German Federal Institute for Risk Assessment

FAQ

9 July 2025

Chlorate in food

Questions and answers about origin and health risks

Chlorates are salts of chloric acid. In the past, sodium and potassium chlorate were mainly used for weed control. In the EU, chlorate is no longer permitted as an active substance in plant protection products (PPPs) or biocidal products. However, chlorate can also form as a by-product during the storage or use of cleaning products or disinfectants containing chlorine. According to current knowledge, the main source of chlorates in food is contact with water that has been treated with products which contain chlorine. For example, residues may remain on work surfaces or in machines after cleaning or disinfection and enter food in this way.

Following repeated detection of chlorate in food, the European Food Safety Authority (EFSA) assessed the health risks posed by chlorate in food in 2015. Based on this assessment and in consideration of the chlorate levels actually measured in food, the European Union (EU) has set maximum residue levels (MRLs) for chlorate in food.

The German Federal Institute for Risk Assessment (BfR) has compiled a list of questions and answers on this topic.

What is chlorate?

Chlorates are salts of chloric acid ($HClO_3$) consisting of the chlorate anion (ClO_3^-) and various cations. Well-known chlorate compounds include sodium and potassium chlorate. It is not known which chlorate compounds were present in the foods in which chlorate was detected.

Where does chlorate come from and how is it used?

In the past, sodium and potassium chlorate were used for weed control. In the EU, plant protection products (PPP) or biocidal products containing chlorate as an active substance

are no longer permitted. However, chlorate can form as a by-product during the storage or use of cleaning products or disinfectants containing chlorine.

How does chlorate enter food?

According to current knowledge, chlorates enter food through contact with water that has been treated with biocidal products which contain chlorine. Chlorate can form as a by-product when such products are used or may already be present in a product during storage. Residues may remain on surfaces or equipment after cleaning or disinfection and enter food in this way. Water is also added to some foods during production.

Can chlorate impair health? Who is particularly sensitive?

Repeated intake of chlorate can inhibit iodine absorption and possibly lead to a deficiency. This inhibition can cause temporary changes in thyroid hormone levels in members of risk groups. People with thyroid disorders or iodine deficiency as well as newborns and children are particularly susceptible to adverse effects. Pregnant women who already have thyroid dysfunction are another vulnerable group. However, the inhibition of iodine uptake by chlorate is not permanent: if chlorate is no longer ingested, iodine uptake returns to normal after some time. A single intake of chlorate has no significant effect on the inhibition of iodine uptake. However, even a single intake of higher concentrations of chlorate can cause damage to red blood cells.

At what intake levels does chlorate pose a health risk?

For chlorate, EFSA has derived a tolerable daily intake (TDI) of 0.003 milligrams (mg) per kilogram (kg) of body weight. Based on the finding that a single intake of higher concentrations of chlorate can damage red blood cells, EFSA has also derived an acute reference dose (ARfD) of 0.036 mg per kg body weight for chlorate.

What are the maximum levels for chlorate in food?

The maximum residue levels of plant protection products (PPP) permitted in and on food are regulated uniformly across the EU. In 2020, provisional maximum residue levels for chlorate in food were set. The maximum permitted levels vary depending on the type of food and the expected, unavoidable level of residues. The maximum levels are based on measurements of the actual prevalence of chlorate in food from between 2014 and 2018, which were provided by Member States and food business operators. In 2025, current data on prevalence in food is to be used as a basis to review these maximum levels and adjust them if necessary. They should be as low as possible and follow the ALARA principle (ALARA = as low as reasonably achievable).

How much chlorate is allowed in drinking water?

For chlorate, the World Health Organization (WHO) has published a provisional guideline value of 0.7 mg per litre of drinking water. However, a reduction of this value is currently under discussion. The regulations in the German Drinking Water Ordinance are already significantly stricter and stipulate a limit value for chlorate of 0.07 mg per litre of drinking water, ten times lower than the WHO. An exception is provided in the case of immediate hazard prevention. Following, for example, local contamination due to leaks in drinking water pipes, the chlorate concentration in drinking water may rise to 0.7 mg per litre for a short period.

Can chlorate in food lead to health impairments?

Based on the evaluated data on the prevalence of chlorate in food, EFSA concludes in its opinion that repeated intake of chlorate in younger population groups with mild to moderate iodine deficiency is a cause for concern. However, a single intake is not considered to pose a critical health risk.

In which foods is chlorate particularly frequently detected?

Chlorate is detected in a wide range of foods of both plant and animal origin. It is frequently found in frozen and processed foods, fruit juices and salads/herbs. The presence of chlorate in these products could be due to processes such as glazing frozen goods, diluting juice concentrates or washing herbs and salads with water which contains chlorate.

Did the foods containing chlorate originate from specific countries?

Chlorate residues have been detected in food from numerous countries of origin, including Germany.

What can consumers do?

Consumers should eat a balanced and varied diet. The health benefits of fruit and vegetables remain undisputed.

Further information on chlorate in food on the BfR website

Opinion on chlorate issued 15 February 2018
https://www.bfr.bund.de/en/opinions/the-entry-of-chlorate-into-the-food-chain-should-be-reduced/

Questions and answers on residues of plant protection products in food
https://www.bfr.bund.de/en/service/frequently-asked-questions/topic/questions-and-answers-on-residues-of-plant-protection-products-in-food/

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent public health institution within the portfolio of the German Federal Ministry of Agriculture, Food and Regional Identity (BMLEH). The BfR advises the Federal Government and the States ('Laender') on questions of food, feed, chemical and product safety. The BfR conducts independent research on topics that are closely linked to its assessment tasks.

This text version is a translation of the original German text which is the only legally binding version.

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Supervisory Authority: Federal Ministry of Agriculture, Food and Regional Identity
VAT ID No. DE 165 893 448
Responsible according to the German Press Law: Dr Suzan Fiack

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