

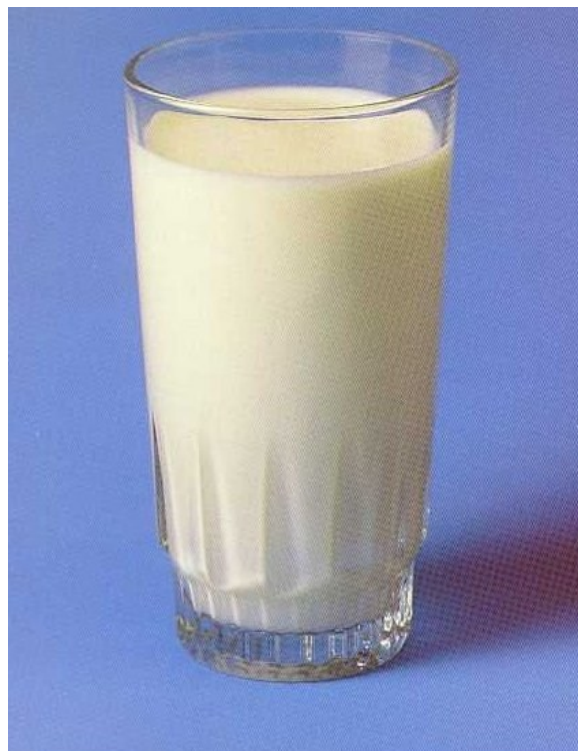
Effect of heat treatment on the risks and benefits of consumption of raw cow milk: preliminary results

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Introduction

- Many pathogens including *Salmonella* spp., *Campylobacter* spp., human pathogenic *E. coli*, *Listeria monocytogenes*, human pathogenic *Yersinia*, enterotoxin producing *Staphylococcus aureus*, *Clostridium botulinum*, *Bacillus cereus*, *Cryptosporidium parvum*, etc. can be isolated from raw cow milk
- The prevalence of food-borne pathogens in bulk tank milk of cattle varies but in most of the described surveys their presence was demonstrated [1]
- In developed countries, milk-borne and milk product-borne outbreaks represent 2-6% of the bacterial food-borne outbreaks [2]



Objective: to evaluate the microbiological, (bio-)chemical and nutritional risks and benefits related to the consumption of raw cow milk in Belgium, and to evaluate the effect of heat treatment of milk on these risks and benefits

Material and methods

This risks/benefits analysis is performed by a working group of the Scientific Committee of the Belgian Federal Agency for the Safety of the Food Chain based on a literature study and expert opinion.

Preliminary results

Risks of raw cow milk and effect of heat treatment

MICROBIOLOGICAL ASPECTS

• The majority of raw cow milk-borne outbreaks in the world are attributable to *Salmonella* spp., *Campylobacter* spp., human pathogenic O157 and non-O157 *E. coli*, with some sporadic cases described for *Listeria monocytogenes*.

• *E. coli* and *Listeria monocytogenes* are most pathogenic for humans, followed by *Campylobacter* spp. and *Salmonella* spp.

• These 4 pathogens are present in cattle or in the farm environment, and in raw cow milk in Belgium.

Concise overview of available data to indicate the relative hazard of different pathogens that can be present in raw milk:

Pathogen	Presence in dairy cattle in Belgium	Prevalence in raw cow milk in Europe	Human outbreaks in Europe	Severity to humans (0 < 4)
<i>Salmonella</i> spp.	Present	0-2.9%	5	3
<i>Campylobacter jejuni</i> and <i>coli</i>	Present	0-6%	18	3
Human pathogenic <i>E. coli</i>	Present	0-5.7%	13	4
<i>Listeria monocytogenes</i>	Present	2.2-10.2%	0 (1 in USA)	4

Pasteurization eliminates all the common vegetative pathogens in milk to a level considered safe for public health. However, pasteurization is inadequate to destroy spores of *Clostridium botulinum* and *Bacillus cereus* and may induce their germination. Sterilization and UHT treatment destroy both vegetative micro-organisms and spores and produce a commercially sterile product.

(Bio)CHEMICAL / NUTRITIONAL ASPECTS

There are no explicit risks of (bio)chemical or nutritional nature associated with the consumption of raw milk, except for environmental and similar chemical contaminants (e.g. residues of antibiotics, mycotoxins), which are excluded from the scope.

Benefits of raw cow milk and effect of heat treatment

MICROBIOLOGICAL ASPECTS

Pathogen growth inhibition by antimicrobial systems

BUT:

- Activity limited at refrigeration temperature used to store raw milk
- Activity retained after pasteurization
- Activity obliterated after UHT, but no influence because commercially sterile product

Pathogen inhibition by lactic acid producing bacteria

BUT:

- Limited growth at refrigeration temperature used to store raw milk
- Spoilage of milk above refrigeration temperature
- ! Remark: Destruction by pasteurization → risk of better growth of thermoresistant spores or of post-pasteurization contaminating bacteria
- Destruction by UHT but no influence because commercially sterile product

Increased immunity for chronic raw milk drinkers & reduced allergies ... ?

BUT:

- Scientific proof = controversial
- Underlying mechanisms unknown
- Difficult to conclude about effect of heat treatment

Health effects due to probiotic bacteria

BUT:

- Limited effect due to insufficient number in raw milk

(Bio)CHEMICAL / NUTRITIONAL ASPECTS

• Milk is an mportanimportant source of calcium, phosphor, proteins (mainly lysine) and vitamins (B₂ and B₁₂). Pasteurization nor UHT treatment have a significant effect on these components in terms of human nutritional requirements. Other nutrients that could be partly destroyed by heating contribute less to the daily requirement and reduced levels are easily compensated by a balanced diet.

• Alleged drawbacks of heating milk related to health (lactose intolerance, reduced digestibility, diabetes, osteoporosis, arthritis) are scientifically not substantiated.

• The main negative effect of heating milk is the modified organoleptic profile, for which is the milk fat content is an it determining factor (cfr. skimmed milk with 0.1g fat/100ml versus whole milk with 3.5g fat/100ml).

Conclusion



- Milk is important for a healthy diet. If consumed unheated, raw milk can present an increased health hazard due to possible contamination with pathogenic bacteria.
- Pasteurization and UHT-heating are the most effective methods for enhancing the microbiological safety with minor impact on the nutritional value of milk.

References

- [1] Griffiths M.W. (2010). Improving the safety and quality of milk: Milk production and processing (Volume 1), edited by M. W. Griffiths, University of Guelph, Canada.
- [2] De Buyser M.-L. et al. (2001). Int J Food Microbiol 67: 1-17.