

Frequently asked questions about solanine (glycoalkaloids) in potatoes

FAQ to the BfR of 23 April 2018

Potatoes belong to the family of nightshade plants. Characteristic ingredients of these plants are glycoalkaloids, including solanine, which can lead to cases of poisoning. Due to some cases of poisoning probably attributable to the consumption of potato dishes, the German Federal Institute for Risk Assessment (BfR) recommends that potatoes are handled properly and has compiled some questions and answers on the subject.

What is solanine?

Solanine is a glycoalkaloid to be found in potatoes. Glycoalkaloids are secondary plant ingredients occurring in plants of the nightshade family as a defence mechanism against pests and germs. Potato tubers mainly contain the glycoalkaloids α -solanine and α -chaconine, mostly in the peel of the tubers. Particularly high concentrations are to be found in the sprouts and stem buds, the so-called "eyes". The presence of green parts indicates an elevated glycoalkaloid content. Some of the alkaloids pass over to the water during boiling.

What health effects can glycoalkaloids have?

The consumption of green, sprouting or damaged potatoes can lead to poisoning through glycoalkaloids. From a certain glycoalkaloid content in the potato, consumers can perceive a bitter taste and a burning sensation in the mouth. Cases of minor poisoning cause symptoms such as nausea, stomach-ache, vomiting and diarrhoea, sometimes accompanied by fever. In severe cases, impairment of consciousness and very rarely complete loss of consciousness can occur, along with disturbances in brain function, breathing and in the cardiovascular system. There are also reports of isolated instances of deadly poisoning.

How great is the risk of suffering glycoalkaloid poisoning?

Only a few cases of poisoning caused by the consumption of potato dishes have been reported and documented in the last 100 years. This could be evidence that cases of poisoning rarely occur due to the bitter taste of the glycoalkaloids. Due to the non-specific symptoms, however, the actual number could be considerably higher. Deaths as a result of glycoalkaloid poisoning have not been reported in the last 50 years.

What is the average glycoalkaloid content of potatoes and from when does a health risk exist?

A content of up to 200 mg (milligrams) of glycoalkaloids per kg (kilogram) potatoes has generally been recognized as safe up to now. Properly cultivated, harvested and stored potatoes usually have a glycoalkaloid content of 20 to 100 mg per kg, but examinations of potato samples have occasionally shown glycoalkaloid levels of over 200 mg per kg potatoes too.

The Federal Institute for Risk Assessment (BfR) has derived a NOAEL (No Observed Adverse Effect Level – the highest dose at which no undesired health effects were observed) of 0.5 mg per kg body weight and day. To avoid an exceedance of the NOAEL, the glycoalkaloid content in table potatoes should be no higher than 100 mg per kg potatoes. In view of the current incomplete data, these recommendations should be regarded as provisional.

What does the Federal Institute for Risk Assessment recommend regarding the glycoalkaloid content of potatoes?

Based on the currently available data, the BfR recommends that the glycoalkaloid content of potatoes intended for consumption should lie below 100 mg per kg fresh weight. It is advised that the appropriate tests be conducted.

The BfR recommends that consumers comply with the following measures when storing and preparing potatoes:

- Potatoes should be stored in a cool, dark and dry place
- Old, dried up, green or strongly sprouting potatoes, as well as potato peels as snacks consisting mainly of potato peelings, are not suitable for consumption
- Green parts and so-called “eyes” should be generously removed from potatoes
- If consumers want to eat the skin along with the potato, only undamaged, fresh potatoes are fundamentally suited for this purpose
- Small children in particular should only eat peeled potatoes
- Potato dishes should not be eaten if they have a bitter taste
- Consumers should not reuse the water in which potatoes have been boiled as some of the glycoalkaloids can pass over to the cooking water
- Deep-frying fat for potato products should be changed regularly

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