



# Research Anthology: Raw Milk

MAY 16, 2024



For Public Health

## KEY POINTS

- Raw milk consumption is linked to a number of foodborne illnesses that can result in serious complications and death.
- The federal government regulates interstate milk sales, but states control the sales within their own state.
- Raw milk sales are trending upward in some states.



## Public health concerns about raw milk consumption

Raw milk, or unpasteurized milk, is a public health concern.[\[A\]](#) Studies have shown an association between the legal sale of unpasteurized dairy products and a higher incidence of related disease outbreaks.[\[B\]](#) Recent increases in raw milk availability have public health experts researching the risks and potential disease outbreaks that can result from its consumption.

Consuming raw milk is linked to a significant number of foodborne illnesses, some of which can result in serious complications and death.[\[C\]](#) A variety of pathogens cause these illnesses, including:

- *Escherichia coli*.
- *Campylobacter jejuni*.
- *Salmonella*
- *Listeria monocytogenes*.
- *Brucella abortus*.[\[D\]](#)

Exposures to *Brucella* strain RB51 are of recent concern. It is both difficult to diagnose and resistant to the first-line antibiotic used to treat brucellosis.[\[E\]](#)

## Pasteurization protects public health

Milk pasteurization, a heating process that destroys pathogens,[\[F\]](#) protects public health. In 1947, Michigan was the first state to require milk pasteurization.[\[G\]](#) Since then, both the federal government and the states have played important roles in governing milk safety. Under authority granted by the Commerce Clause of the US Constitution,[\[H\]](#) the federal government regulates the interstate sale of raw milk.

In 1987, the Food and Drug Administration (FDA) mandated pasteurization of all milk or milk products (with the exception of some cheeses) for sale or distribution in interstate commerce.[\[I\]](#) The FDA also regulates milk through its branding regulation. This requires pasteurizing anything labeled as "milk" sold in interstate commerce.

## Reason raw milk is still available

While the federal government has authority to regulate *interstate* milk sales, individual states control the *intrastate* sale of dairy products. Many states have adopted the Grade "A" Pasteurized Milk Ordinance, a model law by the US Department of Health and Human Services. It prohibits the retail sale of unpasteurized milk.[\[J\]](#) Some states allow the distribution or sale of raw milk within their state in one or more of the following locations:

- Retail locations
- Individual farms
- Farmers' markets
- Cow or herd shares, an arrangement under which an individual owns part of a cow or herd and is entitled to the milk produced.[\[K\]](#)

**Raw milk demand increasing**



In recent years, consumer demand has resulted in expanded legal access to raw milk in several states. Increased legalization of the intrastate sale of raw milk is expected to increase the disease burden associated with the consumption of raw milk.[\[L\]](#)

# Legal resources

Expand All

Federal laws on raw milk



The following resources describe federal laws on the interstate sale and distribution of raw milk.

- [21 C.F.R. § 1240.61 \(2019\)](#) 
  - Federal regulation prohibiting the interstate sale of unpasteurized milk.
- [21 C.F.R. § 131.110 \(2019\)](#) 
  - Federal regulation for the standardization of milk and cream in interstate commerce, defining "milk" as "the lacteal secretion" from cows.
  - Requires that milk be pasteurized and contain certain percentages of milk solids and milkfat.
- [US Department of Health and Human Services, Public Health Service, Food and Drug Administration. \*Grade "A" Pasteurized Milk Ordinance \(2017 Revision\)\*](#)  
  - Model ordinance establishing minimum standards and requirements for the production, processing, packaging, and sale of milk products.
  - Section 9 requires that only pasteurized milk shall be sold to consumers.

Surveys of state laws on raw milk



The following resources summarize state laws on the intrastate sale and distribution of raw milk.

- [Map of State Laws Related to the Sale of Raw Milk](#), Public Health Law Program, Centers for Disease Control and Prevention (2019)
  - Presents a map of state laws governing the sale of unpasteurized milk to consumers as of 2019.
  - Indicates changes to state laws expanding or restricting access to unpasteurized milk from 2012 through 2018.
- [Legal Status of the Sale of Raw Milk and Outbreaks Linked to Raw Milk, by State, 2013–2018](#), Centers for Disease Control and Prevention
  - Provides a map of the 50 states coded by type of state raw milk law and number of outbreaks, a resource of CDC's [Raw Milk](#) website.
- [State Milk Laws](#) , National Conference of State Legislatures (2016)
  - Categorizes state raw milk laws based on legality of sale or distribution for different sites or modes (e.g., retail stores, on the farm, through cow share programs).
  - Links to an undated state-by-state summary of raw milk laws.
- [2011 Raw Milk Survey](#)  , National Association of State Departments of Agriculture (NASDA) (2011)
  - Summarizes data collected by NASDA on the regulation and sale of raw milk in 50 participating states.



The following articles give historical background and policy analyses of raw milk laws, including legal challenges to and theories of recovery under those laws.

- [Regulating milk: women and cows in France and the United States](#) , Cohen M. *American Journal of Comparative Law* 2017;65:469–526.
  - Provides historical background on the regulation of milk in the United States and France.
- [Milk, ideology, and law: perfect foods and imperfect regulation](#) , Zylberberg D. *Georgetown Law Journal* 2016;104:1377–403.
  - Discusses the effect of food ideologies and movements on government regulation, as well as governmental influences on the industrialization of milk.
- [The dangerous right to food choice](#) , Wiseman SR. *Seattle University Law Review* 2015;38:1299–315.
  - Discusses the argument that the right to choose the food one eats, even if the government deems a food unsafe, is a fundamental right under the Constitution.
- [Raw milk and the First Amendment: implications for public health policy and practice](#) , David SD. *Public Health Reports* 2014;129(5):455–7.
  - Considers the outcomes of potential First Amendment challenges to 1) restrictions on raw milk advertising and 2) mandated warning labels identifying the risks of raw milk.
- [The legal anatomy of product bans to protect the public's health](#) , (Subscription required; link to abstract provided.), Hodge JG & Scanlon M. *Annals of Health Law* 2014;23:20–41.
  - Analyzes government product bans to protect consumer safety and devises a framework of essential elements to support passage (and prevent reversal) of product bans intended to protect the public's health.
  - Mentions raw milk among examples of bans on consumable products.
- [Raw milk in court: implications for public health policy and practice](#) , David SD. *Public Health Reports* 2012;127(6):598–601.
  - Explains federal laws governing the sale of raw milk and reviews two federal cases involving raw milk (i.e., *Farm-to-Consumer Legal Defense Fund v. Sebelius* (action challenging constitutionality of federal interstate ban), *US v. Allger* (action by FDA against Pennsylvania farmer engaged in interstate sale and cow share program)).
- [Deja moo: Is the return to public sale of raw milk udder nonsense?](#)  , Adams DC, Olexa MT, Owens TL, et al. *Drake Journal of Agricultural Law* 2008;13(2):305–46.
  - Provides a detailed examination of raw milk and the laws governing it.
  - Discusses legal theories for recovery of damages by persons sickened by raw milk (e.g., negligence, products liability, breach of warranty).
- [Jumping on the next bandwagon: an overview of the policy and legal aspects of the local food movement](#) , Coit M. *Journal of Food Law & Policy* 2008;4:45–70.
  - Examines federal and state raw milk laws, among other laws, in the context of consumer demand for locally-produced food.
  - Examines Colorado's law exempting cow share programs from state pasteurization requirements.
- [A legal history of raw milk in the United States](#)  , Weisbecker A. *Journal of Environmental Health* 2007;69(8):62–3.
  - Provides a brief history of the development of local, state, and federal laws governing the sale of raw milk from the early 1900s to 2006.
  - Focuses on FDA activity leading up to the FDA 1987 prohibition of the interstate sale of raw milk.

## Public health resources

▼ Expand All

### Disease outbreaks associated with raw milk



CDC defines a foodborne disease outbreak as “an incident in which two or more persons experience a similar illness after ingestion of a common food, and epidemiologic analysis implicates the food as the source of the illness.” [\[M\]](#) The resources below describe some of the

outbreaks associated with raw milk reported from 2010 to present.

- [Outbreak of fluoroquinolone-resistant \*Campylobacter jejuni\* infections associated with raw milk consumption from a herdshare dairy—Colorado, 2016](#) , Burakoff A, Brown K, Knutsen J, et al. *MMWR Morbidity and Mortality Weekly Report* 2018;67(5):146–148.
  - Describes an outbreak of 12 confirmed and 5 probable cases of *Campylobacter* infections associated with milk from a single herdshare dairy.
  - Highlights risks of raw milk consumption by herd share members and difficulties encountered by local public health officials trying to contain herdshare outbreaks.
- [Outbreak-related disease burden associated with consumption of unpasteurized cow's milk and cheese, United States, 2009–2014](#) , Costard S, Espejo L, Groenendaal H, et al. *Emerging Infectious Diseases* 2017;23(6):957–64.
  - Estimates outbreak-related illnesses from contaminated dairy products.
  - Finds that "unpasteurized milk, consumed by only 3.2% of the population, and cheese, consumed by only 1.6% of the population, caused 96% of the illnesses caused by contaminated dairy products."
- [Campylobacter jejuni infections associated with raw milk consumption—Utah, 2014](#), Davis KR, Dunn AC, Burnett C, et al. *MMWR Morbidity and Mortality Weekly Report* 2016;65(12):301–5.
  - Reviews a 2014 outbreak of campylobacteriosis in three patients who had consumed raw milk from a dairy in Utah, where raw milk sales from the farm are legal.
  - Notes that raw milk from the dairy had passed state testing requirements prior to outbreak.
- [Increased outbreaks associated with nonpasteurized milk, United States, 2007–2012](#) , Mungai EA, Behraves CB, Gould LH. *Emerging Infectious Diseases* 2015;21(1):119–22.
  - Finds that the number of outbreaks associated with raw milk increased over the 6-year period from 2007 to 2012, paralleling increased legal availability of raw milk for human consumption.
  - Finds that 81% of outbreaks were reported in states where sale of raw milk was legal.
- [Sharing milk but not messages: campylobacteriosis associated with consumption of raw milk from a cow share program in Alaska, 2011](#) , Castrodale LJ, Gerlach RF, Xavier CM, et al. *Journal of Food Protection* 2013;76(5):744–7.
  - Analyzes outbreak of four *Campylobacter* cases related to milk obtained from a cow share program.
  - Discusses the importance of timely notification of those at risk.
- [Recurrent outbreak of \*Campylobacter jejuni\* infections associated with a raw milk dairy—Pennsylvania, April–May 2013](#), Centers for Disease Control and Prevention. *MMWR Morbidity and Mortality Weekly Report* 2013;62(34):702.
  - Identifies six confirmed and two probable cases of campylobacteriosis in persons who consumed raw milk from a dairy certified to sell raw milk by the Pennsylvania Department of Agriculture.
- [Nonpasteurized dairy products, disease outbreaks, and state laws—United States, 1993–2006](#) , Langer AJ, Ayers T, Grass J, et al. *Emerging Infectious Diseases* 2012;18(3):385–90.
  - Compares outbreaks from consumption of pasteurized dairy products to those caused by unpasteurized dairy products.
  - Examines the association between outbreaks caused by unpasteurized dairy products and state laws, finding fewer outbreaks in states where sale was restricted.
- [Outbreak of \*Escherichia coli\* O157 associated with raw milk, Connecticut, 2008](#) , Guh A, Phan Q, Nelson R, et al. *Clinical Infectious Diseases* 2010;51(12):1411–7.
  - Presents results of a study of an *E. coli* outbreak associated with raw milk sold from one Connecticut dairy farm store. Of 14 cases, 5 required hospitalization and 3 experienced hemolytic uremic syndrome though the dairy had met all state regulatory standards.
  - Estimates put the combined cost of outbreak investigation and hospitalization expenses of case patients at more than \$400,000.

## Health risks associated with raw milk



The resources below discuss both emerging concerns and well-established risks associated with drinking raw milk, focusing primarily on risks posed by raw dairy in the United States. Articles assessing comparative risks and benefits are also included under this heading.

- [Foodborne illness outbreaks linked to unpasteurised milk and relationship to changes in state laws – United States, 1998–2018](#) , Koski, L, Kisselburgh, H, Landsman L, et al. *Epidemiology & Infection* 2022; 150:E183.

- Presents the results of a study that analyzes the number of outbreaks and outbreak-associated illnesses over time.
- Compares outbreak numbers in states where the sale of unpasteurized milk is legal to states where it is prohibited.
- [Notes from the field: human \*Brucella abortus\* RB51 infections caused by consumption of unpasteurized domestic dairy products—United States, 2017–2019](#) , Negrón ME, Kharod GA, Bower WA, et al. *MMWR Morbidity and Mortality Weekly Report* 2019;68:185.
  - Discusses and characterizes the emerging threat of antibiotic-resistant *Brucella abortus* RB51 from consumption of raw milk.
  - Attributes the source of RB51 in raw milk to the vaccine used to protect cattle from *B. abortus*.
- [Raw milk intake: beware of emerging brucellosis](#) , Sfeir MM. *Journal of Medical Microbiology* 2018;67:681–2.
  - Highlights the importance of proper diagnosis and treatment of persons infected with *Brucella abortus* RB51, a potentially life-threatening emerging infection associated with consuming raw milk.
- [A 100-year review: microbiology and safety of milk handling](#) , Boor KJ, Wiedmann M, Murphy S, et al. *Journal of Dairy Science* 2017;100:9933–51.
  - Presents a historical analysis of the improvement of milk safety through pasteurization and other microbial controls.
  - Assesses future challenges and underscores need for the dairy industry to implement updated science-based food safety practices to protect public health.
- [Campylobacter spp. prevalence and levels in raw milk: a systematic review and meta-analysis](#)  (Subscription required; link to abstract provided), Christidis T, Pintar KD, Butler AJ, et al. *Journal of Food Protection* 2016;79(10):1775–83.
  - Estimates the prevalence of *Campylobacter spp.* in raw milk through a systematic review and meta-analysis of relevant literature.
- [Raw milk consumption: risks and benefits](#) , Lucey JA. *Nutrition and Food Science* 2015;50(4):189–93.
  - Discusses the prevalence of pathogens in raw milk and critically evaluates some suggested benefits.
- [Consumption of raw or unpasteurized milk and milk products by pregnant women and children](#) , American Academy of Pediatrics. *Pediatrics* (2014);133(1):175–9.
  - Reviews the risks and suggested benefits of consuming raw milk, especially for pregnant women and children.
  - Endorses a ban on the sale of unpasteurized milk.
- [A literature review of the risks and benefits of consuming raw and pasteurized cow's milk](#)  , Davis BJK, Li CX, Nachman KE. Johns Hopkins Bloomberg School of Public Health, Center for a Livable Future, 2014 report.
  - Evaluates scientific literature (1999 to 2014) on the comparative health benefits and risks of raw and pasteurized milk, pursuant to a request from Maryland legislators considering a bill to legalize distribution of raw milk via cow shares.
  - Concludes that known hazards of drinking raw milk outweigh any evidence of potential benefits and advises against legalization.
- [Raw milk consumption among patients with non-outbreak-related enteric infections, Minnesota, USA, 2001–2010](#) , Robinson TJ, Scheftel JM, Smith KE. *Emerging Infectious Diseases* (2014); 20(1):38–44.
  - Explains how the number of cases from outbreak data significantly underrepresents the total number of persons made ill from pathogens in raw milk.
- [Raw \(unpasteurized\) milk: are health-conscious consumers making an unhealthy choice?](#) , Jay-Russell MT. *Clinical Infectious Diseases* 2010;51(12):1418–19.
  - Challenges the advocacy of raw milk in a commentary on the Guh et al. study (see Outbreaks section, above) describing the 2008 Connecticut *E. coli* O157 outbreak.
- [Unpasteurized milk: a continued public health threat](#) , Lejeune JT, Rajala-Schultz PJ. *Clinical Infectious Diseases*. 2009;48(1):93–100.
  - Discusses pathways and sources of raw milk contamination, methods used to control contamination, and trends in raw milk consumption and associated disease outbreaks in the United States.
  - Counters purported disadvantages of pasteurization and emphasizes that avoiding consumption of raw milk is critical to disease prevention.
- [Food safety hazards associated with consumption of raw milk](#)  , Oliver SP, Boor KJ, Murphy SC, et al. *Foodborne Pathogens and Disease* 2009;6:793–806.
  - Reviews literature on the prevalence of pathogens in raw milk in the United States (2000–2009), summarizes outbreak data (2000–2008), and describes state laws allowing sale of raw milk.

- Argues there is scant data to support contentions of raw milk proponents, while hazards are well established.

## Potential benefits of raw milk

Advocates for raw milk emphasize benefits of drinking raw milk related to nutrition, allergies, and lactose intolerance.<sup>[N]</sup> While there is some evidence connecting raw milk to the "farm effect"—an association between children growing up on farms and reduced allergies—evidence of other benefits is lacking.<sup>[O]</sup> Furthermore, the scientific literature in this area routinely acknowledges that even if raw milk plays a role in, for example, preventing allergies, the risk of serious infection far outweighs possible benefits.<sup>[P]</sup> The following resources address potential benefits of raw milk consumption.

- [Raw cow's milk and its protective effect on allergies and asthma](#) <sup>[?]</sup>, Sozanska B. *Nutrients* 2019;11(2):469–80.
  - Reviews the current understanding of the role of raw milk in allergy prevention.
  - Asserts that unique components of raw milk can affect immune function but acknowledges need for additional research to understand protective effect on allergies.
- [Raw milk consumption and other early-life farm exposures and adult pulmonary function in the Agricultural Lung Health Study](#) <sup>[?]</sup>, Wyss AB, House JS, Hoppin JA, et al. *Thorax* 2018;73(3):279–82.
  - Reports novel results of a study suggesting an association between improved pulmonary function in adulthood and early-life ingestion of raw milk.
- [Got milk? Understanding the farm milk effect in allergy and asthma prevention](#) <sup>[?]</sup>, Yu JE, Miller RL. *Journal of Allergy and Clinical Immunology* 2016;137:1701–8.
  - Discusses research on the role of fatty acids and microRNA as potential biological mechanisms for the protective effect of raw milk against allergies and asthma but concludes that present safety concerns warrant consumption of only pasteurized milk.
- [Consumption of unprocessed cow's milk protects infants from common respiratory infections](#) <sup>[?]</sup>, Loss G, Depner M, Ulfman LH, et al. *Journal of Allergy and Clinical Immunology* 2014;135(1):56–62.
  - Presents results of a study on the effects of raw and pasteurized milk consumption on early infant infections.
  - Finds stronger correlation between raw milk consumption and reduced risk of infant fevers and respiratory infections.
- [Effect of raw milk on lactose intolerance: a randomized controlled pilot study](#) <sup>[PDF]</sup> <sup>[?]</sup>, Mummah S, Oelrich B, Hope J, et al. *Annals of Family Medicine* 2014;12(2):134–41.
  - Finds that drinking raw milk did not reduce symptoms of lactose intolerance in adults positive for lactose malabsorption.
  - Notes that evidence of raw milk's positive effects on lactose malabsorption remains anecdotal.
- [The protective effect of farm milk consumption on childhood asthma and atopy: the GABRIELA study](#) <sup>[?]</sup>, Loss G, Apprich S, Waser M, et al. *Journal of Allergy and Clinical Immunology* 2011;128(4):766–73.
  - Investigates the farm milk effect to determine milk components associated with the apparent protective effect of early-age raw milk consumption on asthma.
  - Finds that whey protein fraction may be responsible.
- [A systematic review and meta-analysis of the effects of pasteurization on milk vitamins, and evidence for raw milk consumption and other health-related outcomes](#) <sup>[?]</sup>, MacDonald LE, Brett J, Kelton D, et al. *Journal of Food Protection* 2011;74(11):1814–32.
  - Presents the results of a systematic review of published literature on purported benefits of raw milk related to nutrition, cancer, allergies, and lactose intolerance.
  - Concludes that literature supports the beneficial effect of raw milk consumption on allergies but says the effect may have many factors.

## Raw milk consumers (characteristics/motivations)

Raw milk consumers themselves occasionally have been the subject of studies to determine their characteristics and motivations. The following articles present the results of some raw milk consumer studies.

- [Knowledge, attitudes and practices regarding raw milk consumption in the Pacific Northwest](#) <sup>[?]</sup> (Subscription required; link to abstract provided), Bigouette JP, Bethel JW, Bvbjerg JG, et al. *Food Protection Trends* 2018;38(2):104–10.

- Summarizes questionnaire responses from a survey of raw milk consumers to determine perceived benefits from and reasons for drinking raw milk.
- [Examining trust factors in online food risk information: the case of unpasteurized or 'raw' milk](#)  (Subscription required; link to abstract provided), Sillence E, Hardy C, Medeiros LC, et al. *Appetite* 2016;200–10.
  - Presents the results of research examining how website design and content affect milk consumers' attention to and trust in that content, using websites offering information either for or against the consumption of raw milk.
- [Survey to determine why people drink raw milk](#) , Mullin GE, Belkoff SM. *Global Advances in Health & Medicine* 2014;3(6):19–24.
  - Examines the health-related motivations of individuals for consuming raw milk, testing a hypothesis that preference for raw milk would be related to lactose maldigestion.
- [Characteristics of consumers of unpasteurized milk in the United States](#)  (Subscription required; linked to abstract provided), Buzby JC, Gould LH, Kendall ME, et al. *Journal of Consumer Affairs* 2013; 47(1):153–66.
  - Analyzes sociodemographic data from FoodNet Population Surveys (1998–1999, 2002–2003, and 2006–2007) to identify characteristics of raw milk consumers.
- [Profile of raw milk consumers in California](#)  , Headrick ML, Timbo B, Klontz KC, et al. *Public Health Reports* 1997;112:418–22.
  - Describes patterns of raw milk consumption in California, where the sale of raw milk is legal.
  - Examines demographics of respondents who drank raw milk, and the prevalence of raw milk consumption in California in 1994.

## Raw milk websites

- [Raw Milk](#)
  - Information from CDC for consumers and researchers, with links to outbreak studies, resources and publications, questions and answers, infographics, and videos of individuals who describe their experiences with foodborne illness from raw milk.
- [Food Safety and Raw Milk](#) 
  - Explains the role of the FDA in regulating raw milk and provides information for consumers and links to internal and external sites about raw milk.

## Position statements of national organizations

In addition to US government agencies, such as the FDA and CDC, the following national organizations have issued formal statements about the hazards of drinking raw milk and the need for pasteurization:

- [Policy Statement: Sale or Distribution of Raw Milk](#)  , National Environmental Health Association; adopted January 28, 2008; revised July 2017
- [Compulsory Pasteurization of All Non-Human-Derived Animal Milk Products Intended for Human Consumption](#) , American Public Health Association; Policy Number 20164, November 1, 2016
- [Consumption of Raw or Unpasteurized Milk and Milk Products by Pregnant Women and Children](#) , American Academy of Pediatrics, Committee on Infectious Diseases, Committee on Nutrition; January 2014
- [Raw Milk Policy](#) , American Veterinary Medical Association; undated (accessed June 2019)

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For technical assistance with this anthology, please contact [phlawprogram@cdc.gov](mailto:phlawprogram@cdc.gov). PHLP provides technical assistance and public health law resources to advance the use of law as a public health tool. PHLP cannot provide legal advice on any issue and cannot represent any individual or entity in any matter. PHLP recommends seeking the advice of an attorney or other qualified professional with questions regarding the application of law to a specific circumstance.

The findings and conclusions of this summary are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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FOOTNOTES

A. See, e.g., Centers for Disease Control and Prevention. Raw Milk [website]. Last updated June 8, 2017. Available at [www.cdc.gov/foodsafety/rawmilk/raw-milk-index.html](http://www.cdc.gov/foodsafety/rawmilk/raw-milk-index.html).

B. Langer AJ, Ayers T, Grass J, et al. Nonpasteurized dairy products, disease outbreaks, and state laws—United States, 1993–2006. *Emerging Infectious Diseases* 2012;18(3):385–90.

C. Oliver SP, Boor KJ, Murphy SC, et al. Food safety hazards associated with consumption of raw milk. *Foodborne Pathogens and Disease* 2009;6:793–806.

D. Langer, *supra* note 2.

E. Centers for Disease Control and Prevention. Exposures to Drug-Resistant Brucellosis Linked to Raw Milk (Food Safety Alert) [website]. February 8, 2019. Available at [www.cdc.gov/brucellosis/exposure/drug-resistant-brucellosis-linked-raw-milk.html](http://www.cdc.gov/brucellosis/exposure/drug-resistant-brucellosis-linked-raw-milk.html).

F. Lejeune JT, Rajala-Schultz PJ. Unpasteurized milk: a continued public health threat. *Clinical Infectious Diseases* 2009;48(1):93–100.

G. Boor KJ, Wiedmann M, Murphy S, et al. A 100-year review: microbiology and safety of milk handling. *Journal of Dairy Science* 2017;100:9933–51.

H. US Const. art. I, § 8, cl. 3.

I. Requirements Affecting Raw Milk for Human Consumption in Interstate Commerce, 52 Fed. Reg. 29509-02 (August 10, 1987) (codified at 21 C.F.R. § 1240.61).

J. US Department of Health and Human Services, Public Health Service, Food and Drug Administration. Grade "A" Pasteurized Milk Ordinance (2017 Revision). Available at [www.fda.gov/media/114169/download](http://www.fda.gov/media/114169/download) [↗](#).

K. See, e.g., Mungai EA, Behravesh CB, Gould L. Increased outbreaks associated with nonpasteurized milk, United States, 2007–2012. *Emerging Infectious Diseases* 2015;21(1):119–22; Adams DC, Olexa MT, Owens TL, et al. Deja moo: is the return to public sale of raw milk udder nonsense? *Drake Journal of Agricultural Law* 2008;13:305–46.

L. Costard S, Espejo L, Groenendaal H, et al. Outbreak-related disease burden associated with consumption of unpasteurized cow's milk and cheese, United States, 2009–2014. *Emerging Infectious Diseases* 2017;23(6):957–64.

M. Centers for Disease Control and Prevention. Foodborne Disease Outbreak 2011 Case Definition [website]. Accessed July 27, 2022. Available at <https://hdc.services.cdc.gov/case-definitions/foodborne-disease-outbreak-2011/>.

N. Lucey, JA. Raw milk consumption: risks and benefits. *Nutrition and Food Science* 2015;50(4):189–93.

O. MacDonald LE, Brett J, Kelton D, et al. A systematic review and meta-analysis of the effects of pasteurization on milk vitamins, and evidence for raw milk consumption and other health-related outcomes. *Journal of Food Protection* 2011;74(11):1814–32.

P. Davis JK, Li CX, Nachman KE. A literature review of the risks and benefits of consuming raw and pasteurized cow's milk. Johns Hopkins Bloomberg School of Public Health, Center for a Livable Future, 2014 report. Available at [www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/research/clf\\_publications/pub\\_rep\\_desc/Literature-Review-Risks-Benefits-Consuming-Raw-Pasteurized-Cow-Milk.html](http://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/research/clf_publications/pub_rep_desc/Literature-Review-Risks-Benefits-Consuming-Raw-Pasteurized-Cow-Milk.html) [↗](#).

SOURCES

- 21 C.F.R. § 131.110 (2019). See also 21 USC § 331(a) (2019) (prohibiting introduction into interstate commerce of any adulterated or misbranded food).