German Federal Institute for Risk Assessment

FAQ

17 July 2025

Perchlorate in food

Questions and answers about origin and health risks

Perchlorates are salts of perchloric acid. The occurrence of perchlorates in the environment is mainly caused by humans, although perchlorate can also occur naturally in the mineral deposits of some countries. Unlike some chlorates, perchlorates have never been approved as plant protection products or biocidal active substances in the European Union (EU). However, perchlorate can form as a by-product when substances containing chlorine are used for cleaning or disinfection. According to current knowledge, the main source of perchlorates in food is contact with water that has been treated with products containing chlorine. For example, residues can remain on work surfaces or in machines after cleaning or disinfection and thus find their way into food.

In the past, perchlorate has been repeatedly detected in and on certain foods such as vegetables and fruit. The European Food Safety Authority (EFSA) therefore assessed the health risks posed by perchlorate in food in 2014 and again in 2025. EFSA's assessment showed that repeated intake of perchlorate can inhibit iodine absorption and, in some cases, lead to deficiency symptoms. This inhibition can cause temporary changes in thyroid hormone levels in risk groups.

In the meantime, maximum levels for perchlorate in food have been set in contaminant legislation, and the permitted concentration in fertilisers has also been restricted.

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

What is perchlorate?

Perchlorates are salts of perchloric acid ($HClO_4$), which consist of the perchlorate anion (ClO_4^-) and various cations. Well-known perchlorate compounds include ammonium perchlorate and various metal salts (barium, potassium, lithium, magnesium and silver perchlorate). It is not known which perchlorate compounds were found in the foods in which perchlorate was measured.

Where does perchlorate come from and how is it used?

Perchlorate is mostly of anthropogenic origin, i.e. produced by humans, but it can also occur naturally. In some countries, such as Chile, perchlorates occur naturally in higher concentrations in the soil. Chile saltpetre, which is used as a fertiliser, may contain perchlorate. Perchlorates are also used as industrial chemicals, particularly as rocket propellants and in fireworks, as well as in medical drugs. They can also be formed by oxidative processes in the atmosphere or in small amounts when disinfectants containing chlorine are used. Perchlorates are currently not authorised for use as plant protection products (PPPs) or biocidal active substances in the EU.

How does perchlorate get into food?

According to current knowledge, perchlorates enter food primarily through contact with water that has been treated with biocidal products containing chlorine. Perchlorate can form as a by-product when such products are used. Residues can remain on surfaces or equipment after cleaning or disinfection and enter food in this way. Water is also added to some foods during production.

Perchlorate can also pass from fertilisers into plants and thus into plant-based foods, where it is transported in particular to the leaves. According to the EU Fertiliser Products Regulation, the perchlorate content of inorganic macronutrient fertilisers must not exceed 50 milligrams (mg) per kilogram (kg) of dry mass. Perchlorate can also enter the environment and subsequently food through its use in industrial chemicals, rocket fuels or fireworks.

Can perchlorate impair health? Who is particularly sensitive to it?

Repeated intake of perchlorate can inhibit iodine absorption and possibly lead to deficiency symptoms. This inhibition can cause temporary changes in thyroid hormone levels in risk groups. People with thyroid disorders or iodine deficiency as well as newborns and children may be particularly affected by adverse effects. Pregnant women with pre-existing thyroid dysfunction are another vulnerable group. However, the inhibition of iodine uptake by perchlorate is not permanent: if perchlorate is no longer ingested, iodine uptake returns to normal after some time.

At what intake amount does perchlorate become a health concern?

For perchlorate, EFSA has derived a tolerable daily intake (TDI) of 0.0014 milligrams (mg) per kilogram (kg) of body weight, based on inhibition of iodine uptake in healthy adults. EFSA considers acute health risks from a single intake of perchlorate in food to be unlikely. Therefore, EFSA has not derived an acute reference dose (ARfD).

What are the maximum levels for perchlorate in food?

Maximum levels for perchlorate are regulated EU-wide by contaminant legislation. Regulation (EU) 2020/685 sets specific maximum levels for perchlorate in various product groups such as fruit and vegetables, tea, herbal tea and infant formula.

How high is the risk of health impairments caused by perchlorate in food?

Based on the evaluated data on the occurrence of perchlorate in food, EFSA concludes in its opinion that a single intake of perchlorate at concentrations measured in food to date is unlikely to cause adverse health effects. However, repeated intake of perchlorate may give rise to concerns about associated health risks, particularly for infants who are breastfed by mothers with iodine deficiency or who ingest perchlorate residues via infant formula. This applies even after two weeks of (short-term) exposure to perchlorate. Perchlorate levels in food should therefore comply with the maximum levels set and be as low as possible overall.

Are foods containing perchlorate sourced from certain countries?

Perchlorate residues have been measured in food from numerous countries of origin, including fruit and vegetables from 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 the BfR website on perchlorate in food

Opinion 006/2018: The entry of perchlorate into the food chain should be reduced
https://www.bfr.bund.de/cm/349/the-entry-of-perchlorate-into-the-food-chain-should-be-reduced.pdf

Topic page on perchlorate
https://www.bfr.bund.de/en/chemical-safety/plant-protection-products/consumer-safety-and-plant-protection-product-residues/plant-protection-product-residues-in-food/gesundheitliche-bewertung-von-perchlorat/

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.

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