



Hot Topic: Raw-milk Cheese

Prepared by Brad Jones for Oldways Preservation Trust

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Raw-milk cheese is chronically misunderstood by policy makers and the public alike. Its regulation and safety has been a topic of heated debate for much of the last century. The Cheese of Choice Coalition was initially founded in 1999 to represent the interests of producers and consumers of raw-milk cheese at a time when legislative changes threatened to eliminate the long-standing regulatory exception for raw-milk cheese and to potentially criminalize it outright. A vital part of our mission continues to emphasize the quality and safety of raw milk cheese and to ensure that consumers have the right to choose their cheese of choice. As pioneering cheese retailer and author Steve Jenkins has famously said, to be denied that freedom would be to “wipe out one of the most beautiful and romantic links between human beings and the earth that we will ever know, and we are going to be the lesser for it.”

What is raw-milk cheese?

Raw-milk cheese gains meaning in contrast to pasteurization. Pasteurized cheese is defined as cheese produced with milk that has been heated to a temperature of 161° F for fifteen seconds or to 145° F for thirty minutes or more. The definition of unpasteurized cheese remains somewhat less clear and depending on the regulatory authority, can indicate cheese whose milk has not been raised over the temperature of the milk at the time of milking (roughly 104°F) prior to the setting of the curd or cheese that has been heat treated but at no more than 160° F. Thermization is a middle ground between pasteurization and no heat treatment and involves bringing milk up to 131° F for two to sixteen seconds. All cheeses that are not by definition pasteurized are considered raw for legal and regulatory purposes (1).

History

Prior to the invention of the pasteurization process by Louis Pasteur in the late 1850's all cheese was by definition made from raw milk. Cheese is a fermented dairy product and it is a result of the labor of microscopic bacteria that digest milk sugar, known as lactose, and convert it into lactic acid. The bacteria not only separate solid curds from liquid whey, they continue to have a ripening effect on the cheese as it matures. Because pasteurization kills nearly 100% of the naturally occurring

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bacteria found in fluid milk, it is impossible to make cheese with heat-treated milk unless a starter culture is reintroduced. The process of isolating bacterial cultures was not sufficiently understood until the end of the 19th century and until that time cheese was invariably made from raw milk.

With the advent of commercial cultures, new processing technology and advanced modes of transportation, cheesemaking in America increasingly moved off of the farm and into the factory. To meet rising demand in urban markets, cheese was now rarely made from the milk of one's own herd but from the pooled milk of many neighboring, and later increasingly distant, farms. The centralization of cheesemaking expanded considerably in the last century to the point that, by the 1980's, there was hardly a farmstead and hardly a raw-milk cheesemaker to found.

The importance of using exceptionally clean raw-milk in cheesemaking cannot be underestimated. Because of the presence of naturally occurring ambient microflora, raw milk is a highly perishable product and it is a particularly suitable medium for bacterial growth. When conscientiously controlled this fact is advantageous if not essential to cheesemaking. The principle of competitive exclusion, where good bacteria outcompete undesirables, renders cheese a preserved product that is safe for human consumption months and even years after the cows, or goats, or sheep are milked. In order to ensure quality, milk must be fresh and clean. For this reason, there is a close relationship between farmstead production and raw-milk cheese. Hygiene becomes more difficult to control when scale escalates dramatically.

Regulation

In America, the 60 day rule is the most critical piece of legislation governing raw-milk cheese. The 60 day rule is a regulatory exception that states that cheese can be made from unpasteurized (raw) milk only in so far as the cheese has undergone an aging process no less than 60 days at a temperature no less than 35° F. This applies to cheeses made domestically as well as those that have been imported. The 60 day aging rule was established in 1949, on the back of a contaminated batch of cheddar that had been sent to soldiers overseas, when it was shown that pathogenic salmonella had hitched a ride across the pond (2). Upon subsequent testing, researchers found that salmonella could not persist in cheddar after 60 days of aging. Hence the 60 day rule.

However, it is clear that not all cheeses ripen in the same way as cheddar and not all pathogens respond the same way as Salmonella. (3) When cheddar ages it increasingly acidifies and this drop in pH neutralizes lurking pathogens. However, in a soft-ripened cheese like Camembert pH actually climbs during the aging process, a fact that is responsible for the soft, creamy paste of ripe bloomy-rinded cheeses. As such, certain fresh cheese styles such as cream cheese and mozzarella are excluded from the 60 day exemption and must be pasteurized no matter what extent they are intended to age (4).

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Although no new legislation affecting the 60 day rule has been passed for many years, the FDA is hypersensitive to the safety of raw-milk cheese. In the year 2000, authorities considered passing a mandatory pasteurization law based on evidence that suggested E. coli could survive 60 days of aging. The Cheese of Choice Coalition enlisted the expertise of microbiologist Catherine Donnelly (Professor, Department of Nutrition and Food Sciences, University of Vermont) to review the validity of the study. Dr. Donnelly found two critical flaws, that the experiment was in fact performed on pasteurized cheese and that inoculation levels were several thousand times higher than what could realistically be present in commercial cheesemaking (2). After the independent scientific analysis and the outspoken activism of the CCC and others, the FDA's review lost priority status in 2002 (5).

The recent passing of the Food Safety Modernization Act (FSMA) extends the regulatory reach of federal authorities and has brought greater attention to unpasteurized milk cheeses. Throughout 2014, as part of a pilot testing program, both imported and domestic raw-milk cheeses have been routinely tested for pathogens of concern. Unsurprising to the artisan cheese community, the results to date overwhelmingly point to the inherent safety of commercially produced raw-milk cheese (6). Nevertheless, heightened regulatory attention to the industry has left many raw-milk cheese makers and retailers I'll at ease.

Safety

In respect to safety, the first crucial point to note is that, although they often get lumped together in the public imagination, experts unanimously agree that fluid raw milk and raw-milk cheese have categorically different food safety profiles. Illness resulting from commercially sold raw-milk cheese is exceedingly rare. The CDC reported 122 incidents of dairy-related illness from 1993-2006 (7). Only 27 of those 122 involved raw-milk cheese, while 38 were a result of cheese that had been pasteurized. The frequency of incident linked to pasteurized cheese reflects the fact that most contamination occurs post-processing. According to the CDC report, only two fatalities were linked to unpasteurized dairy products over the 14 year span, and, although the report does not clearly indicate the origin, it is far more likely that these were a result of fluid milk or cottage industry than from commercially-sold raw-milk cheese.

In addition to the fact that illness is extraordinarily uncommon, current scientific research regarding raw-milk cheese increasingly suggests that the benign microbes found in unpasteurized cheese may have an anti-pathogenic effect. A study conducted at the INRA Research Centre in France, which with the support of the CCC is currently being translated into English, suggests that the rich microbial environment of raw-milk cheese inhibits the growth of pathogens (8). A study published in the International Journal of Food Microbiology draws similar conclusions (9). In lay terms, it is theorized that good microbes outcompete the bad.

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What's more, CCC scientific advisor Dr. Catherine Donnelly has suggested, "Mandatory pasteurization of milk may increase the susceptibility of cheese to growth of pathogens introduced via postprocessing contamination." (10) Konrad Dunhem of CNIEL (the French Dairy Interbranch Organization) has noted that when produced under strict quality controls "raw milk cheese is self-protected against major pathogens and is less exposed to recontamination by major pathogens" (11).

It is also clear that commercial raw-milk cheesemakers produce exceptionally clean milk that minimizes risk in advance. Scientists at the University of Vermont have shown that small-scale artisan cheesemaking firms produce cheese of high microbial quality with very low incidence of pathogenic contamination (12). That data was reinforced in a second study of broader scope (13). One important reason for this is that artisan and raw-milk cheesemakers generally maintain fastidious sanitation regimens and pay extraordinary attention to the health of their animals and the hygiene of their milk and equipment. As CCC advisor Catherine Donnelly has noted "Artisan cheesemakers are unequivocally committed to the safety of the products they produce...regulatory attempts to ban the use of raw milk in cheese making...[is] not supported by the large body of science surrounding these issues."

Health

Not only is raw-milk cheese (when thoughtfully made, according to established best-practices) safe to eat, it is highly nutritious and an important part of a healthy diet. Since the fad fear of fat subsided in the 1990's, and more was learned about the difference between saturated fat, unsaturated fat, trans fat, and others, nutrition research indicates that cheese may actually reduce the risk of obesity and cardiovascular disease (14). It has also been suggested that dairy foods can protect against type 2 diabetes, balance blood pressure, prevent tooth decay, encourage heart health and even increase brain function [see Cheese of Choice Coalition research page - <http://www.cheeseofchoice.org/#!research/c14i1>]. As such dieticians have increasingly promoted the moderate consumption of cheese as part of a balanced diet.

The literature cites various reasons for the myriad health benefits of cheese. Healthy fats such as CLA and Omega 3's come in higher proportions in cheeses produced from grass-fed animals, characteristic of most artisan cheeses. Cheese is a rich source of essential nutrients such as proteins, bioactive peptides, amino acids, fatty acids, vitamins and minerals. Vitamin D, potassium and calcium are especially prominent in cheese, the latter of which has recently been shown to be more vital to human health than previously suspected.

There is an expanding body of literature that suggests that food rich in probiotics, i.e. cheese, yoghurt, and other fermented foods, are especially nutritious, providing essential vitamins and minerals and potentially helpful with respect to allergies, asthma, and a host of other health concerns. Probiotics supply the gut with healthy

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bacteria that help maintain intestinal health and support a healthy immune system. Recent literature has shown that probiotics may be effective in helping to prevent and treat type 2 diabetes and obesity. Other benefits of probiotics may include reducing the risk of some cancers, heart disease, and high cholesterol (15). In sum, as one study concludes, "cheese is an important dairy product and an integral part of a healthful diet due to its substantial contribution to human health" (16).

Flavor

Natural bacteria in raw milk, and the other microflora present in dairy before heat-treatment, lend a great deal of the flavor to the final product. Raw-milk cheeses have natural flora, yeasts, esters and enzymes that contribute to their complex and unique flavor. Moreover, raw-milk cheese is deeply evocative of terroir, the taste of place, that results from the combination of climate, soil, the skill of the cheesemaker. Microbial flora is distinct from one place to the next and raw-milk cheesemakers harnesses this variance to create cheese that expresses unique-flavors of their particular pastures. It is also clear that raw milk cheeses tend to ripen in complex ways that adds texture and depth to the tasting experience (17).

Conclusion

The first and mandatory goal for the entirety of the food production system must be food safety for the consumers. As Dr. Donnelly notes above, the body of science surrounding these issues does not support mandatory pasteurization. Given the flavor, ripening, and health benefits associated with raw-milk cheese, as well as the long history of high-quality production domestic and abroad, raw-milk cheese should encourage celebration rather than concern.

There is no doubt that it takes care to make cheese using raw-milk. It requires cheesemakers to be vigilant in terms of careful animal husbandry, conscious production practices, and ensuring a hygienic production and aging environment. But it also true that the cheesemakers who chose to make raw-milk cheese believe that it creates a superior product—so much so, in fact, that many PDO cheeses in Europe (i.e. Roquefort, Le Gruyere, and Parmigiano-Reggiano, etc) actually require that the milk used for cheesemaking remain raw.

We side with Cheese of Choice Coalition board member Ari Weinzweig when he rhetorically asks "should we be deprived of the opportunity to eat some of the best cheeses in the world?" We think not.

Citations

1. Code of Federal Regulations – Definition.

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- Available online at:
<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=133.3> (last visited May 7th, 2015).
2. Origins of the Regulation of Raw Milk Cheeses in the United States (2005 Third Year Paper) by Laura P. Knoll.
Available online at:
<http://dash.harvard.edu/bitstream/handle/1/8852188/Knoll05.pdf?sequence=1> (last visited May 7th, 2015).
 3. Paxson, H., *The Life of Cheese: Crafting Food and Value in America* (California Studies in Food and Culture), University of California Press 2013.
 4. Code of Federal Regulations Title 21 - Cheese Requirements
Available online at:
<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=133> (last visited May 7th, 2015).
 5. Raw Deal: Trade Implications of the U.S. Food and Drug Administration's Pending Review of Unpasteurized Cheeses (Minnesota Journal of Global Trade, Vol. 12, Num. 461, Summer 2003) by Martha Ingram.
Available online at:
http://media.wix.com/ugd/76ddc6_80fda565969b4e9bbefec1a7b305d9d0.pdf
 6. Department of Health and Human Services letter to American Cheese Society (Aug 29, 2014).
Available online at:
http://media.wix.com/ugd/76ddc6_1af8142927834f74b443bd972e43e3cb.pdf
 7. Centers for Disease Control and Prevention (CDC) Emerging Infections Diseases (2012) Unpasteurized Dairy Products, Disease Outbreaks, United States, 1993 – 2006.
Available online at:
http://media.wix.com/ugd/76ddc6_c7cda530ee7f41f695ed5091a9934b3c.pdf
 8. Microflore du lait cru | Vers une meilleure connaissance des ecosystems microbiens du lait et de leurs facteurs de variation (Conseil National des Appellations d'Origine Laitieres – July 2011) by Cécile Laithier (ed.)
Available online at:
http://media.wix.com/ugd/76ddc6_34c2bdd23eb04eb690f4d9020cc91484.pdf

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9. Survival of *Listeria monocytogenes* during manufacture, ripening and storage of soft lactic cheese made from raw goat milk (International Journal of Food Microbiology, Vol. 64, 2001) by F. Morgan, V. Bonnin, M-P. Mallereau, G. Perrin.
Available online at:
http://media.wix.com/ugd/76ddc6_6592cf72c09f499686e4a636a286a51c.pdf
10. The Pasteurization Dilemma by Donnelly, C., in American Farmstead Cheese: The Complete Guide to Making and Selling Artisan Cheeses, Vermont Cheese Council 2005, P. Kindstedt (ed.)
11. The Benefits and Risks to the Producer and Consumer of Cheese made from Raw (Unpasteurized) Milk, ACS Conference 2011 by Carol Terracine Hartman, Ryan Fewins-Bliss, Brigitte Balogh, and Ewen C.D. Todd.
Available online at:
http://media.wix.com/ugd/76ddc6_1eef5f23f3bf4f48961825a744b68c01.pdf
12. Low Incidence of Foodborne Pathogens of Concern in Raw Milk Utilized for Farmstead Cheese Production (Journal of Food Protection, Num. 8, 2008) by D'Amico, D., Groves, E., Donnelly, C.W.
Available online at:
<http://www.ingentaconnect.com/content/iafp/jfp/2008/00000071/00000008/art00006> (last visited May 7th, 2015).
13. Microbiological quality of raw milk used for small-scale artisan cheese production in Vermont: Effect of farm characteristics and practices (Journal of Dairy Science, Vol. 93, Issue 1, 2010) by D'Amico, D.J., Donnelly, C.W.
Available online at: [http://www.journalofdairyscience.org/article/S0022-0302\(10\)70273-3/pdf](http://www.journalofdairyscience.org/article/S0022-0302(10)70273-3/pdf) (last visited May 7th, 2015).
14. Yogurt and dairy product consumption to prevent cardiometabolic diseases: epidemiologic and experimental studies (The American Journal of Clinical Nutrition, Bol. 99, Num. 5, 2014) by Aren Astrup
Available online at: <http://ajcn.nutrition.org/content/99/5/1235S.short> (last visited May 7th, 2015).
15. Probiotics, their health benefits and applications for developing healthier foods: a review (FEMS Microbiology Letters 2012) by Nagpal, R. et al
Available online at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1574-6968.2012.02593.x/full> (last visited May 7th, 2015).
16. Cheese in nutrition and health (Dairy Science Technology, Vol. 88, 2008) by Walther, B., et al.

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Available online at:

http://media.wix.com/ugd/76ddc6_4cb594eb1caf4bcd8dd5196f5f9f41bc.pdf (last visited May 7th, 2015).

17. Biochemistry of cheese ripening (International Journal of Dairy Technology, Vol. 57, Num. 2/3, 2004) by McSweeney, P.

Available online at:

http://media.wix.com/ugd/76ddc6_5684297d787d4cb3b7e50eb9de0fcfb8.pdf