

THE HEALTH BENEFITS AND LOW FOOD SAFETY RISK OF RAW MILK

AUTHORS:

- Dr. Anna Catharina Berge, DVM, MPVM, PhD. Berge Veterinary Consulting BVBA, cat@rawmilk institute.org
- Dr. Ton Baars, PhD. Senior scientist, Utrecht University, Division of Pharmacology. ton@rawmilk institute.org

There is a world-wide increasing interest in the consumption of raw natural food commodities including raw milk and milk products while there are controversial opinions regarding the health benefits and safety of these products.

Are there health benefits from raw milk?

Consumers are actively seeking out raw milk, partly due to health reasons, but also for taste, freshness, closeness to the producer and to support local food production. It has been estimated that 334 million people all over the world are suffering from asthma that are reducing the quality of life, reducing health and increasing mortality and has a huge financial burden mainly due to productivity loss (Global Asthma Report, 2014).

There is strong scientific evidence that raw milk has the ability to reduce asthma, allergies and atopic eczema (Braun-Fahrlander and Von Mutius, 2011). Furthermore, early life consumption of raw cow's milk has been shown to reduce the risk of manifest respiratory infections and fever by about 30% (Loss et al., 2015). When raw milk is shortly boiled on a farm, even farm children, who are the best protected group of children worldwide, showed increased risks of asthma, hay fever and atopic diseases (Loss et al., 2011). Experimental animal studies recently showed that heating of milk at 80°C for 10 minutes induced asthma, whereas raw, unheated milk did not show any signs of asthma (Abbring et al., 2017).

Other consumers report improved health in various conditions, including gut health, chronic inflammatory conditions, atopic eczema, and overall health. There is lacking peer-reviewed evidence on most of these conditions, and this is most likely due to a small niche food commodity, and limited funding, limited research interest or political obstacles to carrying out the studies.

Why must milk be pasteurized?

The pasteurization requirements for raw milk arose in the 1930's when the hygienic quality of raw milk could not be assured through methods and systems that we have available today and furthermore tuberculosis and brucellosis were major public health threats. Pasteurization has reduced these life-threatening diseases and improved the ability to distribute and sell safe milk to consumers that increasingly moved away from animal production into the cities. Most countries imposed pasteurization requirements to prevent these prevalent foodborne hazards. However, today, hygienic milking routines, closed mechanical milking systems, rapid cooling, cold chains and refrigerators and quality controls can

now achieve microbial safety of raw milk that equals that of pasteurized milk. However, in many commercial dairies that produce milk intended for pasteurization, the production and hygiene standards have been set with the knowledge that there is a pasteurization step that may eliminate milk-borne hazards to the consumers. The current prohibition for unpasteurized milk is mostly based on historic information that may contain misleading facts and confounded statistics and omits to include the scientific information regarding health benefits that have been shown in this millennium. Over the last 30 years, but also already since the 1930s, there has been safe production systems for raw milk, and health benefits of raw milk has been scientifically shown, that makes a review of the national pasteurization requirements warranted. Consumers are increasingly lobbying for legalization and the right to make food choices. Raw milk producers in numerous countries have demonstrated that raw milk can be extremely safe and hygienic, adopting HACCP principles and professional risk reduction and management plans.

There are numerous raw foods that present a microbial hazard to consumers, and production systems involving good manufacturing practices (GMP) and hazard analysis critical control points (HACCP) systems have been developed. HACCP-based systems for food production have been implemented in virtually all agricultural and food processing sectors and deemed to reduce risks to reasonable levels.

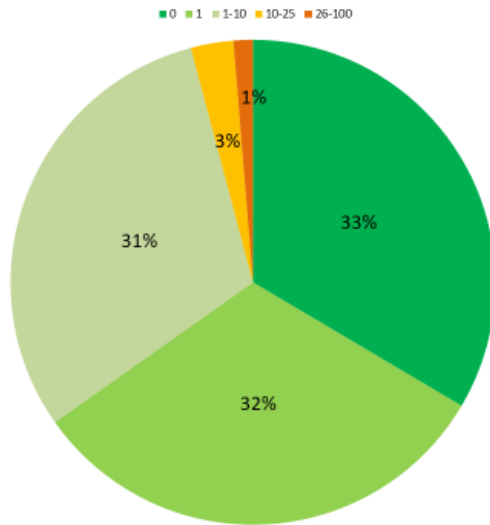
How safe can raw milk be?

The only food commodity that is subject to a pasteurization requirement is raw milk, despite that it has been shown that raw milk can be safe using the same food safety principles. Two examples are here provided to demonstrate that these safe production systems can decrease food-borne disease outbreaks to extremely low levels.

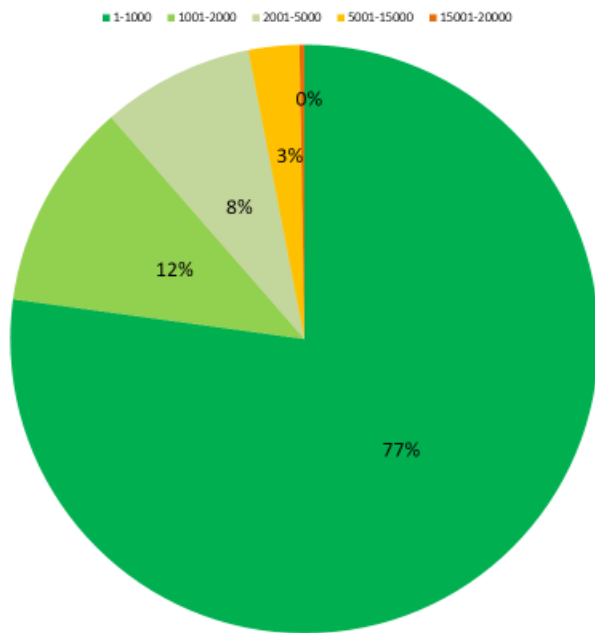
The Raw Milk Institute is a non-profit international organization with a mission to improve the safety and quality of raw milk and raw milk products through training and mentoring farmers; establishing raw milk guidelines; improving raw milk accessibility and production transparency; and education, outreach and research (<http://www.rawmilk institute.org>). RAWMI lists farmers that have developed risk analysis and management plans (RAMP) based on HACCP and including good management practices (GMP) and Sanitation Standard Operating Procedures (SSOP). RAWMI's common standards includes at least monthly testing for the hygiene indicators coliform and total aerobic bacteria (SPC- standard plate counts). RAWMI listed farmers consistently achieve coliform counts that are lower than the requirements for pasteurized milk, and extremely low SPC (**see diagrams**). All coliform results are well below the EU standards of 100 coliforms/ml and 99% are below US pasteurization standards 10 coliforms/ml. The RAWMI system and standards supersede national and state-regulatory requirements that are lacking specific raw milk production criteria.

Diagram 1 and 2. RAWMI common standards at least monthly testing for hygiene indicator bacteria: coliform bacteria and total aerobic bacterial count per one ml of milk.

RAWMI dairies monthly coliform testing results 2012-2017



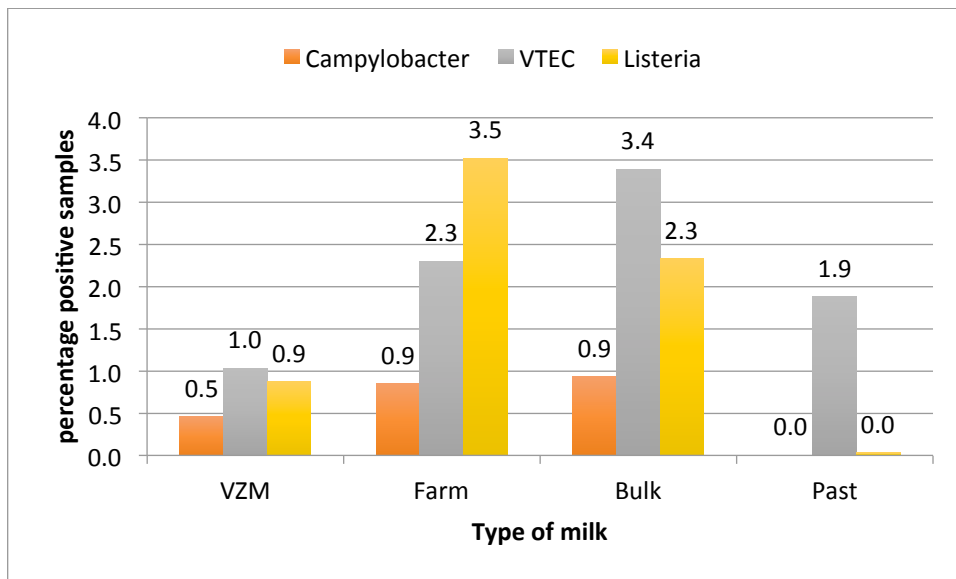
RAWMI dairies monthly SPC testing results 2012-2017



In Germany, there is a federal raw milk system called Vorzugsmilch (VZM: grade A raw milk), established in the 1930s, where farms are under the monthly supervision of the federal veterinary services. These farms are controlled for handling and processing, hygiene parameters, udder health and zoonotic bacteria. Bulk tank and individual cow milk samples from these farms since 2004 for zoonotic bacteria detection were very similar to the samples of pasteurized milk, showing that hygiene management at

Vorzugsmilch farms reaches zoonotic risk levels not significantly different from pasteurized milk, (Diagram 3). The data from Germany further indicates that zoonotic pathogen prevalence in raw milk destined for direct human consumption in controlled raw milk farms (VZM) is a lower hazard for zoonotic pathogens compared to bulk tank milk or milk samples taken from farms that are destined for pasteurization. Around 1,600 VZM samples, 900 farm, 3,700 bulk and 3,800 pasteurized milk samples collected between 2004 and 2015 were analyzed. It should be noted that the presence of zoonotic bacteria in the milk samples does not necessarily indicate that the milk was a risk for humans, since there are various levels of bacteria needed to cause disease, and it also depends on other factors such as susceptibility of the consumer etc.

Salmonella spp. was very rarely found (one bulk milk and 1 pasteurized milk sample). For *Campylobacter spp.* detection the risk was reduced with 50% in VZM compared to any other general raw milk. For verotoxin producing *Escherichia coli* (VTEC, sometimes also referred to as STEC and of which EHEC is one type) the risk was even further reduced and VTEC was even found in pasteurized milk samples. *Listeria monocytogenes* was least often detected in VZM compared to any other raw milk.



Percentage of positive samples in Vorzugsmilch (VZM), Farm milk (Farm) and other Bulk Milk (Bulk) as well as Pasteurized milk (Past) for Campylobacter, VTEC and Listeria. Data derived from Yearbooks of the Federal BfR-Berlin (regular sampling program, data 2004-2015).

What about all these raw milk disease outbreaks I read and hear about in the news?

National outbreak reports and statistics are not good sources to quantify the risk from raw milk. Raw milk associated disease outbreaks are subject to a detection bias, due to that it is easier in an outbreak to trace back a niche commodity actively sought by few consumers than commodities consumed by a large portion of the population. Only a very small fraction of all foodborne disease outbreaks can be traced back to their source, and this creates a detection bias for raw milk associated outbreaks, and therefore most outbreaks caused by meat products, vegetables and fruits consumed by large proportions of the population can never be attributed to a the source, and therefore is not reported to

the media. The European Food Safety Authority (EFSA) attempted a quantitative microbial risk assessment (QMRA) in 2015 and concluded that there was insufficient appropriate data to perform an EU based QMRA, thus EFSA does not consider outbreak data sufficient for risk evaluation. The lack of data from the raw milk sector is to a high degree driven by lack of funding, lack of interest by research institutions and political and regulatory reasons. Most raw milk associated disease comes from raw milk that has been produced by farmers that are subject to limited or no regulations and are not using GMP and HACCP based production systems. Therefore, in a hazard approach, one should discriminate between fresh, raw milk intended for direct consumption and pre-pasteurized milk intended for pasteurization. Due to the increasing interest in the health promoting aspects of raw milk, it is recommended to set up national systems that systematically collect data on microbial risks in raw milk destined for direct consumption.

Conclusion

In conclusion, there is evidence that raw milk can be hygienically produced and safely consumed. There is evidence that there are health-promoting qualities of raw milk which warrants a review of regulations that creates blanket prohibitions on raw milk production and sales. We have good knowledge of food production systems and hygiene to accept that a good raw product does not need to be heat-treated and damaged to be safe.

References

- Abbring, S., K. A. T. Verheijden, M. A. P. Diks, A. Leusink-Muis, G. Hols, T. Baars, J. Garssen, and B. C. A. M. van Esch. 2017. Raw Cow's Milk Prevents the Development of Airway Inflammation in a Murine House Dust Mite-Induced Asthma Model. *Front Immunol* 8:1045.
- Braun-Fahrlander, C. and E. Von Mutius. 2011. Can farm milk consumption prevent allergic diseases? *Clin. Exp. Allergy* 41(1):29-35.
- Global Asthma Report. 2014. T. G. A. Network, ed. The Global Asthma Network, Auckland, New Zealand.
- Loss, G., S. Apprich, M. Waser, W. Kneifel, J. Genuneit, G. Buchele, J. Weber, B. Sozanska, H. Danielewicz, E. Horak, R. J. van Neerven, D. Heederik, P. C. Lorenzen, E. von Mutius, C. Braun-Fahrlander, and G. s. group. 2011. The protective effect of farm milk consumption on childhood asthma and atopy: the GABRIELA study. *J Allergy Clin Immunol* 128(4):766-773 e764.
- Loss, G., M. Depner, L. H. Ulfman, R. J. van Neerven, A. J. Hose, J. Genuneit, A. M. Karvonen, A. Hyvarinen, V. Kaulek, C. Roudit, J. Weber, R. Lauener, P. I. Pfefferle, J. Pekkanen, O. Vaarala, J. C. Dalphin, J. Riedler, C. Braun-Fahrlander, M. E. von, and M. J. Ege. 2015. Consumption of unprocessed cow's milk protects infants from common respiratory infections. *J. Allergy Clin. Immunol* 135(1):56-62.