

## ***Cornell University Food Science Department Position Statement on Raw Milk Sales and Consumption***

We recommend pasteurization of milk intended for consumption by humans. Specifically, we strongly recommend that raw milk not be served to infants, toddlers, or pregnant women, or any person suffering from a chronic disease or a suppressed immune system. In addition, we strongly recommend that raw milk not be provided to the general public at farms or at retail; raw milk consumption could expose these people to unnecessary and/or extremely costly and painful risks for which a milk producer may be held legally responsible. Pasteurization offers protection – both for the consumer and for the producer - from the consequences of foodborne infection by pathogens that can be found in raw milk.

### **Health Hazards Associated with Raw Milk Consumption**

Physicians linked consumption of raw milk with the spread of disease early in the 20<sup>th</sup> century. Raw milk consumption was associated with many serious human diseases, including diphtheria, typhoid, tuberculosis, and brucellosis (1). In fact, in 1938, 25% of all U.S. illnesses resulting from consumption of contaminated food and water were linked back to milk consumption (2). During this era, human illnesses typically resulted from consumption of milk that had been obtained from unhealthy cows under unsanitary conditions. Modern U.S. dairy products are associated with considerably less than 1% of foodborne illnesses that are traced back to food source each year (2). The reduction in numbers of foodborne illnesses associated with milk consumption over the years reflects implementation of: (i) on-farm programs to control animal diseases, including brucellosis, tuberculosis and mastitis; (ii) enhanced farm sanitation practices; (iii) temperature control of milk products from the farm to the consumer (milk must be kept at 45°F or below within 2 hours of milking); and (iv) pasteurization of the majority of commercial dairy products (2).

In addition to the reduction in the number of illnesses associated with dairy product consumption since 1938, the nature of dairy-borne human illnesses has changed, as well. In the past 20 years, illnesses from dairy product consumption have been predominantly associated with *Salmonella enterica*, *Listeria monocytogenes*, *Campylobacter jejuni*, and *Escherichia coli* O157:H7 (3), which can be present in milk obtained from healthy animals, typically as a consequence of contamination that occurs during or after milking (e.g., milk contamination from contact with fecal material or inadequately cleaned equipment) (4). In recent years, pathogenic microorganisms have been isolated from bulk tank samples at rates ranging from 0.87% to 10% of total samples collected (5, 6, 7, 8, 9), indicating a measurable probability of encountering pathogenic bacteria in raw milk.

**Examples and prevalence of human foodborne pathogens isolated from raw bulk tank milk** (adapted from Ruegg, P. <http://www.uwex.edu/milkquality/PDF/zoo.pdf>)

Pathogen	State or Province	# Tanks Sampled	% Positive Bulk Tanks	Reference
<i>Salmonella</i>	WI, MI, IL	678 tanks	4.70%	6
	Ontario	1,721 tanks	0.17%	8
	SD, MN	131 tanks	6.10%	5
	TN, VA	292 tanks	8.90%	9
<i>Listeria</i>	Ontario	1,721 tanks	2.73%	8
	SD, MN	131 tanks	4.60%	5
	TN, VA	292 tanks	4.10%	9
<i>E. coli</i> O157:H7	Ontario	1,721	0.87%	8
	WI	115 tanks	10.00%	7

**Milk Pasteurization**

The public health objective of milk pasteurization, as defined in the Grade “A” Pasteurized Milk Ordinance (2), is to eliminate all non-spore forming pathogens commonly associated with milk. Pasteurization processes are specifically implemented to reduce the potential risk to consumers of illness due to pathogens that may be present in raw milk. All milk intended for human consumption must be handled according to good agricultural and manufacturing process procedures. As pasteurization is not designed to sterilize milk, it may not eliminate all harmful bacteria if raw milk is heavily contaminated. Therefore, milk intended for human consumption must be obtained from healthy cows and protected from contamination. The temperature and time regime for pasteurization is currently designed to kill *Coxiella burnetii*, an animal pathogen that is the causative agent of Q-fever in humans. *C. burnetii* is currently accepted as the most heat-resistant human pathogen found in milk. Good hygiene practices during milking and subsequent handling of milk are essential to reduce the risk of contamination on the farm and in the milk processing plant. Careful packaging of pasteurized milk in clean, sanitized containers also helps retard spoilage of milk so it lasts longer after it is purchased. Milk that is not properly handled can become re-contaminated after the heat treatment. Rapid cooling after pasteurization, sanitary handling, and storage in a clean, closed container at 40°F or below are also important aspects of ensuring safe milk.

**Many Types of Raw Foods Can be Hazardous for Human Consumption**

Many raw foods may be contaminated with harmful bacteria. Certain raw foods should always be treated as if they are contaminated. For example, ground beef may be contaminated with a number of organisms associated with a cow’s gastrointestinal tract, including *E. coli* O157:H7, however proper cooking will kill these organisms. Other foodborne disease outbreaks from *Salmonella* and *Campylobacter* are associated with consumption of undercooked chicken. *Salmonella* infections also have been associated with consumption of raw or undercooked eggs. *Listeria monocytogenes* infections have been attributed to consumption of a number of foods, including improperly cooked

hotdogs. Heat treatments for many foods are commonly accepted practices that not only make the food more palatable, but also, when conducted in accordance with accepted food safety guidelines, reduce the risk of acquiring foodborne infections.

### **Examples of Recent Outbreaks Attributed to Raw Milk Consumption**

In recent years, illnesses from raw milk consumption have made national headlines. For example, *E. coli* O157:H7 infections occurred in the states of Oregon and Washington in December 2005. Of 140 people reportedly consuming milk from a farm, 18 became ill. Five patients (aged 1-13 years old) were hospitalized and four of these patients developed Hemolytic Uremic Syndrome (10). In 2006, *E. coli* O157:H7 was responsible for illness in six children from California (11) and two children in Washington (12). Litigation on behalf of two of the children from California has recently been filed (13). In three additional 2006 outbreaks, *Campylobacter jejuni* infections were diagnosed in two people in Ohio (14), five in Colorado (15), and > 50 people following consumption of raw milk cheese in Wisconsin (15). In 2007, illnesses attributed to raw dairy product consumption included a *Salmonella* outbreak that sickened 29 in Pennsylvania (16), a *Campylobacter* outbreak that affected 67 in Kansas (17), and listeriosis infections among four pregnant women in North Carolina, which resulted in three miscarriages and a premature delivery (18). For comprehensive information on foodborne illnesses, please visit the Centers for Disease Control (CDC) website: [http://www.cdc.gov/foodborneoutbreaks/outbreak\\_data.htm](http://www.cdc.gov/foodborneoutbreaks/outbreak_data.htm). To reduce the risk of contracting foodborne illnesses, consumers should avoid raw milk products.

### **Cornell University staff members supporting this position statement:**

Robert Ralyea, M.S., Sr. Extension Associate, Food Science Department  
(rdr10@cornell.edu)

David P. Brown, M.S., Sr. Extension Associate, Food Science Department  
(dpb1@cornell.edu)

Jason R. Huck, M.S., Dairy Operations Manager, Cornell University (jrh63@cornell.edu)

Martin Wiedmann, Dr. med. vet, Ph.D., Associate Professor and Director of Graduate Studies, Field of Food Science and Technology

Kathryn J. Boor, Ph.D., Professor and Food Science Department Chair  
(kjb4@cornell.edu)

Contact information:  
Food Science Department  
Stocking Hall  
Cornell University  
Ithaca, NY 14853  
607-255-7643

## References

1. Johnson, E. A., J. H. Nelson, and M. Johnson. 1990. Microbial safety of cheese made from heat-treated milk. Part II. Microbiology. *J. Food Prot.* 53:519-540.
2. U.S. Dept. of Health and Human Services, Public Health Service and Food and Drug Admin. 2003. Grade "A" Pasteurized Milk Ordinance. 2003 Revision. <http://www.cfsan.fda.gov/~ear/pmo03toc.html>
3. IOM/NRC. 2003. Scientific criteria to ensure safe food. National Academic Press, Washington, DC. pp. 242-243.
4. Boor, K. J. 1997. Pathogenic microorganisms of concern to the dairy industry. *Dairy Food Environ. Sanit.* 17:714-717.
5. Jayarao, B. M., and D. R. Henning. 2001. Prevalence of foodborne pathogens in bulk tank milk. *J. Dairy Sci.* 84:2157-2162.
6. McManus, C., and J. M. Lanier. 1987. *Salmonella*, *Campylobacter jejuni*, and *Yersinia enterocolitica* in raw milk. *J. Food Prot.* 50:51.
7. Padhye, N. V., and M. P. Doyle. 1991. Rapid procedure for determining enterohemorrhagic *Escherichia coli* O157:H7 in food. *Appl. Environ. Microbiol.* 57:2693-2698.
8. Steele, M. L., W. B. McNab, C. Poppe, and M. W. Griffiths. 1997. Survey on Ontario bulk tank raw milk for food-borne pathogens. *J. Food Prot.* 60:1341-1346.
9. Rohrbach, B. W., F. A. Draughon, P. M. Davidson, and S. P. Oliver. 1992. Prevalence of *Listeria monocytogenes*, *Campylobacter jejuni*, *Yersinia enterocolitica*, and *Salmonella* in bulk tank milk: Risk factors and risk of human exposure. *J. Food Prot.* 55:93-97.
10. Morbidity and Mortality Weekly Report 56(08):165-167. March 2, 2007. *Escherichia coli* O157:H7 Infection Associated with Drinking Raw Milk --- Washington and Oregon, November--December 2005. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5608a3.htm>. Accessed Mar. 6, 2008.
11. Int. Soc. for Infectious Diseases. 2006a. *E. coli* O157, Unpasteurized milk USA (California) (03). A ProMED-mail post, Sept. 29, 2006. Accessed Mar. 6, 2008. [http://www.promedmail.org/pls/otn/f?p=2400:1202:2517207500593079::NO::F2400\\_P1202\\_CHECK\\_DISPLAY,F2400\\_P1202\\_PUB\\_MAIL\\_ID:X,34628](http://www.promedmail.org/pls/otn/f?p=2400:1202:2517207500593079::NO::F2400_P1202_CHECK_DISPLAY,F2400_P1202_PUB_MAIL_ID:X,34628)
12. Int. Soc. for Infectious Diseases. 2006b. *E. coli* O157, Unpasteurized milk USA (Washington): Recall. A ProMED-mail post, Sept. 29, 2006. Accessed Mar. 6, 2008. [http://www.promedmail.org/pls/otn/f?p=2400:1202:2517207500593079::NO::F2400\\_P1202\\_CHECK\\_DISPLAY,F2400\\_P1202\\_PUB\\_MAIL\\_ID:X,34624](http://www.promedmail.org/pls/otn/f?p=2400:1202:2517207500593079::NO::F2400_P1202_CHECK_DISPLAY,F2400_P1202_PUB_MAIL_ID:X,34624)
13. *E. coli* Lawsuit Filed Against Organic Pastures. Posted on Marler & Clark LLP, PS on Feb. 8, 2008. <http://www.ecoliblog.com/2008/02/articles/e-coli-legal-cases/e-coli-lawsuit-filed-against-organic-pastures/>. Accessed Mar 6, 2008.
14. Int. Soc. for Infectious Diseases. 2006c. Foodborne illness, Unpasteurized milk USA (Ohio). A ProMED-mail post, Sept. 29, 2006. Accessed Mar. 6, 2008. [http://www.promedmail.org/pls/otn/f?p=2400:1202:2517207500593079::NO::F2400\\_P1202\\_CHECK\\_DISPLAY,F2400\\_P1202\\_PUB\\_MAIL\\_ID:X,34631](http://www.promedmail.org/pls/otn/f?p=2400:1202:2517207500593079::NO::F2400_P1202_CHECK_DISPLAY,F2400_P1202_PUB_MAIL_ID:X,34631)  
Accessed Mar. 6, 2008.

15. Weise, E. 2006. Raw milk: fit for human consumption? USA Today. Aug. 6, 2006. [http://www.usatoday.com/news/health/2006-08-06-raw-milk-usat\\_x.htm](http://www.usatoday.com/news/health/2006-08-06-raw-milk-usat_x.htm). Accessed Mar 6, 2008.
16. Morbidity and Mortality Weekly Report 56(44):1161-1164. November 9, 2007. *Salmonella typhimurium* Infection Associated with Raw Milk and Cheese Consumption - -- Pennsylvania, 2007. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5644a3.htm>. Accessed Mar. 6, 2008.
17. Kansas Department of Health and Environment. 2007. Outbreak of *Campylobacter jejuni* Infections Associated with Consumption of Cheese Made from Raw Milk – Western Kansas, 2007. [http://www.kdheks.gov/epi/download/Western\\_KS\\_OCT07\\_Campylobacter.pdf](http://www.kdheks.gov/epi/download/Western_KS_OCT07_Campylobacter.pdf). Accessed Mar. 6, 2008.
18. North Carolina: Listeriosis results in stillbirths, premature birth. Posted on Marler & Clark LLP, PS on Dec.19, 2007. <http://www.foodpoisonblog.com/articles/food-poisoning-watch/>. Accessed Mar. 6, 2008.

General information for position statement adapted from “Why Pasteurize? The Dangers of Consuming Raw Milk” Fact Sheet at the following website:  
<http://www.foodscience.cornell.edu/cals/foodsci/extension/upload/FACTrawmilk07.doc>.