman Origin and Infectious Diseases in Humans. *Clinical Infectious Diseases* 2006;43:610-5

ⁱⁱ Steele, M. L., McNab W.B., Poppe C., Griffiths M. W., Chen S., Degrandis S.A., et al. Survey of Ontario Bulk Tank Raw Milk for Food-Borne Pathogens, *Journal of Food Protection*, Vol. 60, No. 11, 1997, Pages 1341-1346

ⁱⁱⁱ In the Matter of an Appeal Under the Health Protection and Promotion Act, Revised Statutes of Ontario, 1990, Chapter H.7; Michael Schmidt, Appellant and The Bruce-Grey-Owen Sound Health Unit, Respondent; Citation: 1994 CarswellOnt 5685; Court: Ontario Health Protection Appeal Board

| Disease | Exposure Source Details | | | | Grand Total |
|--|----------------------------|-----------|-----------|-----------|----------------|
| | | 2005 | 2006 | 2007 | |
| BRUCELLOSIS | Cheese (unpasteurized) | 1 | | 1 | |
| | Milk (unpasteurized) | 1 | 1 | | |
| BRUCELLOSIS Total | | 2 | 1 | 1 | 4 |
| CAMPYLOBACTER ENTERITIS | Cheese (unpasteurized) | 1 | 3 | 24 | |
| | Milk (unpasteurized) | 4 | 16 | 13 | |
| CAMPYLOBACTER ENTERITIS Total | | 5 | 19 | 37 | 61 |
| CRYPTOSPORIDIOSIS | Cheese (unpasteurized) | | | 1 | |
| | Milk (unpasteurized) | 2 | 1 | 2 | |
| CRYPTOSPORIDIOSIS Total | | 2 | 1 | 3 | 6 |
| GIARDIASIS | Milk (unpasteurized) | | 1 | 1 | |
| GIARDIASIS Total | | | 1 | 1 | 2 |
| SALMONELLOSIS Total | Milk (unpasteurized) | 2 | | 1 | |
| SALMONELLOSIS | | 2 | 2 | 2 | 6 |
| SHIGELLOSIS | Cheese (unpasteurized) | | | 1 | |
| | Milk (unpasteurized) | | 1 | 2 | |
| SHIGELLOSIS Total | | | 1 | 3 | 4 |
| VEROTOXIN PRODUCING E. COLI INCLUDING HUS | Milk (unpasteurized) | 3 | 3 | | |
| VEROTOXIN PRODUCING E. COLI INCLUDING HUS Total | | 3 | 3 | | 6 |
| YERSINIOSIS | Milk (unpasteurized) | | | 2 | |
| YERSINIOSIS Total | | | 1 | 2 | 3 |
| Grand Total | | 14 | 29 | 49 | 92 |

Source: Ontario Ministry of Health and Long-Term Care, integrated Public Health Information System (iPHIS) database, extracted [11/02/2008].

Health Units: 2005-2007

| Health Unit of Exposure | # Cases |
|---------------------------------|---------|
| Outside of Ontario | 17 |
| Eastern Ontario | 22 |
| Wellington-Dufferin-Guelph | 9 |
| Waterloo Region | 6 |
| Huron | 6 |
| Perth District | 3 |
| Peterborough County-City | 2 |
| Grey-Bruce | 2 |
| Leeds-Grenville-Lanark District | 2 |
| Toronto | 1 |
| City of Hamilton | 1 |
| Elgin-St. Thomas | 1 |

Organisms: 2005-2007

| Disease | Total # Cases | Health Unit of Exposure | # Cases |
|-------------------|---------------|----------------------------|---------|
| Brucellosis | 5 | Outside of Ontario | 5 |
| Cryptosporidiosis | 5 | Outside of Ontario | 2 |
| | | Wellington-Dufferin-Guelph | 2 |
| | | Huron County | 1 |
| Giardiasis | 2 | Outside of Ontario | 2 |
| Salmonellosis | 7 | Outside of Ontario | 1 |
| | | Wellington-Dufferin-Guelph | 3 |
| | | Niagara | 1 |
| | | Perth District | 1 |
| | | Waterloo Region | 1 |
| Shigellosis | 4 | Outside of Ontario | 4 |
| E. coli | 7 | Outside of Ontario | 1 |
| | | Simcoe-Muskoka | 3 |
| | | Waterloo Region | 2 |
| | | Ottawa | 1 |
| Yersiniosis | 3 | Outside of Ontario | 2 |
| | | Thunder Bay | 1 |

The CDC in the USA conducts media surveillance for raw milk related illness. This summary was last updated July 24 2007.

The CDC reports that from 1998 to 2005 there were 39 outbreaks reported that were associated with unpasteurized milk or cheese. The out breaks resulted in an estimated 831 illnesses, 66 hospitalizations and 1 death. (Source:www.cfsan.fda.gov/~acrobat/milksafe.pdf)

Summarized below are just the Canadian media reports that CDC identified. These numbers are likely to be grossly under reported as many enteric diseases are not investigated or reported and even less reported in the media.

| YEAR | LOCATION | DETAILS | REFERENCES |
|---------------|-----------------|--|---|
| July 2007 | Eastern Ontario | Source: Raw milk cheese made by mobile cheese-maker Casual agent: Undisclosed Illnesses: Two dozen people | ***Raw milk cheese blamed for making two dozen people ill*** 20.jul.07 Ottawa Citizen |
| March 2007 | Ontario | Two children sick 1. Infant contracted listeriosis – likely source, mothers reported consumption of raw milk cheese – in critical condition. 2. 2-year old hospitalized with Yersinia infection – drank raw milk from family farm. | ***Yersinia infection most likely from raw milk*** 16.mar.07 Grey Bruce Health Unit ***Infant Listeriosis in Grey Bruce*** 14.mar.07 Grey Bruce Health Unit News Release Contact: Grey Bruce Health Unit Tel: (519-376-9420) |
| November 2006 | Ontario | Five county residents became ill from consuming unpasteurized raw milk. The five contracted campylobacter following two family gatherings. A sixth person from Belleville was also affected. | ***Raw milk sickens five*** 14.dec.06 Peterborough Examiner (ON) Jeanne Pengelly Contact: Dr. Garry Humphreys Medical Officer of Health, Peterborough County City Health Unit ph: (705) 743-1000 |
| June 2006 | Ontario | 15-year-old in Waterloo region hospitalized with E. coli infection after drinking unpasteurized milk. | *** Raw milk: Public service or outlaw act?*** 13.dec.06 The Record Tamsin McMahon |

| YEAR | LOCATION | DETAILS | REFERENCES |
|--------------------------------|----------|--|---|
| | | | Contact: Chris Komorowski Manager, Food Safety & Infectious Control Region of Waterloo Ph: (519) 883-2269 |
| Summer 2006 | Ontario | Nine-year old Waterloo girl hospitalized with kidney failure after eating raw milk cheese contaminated with E. coli. Cheese given to girl's family as gift. Was not linked to any farms in the region. Another child in the region came down with serious stomach illness caused by campylobacter after consuming raw milk. No further detail provided. | *** Raw milk: Public service or outlaw act?*** 13.dec.06 The Record Tamsin McMahon Contact: Chris Komorowski Manager, Food Safety & Infectious Control Region of Waterloo Ph: (519) 883-2269 |
| 2006 | Ontario | Two confirmed cases of illness on farms in Haldimand and Norfolk due to raw milk consumption. | ***H-N Health Unit warns drinking raw milk unsafe*** 03.jan.07 Port Dover Maple Leaf Contact: Abidi Shuayb Mohammad, Program Coordinator, Communicable Disease Services Halidmand-Norfolk Health Unit Ph: (519)426-6170 Ext. 3234 |
| April 2005 | Ontario | Source: Milk sold out of the back of a truck. Casual agent: E. coli 0157:H7 Illnesses: 6 | ***Ontario officials investigating underground milk market: 4 ill with E. coli*** 14.apr.05 CP Wire Tara Brautigam |
| October 2002 and February 2003 | Edmonton | Source: Unpasteurized gouda cheese to farmers' markets, specialty stores and restaurants. Casual agent: E. coli 0157:H7 Illness: 13 (Age: 22 months – 77 years) 5 cases were hospitalized and two cases | Contact: Lance Honish Environmental Health Epidemiologist. Capital Health- Public Health Division Ph: (780) 413-7923 |

| YEAR | LOCATION | DETAILS | REFERENCES |
|-------------|------------------|---|---|
| | | (aged 2 and 4 years) developed hemolytic uremic syndrome (HUS) as a result of their infection. | |
| August 2001 | British Columbia | Source: Goat's milk from a co-operative farm south of Nanaimo, on Vancouver Island, BC. Casual agent: E. coli 0157:H7 Illness: 5 children | ***Escherichia coli 0157 Outbreak Associated with the Ingestion of Unpasteurized Goat's Milk in British Columbia 2001*** Canada Communicable Disease Report Vol. 28-01 1 January 2002 http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02vol28/dr2801eb.html |
| June 1984 | British Columbia | Source: 17 members of a kindergarten class on Vancouver Island, British Columbia, Canada, visited a raw milk dairy; 13 drank raw milk. Casual agent: C. jejuni Illness: Nine persons became ill a median of 4 days after visiting the dairy. Stools from 10 persons were cultured; three yielded C. jejuni. | ***Epidemiologic Notes and Reports Campylobacter Outbreak Associated with Certified Raw Milk Products – California*** Editorial Note 1984.MMWR. 33(39); 562 http://www.cdc.gov/mmwr/preview/mmwrhtml/00000412.htm |

A very large Canadian exposure to listeriosis contaminated meat product occurred in 2008. This widely reported exposure increased the awareness of this organism and its great danger to the very old, very ill, pregnant women and newborns. Several Quebec raw cheese products were implicated in the various investigations of laboratory confirmed disease. These raw cheese products were proven to be contaminated with listeria monocytogenes. For information about these recalls see Appendix A. This demonstrates that when slightly more active surveillance is undertaken many more cases are found and again would support the opinion that these illnesses are largely unreported in our passive surveillance system.