



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 cow raw milk
- The prevalence of food-borne pathogens in cow bulk tank milks 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]
- Raw milk owns several microbiological, (bio)chemical and nutritional advantages



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

Microbiological risks of cow raw milk and effect of heat treatment

•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.

Pathogen	Prevalence in 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 as 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.

Microbiological benefits of cow raw milk and effect of heat treatment

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
- Destruction by pasteurization → risk of better growth of thermoresistant spores or of post-pasteurisation contaminating bacteria
- Destruction by UHT but no influence because commercially sterile product

Increased immunity for chronic raw milk drinkers

BUT:

- Underlying mechanisms unknown
- Difficult to conclude about effect of heat treatment

Reduced allergies

BUT:

- Underlying mechanisms unknown
- Difficult to conclude about effect of heat treatment

Health effects due to probiotic bacteria

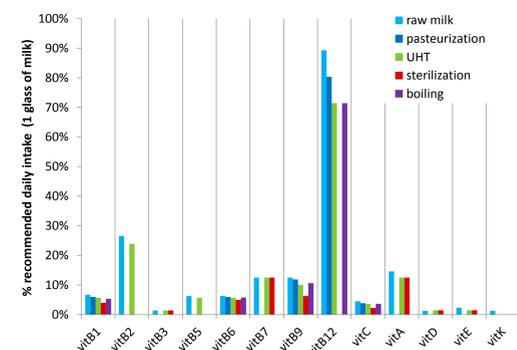
BUT:

- Limited effect due to insufficient number
- Elimination by pasteurization and UHT but no influence

(Bio)-chemical and nutritional benefits and effect of heat treatment

•The main nutritional advantage of milk is the presence of calcium, lysine, vitamins B₂, B₉ 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 are only present in small quantities in milk (in relation to their recommended daily intake) and their destruction is easily compensated by an equilibrated alimentation.



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

•Unmodified milk is not adapted to the nutritional needs of children during their first year of life.

Conclusion



- Milk is important for a healthy diet, if consumed unpasteurized, can present a health hazard due to possible contamination with pathogenic bacteria.
- Heating is the most effective method of enhancing the microbiological safety of milk with (to a large extent) preservation of the other microbiological or biochemical and nutritional beneficial substances
- There is no food that is absolutely free of risks but there are very few foods where there is a simple and practical way to significantly decrease risk without compromising quality. Heat treatment of milk is such a process.

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.