New data from a BfR human study: no cyanide risk resulting from the consumption of marzipan and persipan

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A human study conducted by the Federal Institute for Risk Assessment (BfR) enables more differentiated risk assessment of cyanide exposure following the consumption of bitter apricot kernels, persipan, linseed or manioc (cassava). The study results have now been published in the scientific journal “Archives of Toxicology” (DOI 10.1007/s00204-015-1479-8, open access).

Bitter apricot kernels, linseeds and manioc contain, as natural plant substances, cyanogenic glycosides in relatively high concentrations. Through the enzyme ß-glucosidase which is also contained in the plants, cyanide is released during consumption. Cyanides are salts of hydrocyanic acid. Ingestion of a sufficiently high dose can lead to acute poisoning by blocking energy generation. The BfR study shows that in terms of risk assessment of foods with cyanogenic glycosides it is very important, over and above the dose of bound cyanide, whether and to what extent the plant enzyme ß-glucosidase is active. For only fast enzymatic release leads to high cyanide blood levels in the body which determine toxicity.

The known health risks resulting from the consumption of bitter apricot kernels and unprocessed manioc are confirmed by the human study conducted by the BfR. Compared to these foods, the consumption of linseed, with the same dose of bound cyanide, leads to much lower maximum levels (peak levels) in the blood. Even lower levels are measured following consumption of perspipan which is partly made of bitter apricot kernels, since the ß-glucosidase necessary for the release of cyanide is largely destroyed during the production process.

Bitter apricot kernels should – in accordance with the previous recommendation – only be consumed at a maximum of two kernels per day. Larger quantities of manioc should be processed before consumption (there are various traditional methods here). The consumption of linseed is even safe in the presence of high cyanide contents, provided that current recommendations for consumption of up to 15 g per meal are observed. The consumption of marzipan or persipan, the maximum cyanide content of which in accordance with EU regulations is limited to 50 milligrams (mg) per kilogramme (kg) of food, is harmless in terms of cyanide, even if consumed in very large quantities.

The acute toxicity of cyanide is determined by the peak levels reached in the blood. Above a critical range which is known from the evaluation of poisonings, first clinical symptoms such as vomiting and impaired consciousness are to be expected because the substance blocks energy generation. As part of a controlled human study involving twelve test persons, the BfR analyzed the cyanide blood levels following consumption of the above-mentioned foods. They all contained the same dose of 6.8 mg of cyanide bound as cyanogenic glycoside. The measured maximum blood levels differed widely, however. Whereas the mentioned critical range was almost reached following consumption of approximately 2 grammes (g) of bitter apricot kernels and roughly 100 g of unprocessed manioc, the maximum blood levels were significantly lower after consumption of linseed (31 g). This is probably due to lower activity of the enzyme ß-glucosidase in linseed. Following consumption of 100 g of persipan, the blood levels were even lower by factor 10 compared to bitter apricot kernels and manioc. This appears to be due to intensive heating during the production of persipan which largely destroys ß-glucosidase.

The BfR has derived an acute reference dose for cyanide from the data of the study which also applies to cyanogenic glycosides in foods with high ß-glucosidase activity.

http://link.springer.com/article/10.1007/s00204-015-1479-8