Advice 02-2015 of the Scientific Committee of the FASFC on the evaluation of the microbiological risks of the consumption of dairy products based on raw milk

This self-tasking initiative dossier was launched as a follow-up of previous advices 15-2011 (Evaluation of the risks and benefits of the consumption of raw cow milk and the effect of heat treatment on these risks and benefits) and 11-2013 (Evaluation of the risks and benefits of the consumption of raw milk from animal species other than cows). In the current advice, the microbiological risks of the consumption of raw milk dairy products are evaluated based on an elaborate literature study and expert opinion. In the scope of the advice, the following raw milk dairy products are included: cheese, butter, cream and buttermilk.

Starting from advice 15-2011, a list was established with microorganisms that are assumed to be (potentially) present in cow milk produced in Belgium. Other sources of information were Belgian prevalence data of these organisms in dairy cattle and their environment and expert opinion. Next to this, a list was established of microorganisms that are assumed to be potentially present in raw milk of goats, sheep, horses and donkeys in Belgium (advice 11-2013). Based on these two lists, it was concluded that the following human pathogenic microorganisms can be present in raw milk of cows, goats and sheep in Belgium: *Bacillus cereus*, *Campylobacter coli* and *jejuni*, *Coxiella burnetii*, enterotoxin producing *Staphylococcus aureus*, *Helicobacter pylori*, human pathogenic *Escherichia coli*, human pathogenic *Yersinia*, *Leptospira*, *Listeria monocytogenes*, *Salmonella* spp., *Streptococcus agalactiae*, *Streptococcus equi* subsp. *zooepidemicus*, *Brucella* spp., *Mycobacterium bovis*, *Cryptosporidium parvum*, *Toxoplasma gondii*, *Clostridium botulinum* and the potentially pathogenic bacterium *Mycobacterium avium* subsp. *paratuberculosis*.

In scientific literature, frequencies of occurrence of specific pathogens in specific products have been reported. These reports were collected for Europe. Frequencies were found for several types of raw milk cheeses, butter and cream. For buttermilk, no frequencies were found. The following microorganisms were found in studies where raw milk dairy products were analyzed: *Salmonella*, verotoxin producing *Escherichia coli* (VTEC), *Listeria monocytogenes*, *Campylobacter*, *Staphylococcus aureus*, *Bacillus cereus*, *Mycobacterium avium* subsp. *paratuberculosis* and *Coxiella burnetii*.

The consumption of dairy products based on raw milk has caused several clinical cases and foodborne outbreaks. Cases and outbreaks found in scientific literature or reported by official agencies were collected for Europe, Canada and the United States. Only outbreaks caused by the consumption of raw milk cheeses were found and one outbreak was related to the consumption of raw milk cream. Outbreaks caused by raw milk butter or buttermilk were not found. The following human pathogenic microorganisms are linked to outbreaks with raw milk cheeses: *Salmonella*, VTEC, *Listeria monocytogenes*, *Brucella* spp., *Campylobacter*, enterotoxin producing *Staphylococcus aureus*, *Streptococcus* spp. and the tickborne encephalitis virus (TBEV). The outbreak resulting from the consumption of raw milk cream was caused by *E. coli* O157:H7.

Based on the information on the possible presence of pathogenic microorganisms in raw milk, on the frequencies of occurrence of pathogenic microorganisms in raw milk products and/or the fact whether they caused already outbreaks resulting from the consumption of raw milk products, a selection was made of relevant human pathogenic microorganisms for which a risk evaluation was performed (*Salmonella*, human pathogenic VTEC, *Listeria monocytogenes*, *Campylobacter* and enterotoxin producing *Staphylococcus aureus*).

The risk assessment was based on the possible presence of pathogenic microorganisms in raw milk in Belgium, the frequency of detection in raw milk dairy products in Europe, the outbreaks resulting from consumption of raw milk cheese in Europe, the United States and Canada, the worst case behavior in raw milk cheese and the score of the severity of the adverse effects for public health. The following conclusions were drawn. As there is a great uncertainty linked to the available data, it is not possible to carry out a full risk assessment for Belgium. However, it was estimated that the risks of infection after consumption of raw milk cheese were mainly linked to *Listeria monocytogenes* (less frequently but more severe), human pathogenic VTEC, *Salmonella*, enterotoxin producing *Staphylococcus aureus* and *Campylobacter*. For *Listeria monocytogenes*, it was concluded that the risk is mainly situated with fresh (obtained by coagulation) and soft cheeses that have characteristics (pH, a_w) favorable for growth during the ripening and the storage of the cheese. A contamination can occur due to the raw milk as well as a post contamination from the environment.

Concerning the consumption of raw milk butter, the risks are linked to contamination with *Listeria monocytogenes*, human pathogenic VTEC and enterotoxin producing *Staphylococcus aureus*. However, the risks are estimated to be relatively lower compared to soft and certain fresh raw milk cheeses, especially due to the limited growth possibilities of the pathogens.

In raw milk cream, the risks are linked to contamination with *Listeria monocytogenes*, human pathogenic VTEC and enterotoxin producing *Staphylococcus aureus*. The risks are comparable with these of raw milk butter and are thus estimated to be relatively lower than these due to the consumption of soft and certain fresh raw milk cheeses.

Concerning raw milk buttermilk, there is no information available in the scientific literature and therefore the microbiological risks linked to the consumption of this product cannot be estimated.

In addition, some microorganisms representing a risk in outbreaks in Belgium or abroad (*Brucella* spp., *Mycobacterium bovis* and the TBEV) or that can be an emerging risk (*Coxiella burnetii*, *Mycobacterium avium* subsp. *paratuberculosis*) are described.

In comparison with dairy products based on heat treated milk, the heat treatment will make sure that the pathogenic microorganisms that are possible present are inactivated which will increase the safety of these products. However, not only the raw milk is a source of contamination, but post contamination can also occur, and therefore even dairy products based on pasteurized milk represent risks. Mostly, the contamination levels of raw milk are low, exceptionally in the case of a subclinical mastitis where high initial numbers of *Listeria monocytogenes* or enterotoxin producing *Staphylococcus aureus* can be excreted. Although this is rare and such milk is also diluted in the whole milk supply, it can occur and this scenario cannot be ignored due to the consequences from an eventual important contamination.

Finally, the Scientific Committee makes recommendations concerning the management of mastitis, post harvest cross contamination of the milk from the environment, the growth of pathogens in raw milk and during the production and storage of raw milk dairy products and the awareness of the producer and the consumer. It is important that the good hygienic practices during the milking, the production process, the storage and the distribution are respected. The control of the procedures of cleaning and disinfection of the material that is used for the whole of the production process is also important from the milking to the sales of the products.

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