Benzene in foodstuffs

Benzene is a chemical compound used in the industry. It is also found in gasoline and in cigarettes. The International Agency for Research on Cancer (IARC) considers benzene as a substance that is carcinogenic for man. Exposure to benzene is mainly environmental (traffic, industry, …). Yet, there are indications that certain foodstuffs contain increased concentrations of this and of similar components (e.g. toluene or ethylbenzene).

There are several possible sources of benzene in food. Benzene may be formed by decarboxylation of the benzoic acid salts (benzoates) in the presence of ascorbic acid (vitamin C) (Figure 1). Benzoic acid is added to many foodstuffs as a preserving agent and may be present either as a natural component or as a food additive. The presence of transition metal catalysts (Cu (II) or Fe(III) ions), the acidity, UV light and the temperature may have an effect on the formation of benzene from benzoates. Benzene may also be transferred to foodstuffs as it leaks from packaging materials or the environment where the food is stored or by contaminated water. It may also be formed during irradiation processes. Contaminated carbon dioxide (CO₂) has been described as a source of benzene in beer. Benzene contaminations of food were found more than 10 years ago in the USA in soft drinks at concentrations of more than 1 µg/kg. The European standard for benzene in drinking water is 1 µg/kg. That is also the limit that is suggested as an acceptable reference value for benzene in soft drinks by the Scientific Committee of the Belgian Federal Agency for the Safety of the Food Chain.

For now, little is known about the presence of benzene in other foodstuffs at increased concentrations. However, it appears from recent literature on the subject, that benzene was found in carrot juice for infants, due to the heat treatment this product undergoes in order to rule out microbiological contamination (Lachenmeier, 2008). A systematic study of the exposure to benzene in the human food chain is not yet available, but research has been started.

What researchers want to know now is to what extent the intake of benzene contaminated food involves a risk for public health. To answer that question, they need reliable intake estimates. Hence, they need as much information as possible on the benzene concentrations in foodstuffs and must combine this information with the data on the consumption of these products.

A research is now being done on other possible sources of benzene in food. As it is, there are also products that may contain benzene in a natural way, e.g. mango and cranberry. Juices made from these fruits are also examined. Benzene may also be formed from certain precursors (ß-carotene, fenylalanine and certain terpenes) that may be present in food (Lachenmeier, 2010).

In the next few years more information will become available. But, as yet, there are no indications that lead to believe that the health of consumers is at risk because of the presence of benzene in foodstuffs.
Figure 1: decarboxylation of benzoic acid into benzene

References:
- Lachenmeier et al. (2010). Food and Chemical Toxicology 48, 291-297.

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