

Advice 15-2011 of the Scientific Committee of the FASFC on the risk-benefit evaluation of raw cow milk consumption and the effect of heat treatment on these risks and benefits

Many human pathogens including *Salmonella* spp., *Campylobacter* spp., human pathogenic verocytotoxin-producing *E. coli*, *Listeria monocytogenes*, *Yersinia*, enterotoxin producing *Staphylococcus aureus*, *Bacillus cereus*, *Cryptosporidium parvum*, etc. as well as *Clostridium botulinum* toxins, can be isolated from raw cow milk. The prevalence of food-borne pathogens in raw cow milk varies, but their presence has been demonstrated in many surveys. In industrialized countries, milk-borne and milk product-borne outbreaks represent 2 to 6% of the bacterial food-borne outbreaks.

The aim of this study is to evaluate the risks and benefits related to the consumption of raw cow milk in Belgium, and to evaluate the effect of heat treatments of milk on these risks and benefits, considering the microbiological as well as the (bio)chemical and the nutritional aspects.

The majority of reported raw cow milk-borne outbreaks are attributable to *Campylobacter* spp., human pathogenic O157 and non-O157 *E. coli*, *Salmonella* spp., and in some rare cases to *Listeria monocytogenes*. Human pathogenic verocytotoxin-producing *E. coli* and *Listeria monocytogenes* can cause severe illness, followed by *Campylobacter* spp. and *Salmonella* spp. These 4 pathogens can be present in cattle or in the farm environment, and in raw cow milk in Belgium. From a microbiological point of view, the consumption of raw milk is considered as a risk product for a human food-borne infection. The availability of raw milk vending machines for direct sale encourages the sale of raw milk amongst the population. The exposure and as such the risk is raised, especially for at risk populations (YOPIs, i.e. the very young, elderly persons, pregnant women, those already suffering from illness, and immune-compromised persons), if the consumer is not well informed about the necessity of boiling the raw milk before consumption. Such vending machines must be well managed and clear information should be provided to the groups at risk.

The risk of raw milk consumption is considerably reduced and even eliminated by heat treatment. Pasteurization (min. 71°C/15s or 63°C/30min or equivalent) reduces the vegetative pathogens in milk to a level considered safe for public health. Pasteurization is however, inadequate to destroy spores of *Clostridium botulinum* and *Bacillus cereus* and the heat shock may induce their germination. Sterilization and UHT treatment destroy both vegetative micro-organisms and spores and produce a commercially sterile product.

Several microbiological benefits are assigned to raw cow milk consumption, namely pathogen growth inhibition by antimicrobial (mainly enzymatic) systems and by lactic acid producing bacteria, increased immunity, reduced allergies, and health effects of probiotic bacteria. Nevertheless, the activity of most antimicrobial enzymes is limited at the refrigeration temperature used to store raw milk, and many of the antimicrobial systems retain almost all their antimicrobial activity after pasteurization. After sterilization (including UHT treatment), most endogenous antimicrobial activities are obliterated, but their activity is no longer needed since the milk is commercially sterile. The growth of lactic acid producing bacteria and the subsequent acidification and coagulation of the milk limit the outgrowth of pathogens but also the shelf-life of raw milk. Consequently, pathogens requiring an outgrowth in the raw milk before reaching their infectious dose represent a low risk for raw milk consumers. The current evidence for the assumed relation between drinking raw milk and an increased immunity at one hand and a reduction of allergies on the other hand, is controversial and the underlying mechanisms are unknown. It is therefore difficult to conclude about a possible effect of heating milk on these parameters. The growth of probiotic bacteria is too limited in raw milk to have beneficial effects for the consumer.

The nutritional benefits associated with raw milk consumption generally remain after pasteurization, UHT treatment and/or homogenization of the milk (changes of a technical nature were not considered). Milk is an important source of calcium, phosphorus, proteins and essential amino acids (especially lysine), and the vitamins B₂ and B₁₂. The effect of a heat treatment on the deliverance of these nutrients is negligible. Other nutrients present in milk that could be (partly) destroyed by heating, contribute less to the daily requirement. Reduced levels of these nutrients are easily compensated by a balanced diet.

In addition, heating (and/or homogenization) is, most probably wrongfully, associated with a reduced milk digestibility, inactivation of beneficial enzymes, reduction of lactose with the formation of lactulose, and an increased risk of various conditions (e.g. milk allergy, lactose intolerance, diabetes, osteoporosis, arthritis). These allegations are refuted and/or put into a scientific perspective in this advice. The main negative effect of biochemical nature of heating milk is the modified organoleptic profile, although this is rather a matter of perception.

In this advice it was demonstrated that when consuming raw milk the exposure to microbiological hazards is real and that this has resulted several times in food-borne infections. Heat treatment (pasteurization, boiling, but UHT treatment in particular) is an historically and scientifically proven, efficient method for guaranteeing the microbiological safety of milk without affecting significantly the nutritional value of milk.

When purchasing raw milk, the Scientific Committee recommends that the raw milk is heated just at boiling point before consumption.

The full text is available on this website in dutch and in french, respectively under the section "Wetenschappelijk Comité/Adviezen" and "Comité scientifique/Avis".