

Salmonella and Chocolate

Communication No. 010/2022 of April 12, 2022

The European Food Safety Authority (EFSA) and the European Centre for Disease Prevention and Control (ECDC) are currently investigating a transnational outbreak of salmonellosis linked to chocolate products. The German Federal Institute for Risk Assessment (BfR) has therefore compiled information on the topic of *Salmonella* in chocolate.

After *Campylobacter* germs, *Salmonella* is the most common bacterial causative agent of intestinal diseases in Germany. High-risk foods are in particular undercooked or raw meat and products made from it, eggs and egg-products that have not been heat-treated, and plant-based foods. However, fatty foods such as chocolate, which are contaminated with *Salmonella*, can also cause an infection with *Salmonella*.

In the case of chocolate, even small amounts of germs can be enough to cause a disease. The low infection doses are attributed to the fact that the *Salmonella* in the high-fat chocolate is very well protected against the acidic conditions in the human stomach and, for the most part, reach the intestines alive, where it can cause an infection.

The disease, known as salmonellosis, is often accompanied by diarrhoea and abdominal pain, but fever, nausea and vomiting are also possible. Children in their first years of life and people whose immune system is weakened, for example due to old age or previous illnesses, are particularly at risk.

Salmonella is very rarely detected in chocolate. As part of reporting on zoonotic pathogens in the food chain, the competent authorities of the federal states in Germany reported tests for the occurrence of *Salmonella* in around 2,500 samples of chocolate-containing products to the BfR between 2012 and 2019. *Salmonella* was not detectable in any of the reported samples from these years. Since 2020, the Federal Office of Consumer Protection and Food Safety (BVL) has been responsible for data collection and reporting on this topic.

Nevertheless, outbreaks of disease caused by *Salmonella* in chocolate products are known primarily through scientific publications. The last outbreak of salmonellosis in Germany known to the BfR in connection with chocolate occurred in 2001 and was caused by the *Salmonella* type *Salmonella* Oranienburg.

Depending on the age and state of health of the people affected, the minimum infectious dose of *Salmonella* may be 10,000 – 1,000,000. In the case of chocolate, however, low bacterial counts can be enough to cause a disease. These low infectious doses are attributed to the fact that high-fat chocolate provides *Salmonella* with effective protection against the acidic conditions present in the human stomach and, for the most part, allows him to reach the intestines alive, where it can cause an infection. *Salmonella* can survive in chocolate for up to several years. It is also very well protected against heat due to the low water content of chocolate and the protective effect of the fat.

There are almost 2,700 different *Salmonella* serotypes (serovars). A prevalence for certain serovars to be more common in chocolate than others – such as with eggs, which are mostly contaminated with *Salmonella* (S.) Enteritidis – is not evident in chocolate products. For example, in known salmonellosis outbreaks caused by the consumption of contaminated chocolate products, the serovars S. Napoli, S. Oranienburg or S. Typhimurium were found. S. Durham has been found in cocoa powder, S. Eastborne in cocoa beans, and S. Nima in

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chocolate coins. In the National Reference Laboratory for *Salmonella* at the BfR, the serovars *S. Hull* or *S. Salford* (isolate from chocolate), *S. Nigeria* (isolate from cocoa shells), *S. Typhimurium* (isolate from chocolates) and *S. Senftenberg* and *S. Weltevreden* (isolates from cocoa) were identified during the last four years.

The ECDC and EFSA provide more information on the transnational salmonellosis outbreak on their website:

https://www.efsa.europa.eu/sites/default/files/2022-04/ROA_monophasic%20S%20Typhimurium%20ST34%20linked%20to%20chocolate_2022-00014_UK%20FINAL.pdf

Public warnings and information according to the Food and Feed Code (LFGB) are published in Germany by the federal states and the BVL on the website lebensmittelwarnung.de (in German):

<https://www.lebensmittelwarnung.de/bvl-lmw-de/liste/alle/deutschlandweit/10/0>

More information on the BfR website about food-borne infections caused by *Salmonella*

Questions and answers on protection against infection with *Salmonella* (in German):

https://www.bfr.bund.de/de/fragen_und_antworten_zum_schutz_vor_infektionen_mit_salmonellen-199146.html



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