

DOI 10.17590/20181114-092549-0

Brucellosis: Although risk of infection from mare's milk is low in Germany, BfR still recommends heat treatment

Joint Opinion No. 028/2018 of the BfR and the FLI of 5 September 2018

Brucellosis is an infectious illness caused by bacteria of the *Brucella* genus. It is one of the most frequent zoonoses worldwide and is primarily transferred from livestock to humans. Infected persons experience flu-like symptoms with fever, chills, loss of appetite and tiredness.

Brucellosis is transmitted to humans primarily by sheep, goats, cattle and pigs. People can acquire the illness through direct contact with infected animals or via food derived from these animals. This generally happens upon the consumption of raw milk or raw milk cheese. An infection from human to human can be practically excluded.

Together with the Friedrich Loeffler Institute (FLI), the German Federal Institute for Risk Assessment (BfR) evaluated

- whether equine brucellosis can occur in Germany,
- whether brucella can be found in the milk of infected horses and
- how the risk of a brucellosis infection in humans due to the consumption of non-heat-treated/unpasteurized mare's milk can be assessed.

The BfR and the FLI estimate the risk of equine brucellosis occurring in countries such as Germany, which are officially free of bovine, ovine and caprine brucellosis, as low. Although horses can become infected through close contact with infected cattle, sheep, goats or pigs, they are not considered primary hosts of *Brucella*. In countries in which brucellosis does not occur in the above-mentioned animal species, horses are also not carriers of *Brucella*.

Brucella can theoretically be excreted through the milk of infected mares. However, no reliable data are available on this.

Overall, the BfR and FLI assess the risk of brucellosis in humans due to the consumption of non-heat-treated mare's milk in Europe to be low. It is possible in theory, but it is unlikely. Because other pathogens in addition to *Brucella* can occur in non-heat-treated mare's milk, the BfR recommends that mare's milk should undergo heat treatment before it is consumed. Raw milk should be heated to 72 °C for at least two minutes.

		BfR Risk Profile: Transmission of brucellosis through non-heat-treated mare's milk in Germany (Opinion No. 028/2018)				
A	Affected groups	General population 				
B	Probability of a health impairment through the consumption of non-heat-treated mare's milk [1]	Practically excluded	Unlikely	Possible	Probable	Certain
C	Severity of the health impairment through the consumption of non-heat-treated mare's milk [2]	No impairments to severe impairments possible				
D	Reliability of the available data [3]	High: The most important data are available and are free of contradiction	Moderate: Some important data are missing or contradictory	Low: Numerous important data are missing		
E	Controllability by the consumer [4]	Control not necessary	Controllable through precautionary measures	Controllable through avoidance	Not controllable	

Squares highlighted in dark blue indicate the properties of the risk assessed in this opinion (more detailed information on this is contained in BfR Opinion No. 028/2018 of 5 September 2018).

Explanations

The risk profile is intended to visualise the risk outlined in the BfR Opinion. It is not intended for the purpose of comparing risks. The risk profile should only be read in conjunction with the corresponding opinion.

Line B – Probability of a health impairment

[1] – In light of the epidemiological situation and under the currently valid legal regulations, the foodborne risk of brucellosis in humans due to the consumption of non-heat-treated mare's milk in Europe is assessed as low.

Line C – Severity of the health impairment:

[2] – The severity of the impairment can vary. Often, there are no signs of infection at all. When symptoms occur, they range from fever, chills, loss of appetite and tiredness to organ damage.

Line D – Reliability of the available data

[3] – Reliable data on the transmission of *Brucella* through mare's milk are not available. Conventional test methods for cow's milk have not been validated for mare's milk. In addition, insufficient epidemiological data are available on atypical *Brucella* pathogens and *Brucella suis* in Germany.

Line E – Controllability by the consumer

[4] – The information in the line "Controllability by the consumer" should not be seen as a recommendation from the BfR; it has a purely descriptive character. The BfR has recommended courses of action in its Opinion: The BfR recommends that mare's milk be subjected to heat treatment before consumption

FEDERAL INSTITUTE FOR RISK ASSESSMENT (BfR)

1 Object of the assessment

The German Federal Institute for Risk Assessment (BfR) and the Friedrich-Loeffler Institute (FLI) jointly assessed the extent to which *Brucella* infections in horses occur in Germany and other brucellosis-free countries. The institutes also evaluated whether *Brucella* can be found in the milk of infected horses and how the risk of brucellosis in humans due to the consumption of non-heat-treated mare's milk can be assessed.

2 Result

The risk of equine brucellosis in countries that are officially free of ovine, caprine and bovine brucellosis is low. For *Brucella suis* and atypical *Brucella* species, epidemiological data are currently insufficient to allow an assessment of risk.

The pathogens causing brucellosis could theoretically be excreted through the milk of infected mares. However, reliable epidemiological data or data from animal experiments are not currently available.

Considering the epidemiological situation and following the currently valid legal regulations, the BfR and FLI assess the food-borne risk of brucellosis in humans due to the consumption of non-heat-treated mare's milk in Europe as low, but theoretically possible. Because other pathogens can occur in non-heat-treated mare's milk, the BfR recommends that mare's milk should undergo heat treatment before it is consumed.

3 Reasoning

Brucellosis in horses

Equine brucellosis is rare in Europe. In horses, the infection usually has few symptoms and rarely results in miscarriages (Nicoletti, 2007, MacMillan & Cockrem, 1986, Denny, 1973). After generalised bacteraemia¹, complications can occur in bursa sacs, tendons, muscles and joints. In this respect, horses are different from classic animal hosts, in which the infection primarily occurs in the reproductive organs (uterus, placenta). This could explain the low miscarriage rate in horses as compared to other animal species. Equine brucellosis is usually caused by *B. abortus* (Mair, 2009), but rare cases of infections with *B. melitensis* (Corbel, 2006) and *B. suis* (Cook & Kingston, 1988) have been described. The most recent case of equine brucellosis in Europe was reported in Croatia (Cvetnic et al., 2005), which was caused by *B. suis* bv 3, a biovar (variant of a bacterial species) that is not prevalent in Europe.

The individual *Brucella* species demonstrate certain host specificities. For example, *B. abortus* primarily infects cattle and other Bovidae (family of bovids/cow-like animals), *B. melitensis* infects sheep and goats, whereas pigs are predominantly infected by *B. suis* (bv 1-3). Horses are not considered primary hosts for *Brucella* species. But in the event of a high frequency of illness in livestock and close contact (e. g. shared grazing areas), transfer of *Brucella* to horses can occur as a consequence of the higher risk of infection. Horses are not generally considered animal reservoirs. It is well documented that horses become infected with *B. abortus* when the horses come in close contact with cattle (Ocholi et al., 2004, O'Sullivan, 1981, Denny, 1973, McCaughey & Kerr, 1967, Duff, 1937). Currently, there are no proven cases of transmission within horse populations or infection of other livestock through horses.

After an experimental infection of horses with *B. abortus* via the eye, bacteria could be detected in the blood for up to two months (MacMillan & Cockrem, 1986). Apart from mild bouts of fever, no clinical symptoms were detected. A normal course of pregnancy was documented subsequently in a total of five infected mares. Cattle in close contact with these mares remained free of brucellosis over the course of the experiment. Foals ingested maternal anti-*brucella* antibodies through the colostrum, but the foals did not become infected.

Brucella in mare's milk

The successful cultivation and isolation of *Brucella* from mare's milk has not been described in literature. Serological diagnosis in mare's milk seems methodologically difficult (MacMillan

¹ Occurrence of significant numbers of bacteria in the blood.

& Cockrem, 1986) and has not yet been sufficiently validated at this time. Conventional test methods for cow's milk cannot be applied to mare's milk.

There is currently little literature on the frequency of *Brucella* in mare's milk (Colavita et al., 2016). The risk of transmission of the bacteria via the milk of infected mares would appear to be lower than the probability of transmission in ruminants. According to the epidemiological situation and under the currently valid legal regulations, the foodborne risk of a *Brucella* infection due to mare's milk in Europe can be assessed as low. In Central and Northern Europe as well as in large parts of Western Europe, cattle, sheep and goats are practically free of brucellosis. In rare cases, infections in horses could be caused by atypical *Brucella* species, *B. suis* bv 2 (occurs in wild boars and hares in Germany) or *B. melitensis* from protected wildlife populations (e.g. ibexes in the French Alps). Import of infected animals from high-risk areas is also conceivable. From such areas, highly variable, sometimes high seroprevalences² (1-16%) have been reported in horses (Ardo & Abubakar, 2016, Junqueira et al., 2015, Zolzaya et al., 2014).

Legal provisions for the production of raw milk

In terms of legal provisions, the rules for primary production of Regulation (EC) No. 852/2004 and Regulation (EC) No. 853/2004 apply in the European Union (EU) to the production of raw milk. In this context, special attention should be given to adherence to the specific hygiene rules for food of animal origin according to Regulation (EC) No. 853/2004 Annex III Section IX Chapter I Number 2 Letter a Clause iii. According to this, animal populations that are sensitive to brucellosis and from which raw milk is derived must be regularly examined for brucellosis within the scope of a control programme approved by the responsible authority. The member states can issue national provisions for the supply of raw milk in line with Art. 10 Regulation (EC) No. 853/2004. According to this, compliance with the German Food Hygiene Regulation (*Lebensmittelhygiene-Verordnung*, LMHV) and the German Animal Food Hygiene Regulation (*Tierische Lebensmittel-Hygieneverordnung*, Tier-LMHV) must be ensured for the supply of raw milk. Pursuant to the *Tier-LMHV*, the supply of raw milk to consumers is generally prohibited (Art. 17, Para. 1). In deviation from this, raw milk can be supplied as certified raw milk (Art. 17 Para 2 and 3 as well as Annex 9). Certified raw milk is packaged raw milk from companies subject to specific checks, which has not undergone any form of heat treatment. According to Art. 17 Para. 4, supply of raw milk from the milk production company directly to consumers is possible if it complies with the requirements of Art. 17 Para. 4 No. 1 to 5.

Sale of mare's milk in Germany

Currently, no data are available on the sales quantities of non-heat-treated mare's milk in Germany. Moreover, it is not possible at the moment to make a statement on how many companies produce mare's milk. Mare's milk is a niche product, which is sold only by individual enterprises.

These companies advertise their mare's milk products mainly on the internet and offer deep frozen or freeze-dried milk as well as certified raw milk.

² Frequency of antibody detection in the blood of individuals within a population

4 Framework for action/measures

The BfR recommends heat treatment of mare's milk before consumption. Raw milk should be heated to 72 °C for at least two minutes.

More information on the topic of brucellosis

At the BfR website

https://www.bfr.bund.de/en/a-z_index/brucellosis-129774.html

At the FLI website

<https://www.fli.de/en/institutes/institute-of-bacterial-infections-and-zoonoses-ibiz/reference-laboratories/oie-and-nrl-for-brucellosis/>



BfR "Opinion app"

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About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the Federal Ministry of Food and Agriculture (BMEL) in Germany. It advises the Federal Government and Federal Laender on questions of food, chemical and product safety. The BfR conducts its own research on topics that are closely linked to its assessment tasks.

About the FLI

As Federal Research Institute for Animal Health, the Friedrich-Loeffler-Institut (FLI) addresses farm animal health and welfare. The work aims at the prevention, diagnostics and control of animal diseases, the improvement of animal welfare and animal nutrition as well as the preservation and use of farm animal genetic resources.

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