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Shiga toxin-producing *E. coli* in food: Prediction of the disease-causing potential of the various strains not yet possible

BfR Opinion No. 009/2018 of 19 April 2018

Escherichia coli (*E. coli*) is a germ that occurs naturally in the gut of mammals and birds, as well as in the human intestinal flora. However, certain *E. coli* types can cause severe diarrhoea in humans. These virulent *E. coli* types include Shiga toxin-producing *E. coli* (STEC), also known as Verotoxin-producing *E. coli* (VTEC). Their damaging effect is due to the fact that STEC produce toxins known as Shiga toxins (Stx), which can cause disease in the human gut. As the best known STEC representative, an enterohaemorrhagic *E. coli* (EHEC) strain of the serotype O104:H4 was responsible for numerous severe cases of haemolytic-uremic syndrome (HUS) and bloody diarrhoea in Germany in 2011, as a result of which 53 people died.

According to evaluations made by the BfR, STEC are most often found in meat, meat products, raw milk and raw milk products from ruminants such as cattle, sheep and goats, but they can also occur in products made from wild ruminants and wild boar, as well as plant-based foods. In addition to the produced Shiga toxin, a protein for attaching the pathogens in the intestine (intimin) is regarded as an important factor in the development of severe diarrhoea. Although STEC strains can be better classified today using modern molecular methods, a definite prediction of the potential of STEC strains to cause disease in humans is not possible. For this reason, all Shiga toxin-producing *E. coli* strains are classified as potentially virulent.

To protect against STEC infections through contaminated food, the BfR recommends heating methods, such as boiling, frying, roasting or pasteurising, which kill any pathogens that might be present in meat or raw milk. The requirement here is that a temperature of 70° C or more is reached at the core of the food for at least two minutes; accordingly, meat should be cooked thoroughly. Plant-based foods such as fresh herbs, lettuce and leafy greens, which are generally consumed raw should be stored at a maximum of 7° C, thoroughly washed and used quickly. To reduce the germ load, particularly sprouts should be thoroughly washed, used up as quickly as possible and preferably, thoroughly heated prior to consumption. People with weakened immune systems should avoid eating raw sprouts altogether.

BfR		BfR Risk Profile: STEC risk through food (Opinion No. 009/2018)			
A Affected groups	General population 				
B Probability of a health impairment through the consumption of foods containing virulent <i>E.coli</i> [1]	Practically excluded	Unlikely	Possible	Probable	Certain
C Severity of health impairment through the consumption of foods containing virulent <i>E.coli</i> [2]	No impairment	Slight impairment	Moderate impairment	Severe impairment	
D Reliability of the available data	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 or contradictory		
E Controllability by the consumer [3]	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. 009/2018 of 19 April 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.

[1] – Line B - Probability of health impairment through the consumption of foods containing virulent *E. coli*

The likelihood of contracting severe diarrhoea depends on whether and in what quantities consumed foods contain Shiga toxin-producing *E. coli* (STEC). STEC can be present in meat, meat products, raw milk and raw milk products from ruminants such as cattle, sheep and goats. Products obtained from wild ruminants, wild boar and plant-based foods can also contain STEC.

[2] – Line C - Severity of health impairment through the consumption of virulent *E. coli*

The severity of disease depends on the type and amount of ingested STEC subgroups. Minor illness with gastrointestinal symptoms, bloody diarrhoea as well as haemolytic-uremic syndrome with kidney failure and fatalities are possible.

[3] – Line E - Controllability by the consumer

The information in this line should not be seen as a recommendation from the BfR; it has a purely descriptive character. Precautionary measures recommended by the BfR are listed in the grey box on the first page of this opinion and under the heading **More information at the BfR website on the topic** listed at the end of this opinion.

The full version of this BfR opinion is available in German on

<http://www.bfr.bund.de/cm/343/shigatoxin-bildende-e-coli-in-lebensmitteln.pdf>

More information on the subject of *Escherichia coli* at the BfR website

http://www.bfr.bund.de/en/a-z_index/escherichia_coli-130085.html



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