



Consumption of Unpasteurized (Raw) Milk and Milk Products by Pregnant People and Children: Policy Statement

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Sales of unpasteurized (raw) milk and milk products remain legal in at least 27 US states. Unpasteurized milk and milk products from cows, goats, and sheep continue to be a source of infections attributable to several virulent pathogens, including *Listeria monocytogenes*, *Campylobacter jejuni*, *Salmonella* species, *Brucella* species, and *Escherichia coli* O157. These infections can occur in both healthy and immunocompromised individuals, including older adults, infants, young children, and pregnant people and their fetuses, potentially resulting in life-threatening illness and fetal miscarriage. Pasteurization of milk products greatly reduces risk of illness. Efforts to limit the sale of unpasteurized milk products have been met with opposition from proponents of unpasteurized milk's alleged health benefits. These purported benefits have no evidence base and do not outweigh the risks of unpasteurized milk consumption. Substantial data suggest that pasteurized milk confers equivalent health benefits compared with unpasteurized milk, without the additional risk of infection. The purpose of this policy statement is to provide evidence for the risk of infection from unpasteurized milk consumption, along with the severe illness and infectious complications that occur, especially among pregnant people, infants, and children.

INTRODUCTION

Foodborne illness accounts for substantial morbidity and mortality in the United States. In 2019, an estimated 9.9 million domestically acquired foodborne illnesses were caused by 6 major pathogens, *Campylobacter*

abstract

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species, *Clostridium perfringens*, *Listeria monocytogenes*, norovirus, nontyphoidal *Salmonella* species, and Shiga toxin-producing *Escherichia coli* (STEC).¹ Together, these pathogens accounted for approximately 53 000 hospitalizations and nearly 900 deaths.¹ In addition to the risk of morbidity and mortality from foodborne illness, there are significant financial costs associated with medical care and lost productivity.² The estimated incidence of certain foodborne illness in the United States increased in 2023 compared with 2016–2018, with all Healthy People 2030 targets unmet.³

An important source of increased risk for foodborne illness is consumption of unpasteurized (raw) milk or milk products, including fresh cheeses, soft cheeses, and soft-ripened cheeses. The pathogens responsible for the majority of foodborne illness are found in unpasteurized milk.⁴ Pasteurization kills these pathogens, sterilizing milk to ensure safety for consumption and a longer shelf life. Given the ubiquitous access to pasteurized milk and milk products as well as the effectiveness of existing legislation restricting the sale of unpasteurized dairy products, infections related to ingestion of unpasteurized milk and milk products are among the most preventable of foodborne illnesses. Reasons for the continued burden of disease related to unpasteurized milk or milk products are primarily related to misinformation regarding purported benefits and underestimation of risk. Consumption of unpasteurized dairy products is especially risky among populations such as pregnant people, infants, the elderly, and immunocompromised individuals including transplant recipients,^{5,6} who are most susceptible to infection with pathogens ingested in unpasteurized milk or milk products. Contamination following pasteurization can still occur, especially with *Listeria* species, which is the basis for the recommendation to avoid soft cheeses in pregnancy and following organ transplantation.^{6,7} Attempting to sterilize unpasteurized milk after purchase is not preferable because of variable heating methods and the risk for local contamination. Evidence demonstrates the overwhelming benefits to food safety conferred by standardized pasteurization and consumption of pasteurized dairy products.

EPIDEMIOLOGY OF DISEASES CAUSED BY UNPASTEURIZED (RAW) MILK AND MILK PRODUCTS IN THE UNITED STATES

Infections associated with consumption of unpasteurized milk and milk products are related to contamination with pathogenic and opportunistic organisms from a variety of sources. Contamination of unpasteurized milk may occur by a number of mechanisms, including direct contact with bovine fecal matter; transmission of organisms from bovine skin or hide; clinical or subclinical mastitis; primary bovine diseases such as tuberculosis; environmental contamination; and contact with insects, animals, and humans, for example, by contamination from soiled clothing.⁸

Before pasteurization of milk began in the United States in the 1920s, consumption of unpasteurized dairy products accounted for a significant proportion of foodborne illnesses and resulted in outbreaks of typhoid fever (*Salmonella* Typhi and Paratyphi), group A *Streptococcus* infections, diphtheria (*Corynebacterium diphtheriae*), tuberculosis (*Mycobacterium bovis*), and brucellosis (*Brucella* species).⁹ Pasteurization is the process of heating milk to a specific temperature for a minimum duration of time depending on the method, followed by rapid cooling.^{10,11} This technique eliminates pathogens with an effectiveness beyond that which can be achieved by sanitation practices or filtering alone. Unpasteurized milk, commonly referred to as raw milk, is milk that has not been heated according to these methods prior to consumption or incorporation into milk products such as cheese or ice cream. Although most milk and milk products consumed today in the United States are pasteurized, 4.4% of US adults surveyed in 2016 and 2019 reported consuming raw milk in the prior 12 months.¹² Consumers were more likely to be young adults (18 to 35 years old) and to reside in rural areas. In a 2018–2019 population survey of US adults and children, unpasteurized milk (2%) and unpasteurized soft cheese (1.4%) consumption was reported in the past week.¹³ Compared with consumers of pasteurized dairy, unpasteurized milk consumers are significantly more likely to experience outbreak-related illness and hospitalization.¹⁴ The average number of outbreaks from unpasteurized milk increased in 2005–2011 and again in 2012–2018 compared with 1998–2004.¹⁵ From 2013 to 2018, consumption of unpasteurized milk resulted in 75 outbreaks consisting of 675 illnesses, 98 hospitalizations, and 2 deaths.¹⁵ Outbreaks were most commonly attributable to *Campylobacter* species (49%), followed by *Salmonella* species (17%), STEC (15%), *Cryptosporidium* species (11%), *L. monocytogenes* (1%), or a combination of these pathogens with *Campylobacter* species (7%).¹⁵ Pathogens that commonly resulted in hospitalization were *Listeria* species (100%), STEC (42%), and *Salmonella* species (16%).¹⁵ Nearly half of the illnesses (48%) were in people younger than 20 years, and 14% were in those younger than 5 years.¹⁵ Complications included hemolytic-uremic syndrome (HUS) in 10 cases and Guillain-Barré syndrome in 2 cases.¹⁵ The majority of the single-state outbreaks (58/74; 78%) occurred in states that permitted retail sale of unpasteurized milk.¹⁵

In addition to the pathogens associated with unpasteurized milk and cheese outbreaks, a number of pathogenic and opportunistic bacteria, parasites, and viruses (see Box) have been detected in unpasteurized milk or milk products.^{7,9,14–38} Although the incidence of illness from these pathogens is largely unknown, outbreaks may become more likely if unpasteurized milk consumption increases. However, even in the absence of a multicase outbreak, it

BOX. Organisms Detected in Unpasteurized (Raw) Milk or Milk Products

Bacteria

Brucella species, including *Brucella abortus* RB51 vaccine strain
Campylobacter jejuni
Clostridium perfringens
Coxiella burnetii
Cryptosporidium species
Enterotoxigenic *Staphylococcus aureus*
Escherichia coli, including Shiga toxin-producing (STEC [eg, *E coli* O157])
Listeria monocytogenes
Mycobacterium bovis
Salmonella species
Shigella species
Streptococcus species
Vibrio species
Yersinia enterocolitica

Parasites

Giardia species
Toxoplasma gondii

Viruses

Highly pathogenic avian influenza A(H5N1)
Norovirus
Rabies
Tickborne encephalitis virus
Vaccinia

is important to recognize all unpasteurized milk products as potential sources of illness.

Populations at highest risk of morbidity and mortality from foodborne illnesses are those with altered immunity because of young or old age or immunocompromising medical conditions and pregnant people. Young children are at increased risk for severe complications from diarrheal illness, such as HUS secondary to *E coli* O157, which has been associated with unpasteurized milk consumption and can be fatal.³⁹ Infection with certain enteric pathogens (such as *L monocytogenes* and *T gondii*) during pregnancy comes with the added risk of vertical transmission resulting in congenital or neonatal illness. Breastfeeding is considered safe during the majority of these infections, including listeriosis and toxoplasmosis.⁴⁰ An exception is brucellosis—breast milk should be discarded during early infection due to the potential for transmission.⁴¹ Close contact through breastfeeding should be avoided during the infectious period of disease attributable to *M bovis*, but expressed milk can be provided in the absence of mastitis.

Guidance to avoid unpasteurized milk and soft cheese in pregnancy is largely attributable to the strong association with listeriosis.^{7,42} Incidence of listeriosis in pregnant people is 12 to 14 times that of the general population.^{43,44} Complications of listeriosis in pregnancy include spontaneous abortion or stillbirth (20% of pregnancies), preterm delivery, and neonatal infection (68% of liveborn infants)

including pneumonia, sepsis, or meningitis, and neonatal death (24.5% of those infected).⁴⁵ *T gondii* infection during pregnancy can result in similar complications, and surviving infants with congenital toxoplasmosis may have chorioretinitis, intracranial calcifications, and hydrocephalus.⁴⁶ Asymptomatic infants with laboratory evidence of congenital toxoplasmosis at birth may develop neurologic or ocular disease later in life.⁴⁶ The majority of people of 15 to 44 years old in the United States are seronegative (negative serum immunoglobulin [IgG] for toxoplasmosis and vulnerable to infection during pregnancy.^{46,47} Risk of acquiring toxoplasmosis in pregnancy increases 7-fold for those who consume unpasteurized goat milk.³⁶

An emerging threat to unpasteurized milk product consumers is highly pathogenic avian influenza (HPAI) virus. Passed from wild birds to dairy cows, HPAI A(H5N1) clade 2.3.4.4b is an influenza A virus with the capacity for cow-to-cow transmission.⁴⁸ Bovine HPAI A(H5N1) infection results in high virus concentration in the mammary gland and the resulting milk.⁴⁸ Unpasteurized milk from infected cows can harbor HPAI A(H5N1) virus for up to 5 weeks when refrigerated.³⁷ Pasteurization is effective in killing HPAI A(H5N1); thus, only unpasteurized milk poses an infectious risk.^{37,49} Infections in dairy farm workers from direct contact with infected cows resulted in conjunctivitis, fever, myalgias, headache, and respiratory symptoms with positive influenza A(H5) testing from conjunctival and/or respiratory swab specimens.⁵⁰ No human cases from unpasteurized milk consumption have been identified to date, but HPAI(H5N1) in unpasteurized milk and milk products may represent a threat to children and pregnant people.⁵¹ Animals who consume unpasteurized cow milk infected with HPAI A(H5N1) develop systemic illness including respiratory symptoms, limb paresis, and death.^{37,52} In US states affected by the 2024 dairy cattle outbreak, infectious HPAI A(H5N1) virus was found in nearly one-quarter of unpasteurized milk samples.⁴⁹ The risk of HPAI A(H5N1) transmission through human milk feeding is unknown.⁵¹ An individual with an unpasteurized milk exposure followed by symptomatic influenza A infection, particularly with conjunctivitis, should be evaluated for A(H5N1) with the assistance of the local health department. Suspected and confirmed cases should receive antiviral therapy.⁵³

GUIDELINES FOR SALES OF UNPASTEURIZED MILK AND MILK PRODUCTS BY THE FOOD AND DRUG ADMINISTRATION AND INDIVIDUAL STATES

Since 1924, the US Food and Drug Administration (FDA) has published standards for production, handling, transportation, processing, testing, and sale of milk for human consumption in the United States.¹¹ Only grade “A” milk is acceptable, as defined by the FDA, and unpasteurized milk

is explicitly excluded from this designation, as pasteurization is required. However, the decision to adopt and enforce these standards occurs at the state level. As of 2019, unpasteurized milk sale is allowed in 27 states.¹⁵ Of these states, 52% allow retail sale in grocery stores in addition to sale on a farm.¹⁵ Some states have additional laws surrounding unpasteurized milk certification and warning labeling. State laws vary and frequently change. For more information about requirements in your state related to unpasteurized milk and resources for advocacy, contact the American Academy of Pediatrics (AAP) state advocacy team at stgov@aap.org.

In 1987, the FDA prohibited the interstate shipment of unpasteurized milk for human consumption, effectively banning interstate commerce of unpasteurized milk or milk products.⁵⁴ This ban allows for an exception for cheese made from unpasteurized milk, provided the cheese has been aged a minimum of 60 days and is clearly labeled as unpasteurized. This unpasteurized, aged cheese still poses an infection risk. *E coli* can survive in cheese products even after a 60-day aging period,⁵⁵ demonstrated by a multistate outbreak of *E coli* O157 from commercially sold aged, unpasteurized Gouda cheese that resulted in 38 illnesses, 15 hospitalizations, and 1 case of HUS.⁵⁶ An even larger outbreak with 171 cases (70% of which were children) of salmonellosis resulted from consumption of unpasteurized milk and aged cheese contaminated with *Salmonella* Typhimurium.³¹

NUTRIENTS IN UNPASTEURIZED MILK VS PASTEURIZED MILK

Some proponents of unpasteurized milk and milk products claim that pasteurization destroys or neutralizes important nutrients in milks, such as fats, proteins, carbohydrates, calcium, vitamins, and enzymes.^{57,58} Fats are the major energy macronutrient in cow milk. When lipid profiles were compared between unpasteurized and pasteurized milk, no differences were found in either triglycerides or free fatty acids.⁵⁹ Another study confirmed that total and free fatty acids are not altered by pasteurization, with unchanged concentrations of linoleic and α -linolenic acids.⁶⁰ This analysis did demonstrate a decrease in the total antioxidant activity in treated vs unpasteurized milk. Pasteurization does not alter the lactose content in milk.⁶¹ The proteins in milk are denatured by pasteurization.⁶² However, denaturation of proteins also occurs during digestion in the human stomach. There is loss of bioactive bovine proteins in the milk, such as lactoferrin, IgA, and IgM.⁶² However, consuming bovine bioactive proteins is not the primary purpose of milk ingestion, which is as a supply of protein. The major allergenic proteins in milk—whey and casein—are present in both unpasteurized and pasteurized milk. Infants and children with milk allergy, including both IgE-mediated and non-IgE mediated (eg, food protein-induced allergic proctocolitis) allergy, should avoid all animal milk

and milk products.⁶³ Claims that unpasteurized milk can alleviate other atopic conditions are not supported by the literature. A study that evaluated calcium, magnesium, and zinc found no significant differences between unpasteurized and pasteurized milk.⁶⁴ An extensive systemic review and meta-analysis on vitamins in unpasteurized and pasteurized milk was published in 2011.⁶⁵ For vitamins for which milk is an important dietary source, pasteurization caused a decrease only in vitamin B₂. Pasteurization, therefore, does not significantly alter the nutritional value of milk, and any claimed benefit is outweighed by the risk of illness.

RECOMMENDATIONS FROM NATIONAL AND INTERNATIONAL ORGANIZATIONS REGARDING CONSUMPTION OF UNPASTEURIZED MILK AND MILK PRODUCTS

Virtually all national and international advisory and regulatory committees related to food safety have strongly endorsed the principles of consuming only pasteurized milk and milk products. These include the American Medical Association, the American Veterinary Medical Association, the International Association for Food Protection, the National Environmental Health Association, the American Public Health Association, the FDA, the American College of Obstetrics and Gynecologists, and the World Health Organization.^{66–74} In January, 2012, the US federal government denied a petition requesting federal-level legalization of all unpasteurized milk sales on the scientific basis of the food safety benefits of pasteurization.⁷⁵

The AAP has strongly endorsed the use of pasteurized milk in its 2024–2027 *Red Book*.⁶⁶

CONCLUSIONS

In summary, the AAP strongly supports the position of national and international associations in endorsing the consumption of only pasteurized milk and milk products for pregnant people, breastfeeding parents, infants, and children, including adolescents and young adults. This recommendation applies to milk and milk products from multiple animal species, including cows, goats, and sheep. Pediatricians and obstetricians can counsel families to choose only dairy products specifically labeled as pasteurized. The AAP also endorses a ban on the sale or distribution of unpasteurized milk and milk products throughout the United States, including the sale of certain unpasteurized milk cheeses, such as fresh cheeses, soft cheeses, and soft-ripened cheeses. This recommendation is based on the multiplicity of data regarding the burden of illness associated with consumption of unpasteurized milk and milk products, especially among pregnant people, fetuses and neonates, and infants and young children, as well as the strong scientific evidence that pasteurization does not alter the nutritional value of milk. The AAP also encourages pediatricians to contact their state representatives to

support a ban on sale of unpasteurized milk and milk products. Meanwhile, pediatricians can work with local public health officials to advocate for restrictions surrounding raw milk sale (such as warning labels) and community education on the risks of unpasteurized milk consumption. In states where unpasteurized milk sale is currently outlawed, bills proposing to legalize its sale should be opposed. Beyond counseling in clinical settings, potential strategies for communicating information to a broad audience include social media and school-based campaigns. Additional resources containing information regarding the safety of pasteurization and the risks of consuming unpasteurized milk or milk products are provided in this statement.

RESOURCES

- Fact Checked: The Dangers of Drinking Raw Milk: <https://www.aap.org/en/news-room/fact-checked/fact-checked-the-dangers-of-drinking-raw-milk>
- Raw Milk: What Parents Need to Know (also available in Spanish) <https://www.healthychildren.org/English/healthy-living/nutrition/Pages/Raw-Milk-Dangers-What-Parents-Need-to-Know.aspx>
- Real Raw Milk Facts <https://realrawmilkfacts.com/>
- Milk Pasteurization Process: What Is Pasteurized Milk & Why <https://www.usdairy.com/news-articles/why-is-milk-pasteurized-4-questions-answered>
- Is Raw Milk Safe to Give to Your Child? <https://riseandshine.childrensnational.org/is-raw-milk-safe-to-give-your-child/>
- Listeria and Pregnancy <https://www.acog.org/womens-health/faqs/listeria-and-pregnancy>
- Raw Milk and Raw Dairy Products: What You Need to Know <https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/RawMilkandRawDairyProducts.aspx>
- The Dangers of Drinking Raw Milk https://www.health.ny.gov/diseases/communicable/raw_milk_related/dangers_of_drinking_raw_milk.htm

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ABBREVIATIONS

AAP: American Academy of Pediatrics
FDA: US Food and Drug Administration
HPAI: highly pathogenic avian influenza

HUS: hemolytic-uremic syndrome
Ig: immunoglobulin
STEC: Shiga toxin-producing *Escherichia coli*

The guidance in this statement does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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