Alkenylbenzenes in food: How large is the health risk?

BfR Communication No. 22/2022 of 2 August 2022

Some foods may naturally contain potentially harmful (toxic) substances. These include alkenylbenzenes, for example, which occur as secondary plant constituents in certain herbs and spices, such as basil, fennel and parsley, among others.

These herbs and spices and their extracts are used for food production. In particular, basil-containing pesto, fennel tea and plant-based food supplements may contain high amounts of alkenylbenzenes. It is not permitted to add the alkenylbenzenes estragole, methyleugenol and safrole to foods for flavouring purposes. However, as they occur naturally in certain flavourings and food ingredients with flavouring properties, maximum levels of estragole, methyleugenol and safrole apply in certain foods.

There is controversial discussion of how harmful alkenylbenzenes are to health. Safrole, methyleugenol and estragole exhibit mutagenic and carcinogenic properties in animal studies. Other less well studied alkenylbenzenes, such as elemicin, myristicin and apiol, have a similar chemical structure. This indicates that they may also exhibit similar (toxic) effects. However, most alkenylbenzenes have not yet been sufficiently investigated regarding potential toxic, especially mutagenic and carcinogenic properties.

The German Federal Institute for Risk Assessment (BfR) has summarised the current state of knowledge regarding the occurrence and toxicity of different alkenylbenzenes in food and has published this in the scientific journal “Foods”. The BfR concludes that it is currently not possible to conclusively assess the health risk resulting from alkenylbenzene-containing foods. This is due to knowledge gaps, which have to be closed by appropriate research. In addition to the lack of data on occurrence and contents of toxicologically relevant alkenylbenzenes in foods, there is also a lack of consumption data. In particular for still insufficiently investigated alkenylbenzenes, such as elemicin, myristicin and apiol, there is a need for research regarding their harmful properties.

The underlying articles were published in the scientific journal “Foods” on 10th September 2021 (https://doi.org/10.3390/foods10092139) and 5th July 2022 (https://doi.org/10.3390/foods11131988).

In 2001 and 2002, the Scientific Committee on Food (SCF) of the European Commission assessed safrole, methyleugenol and estragole as mutagenic carcinogens and proposed the restriction of their use in foods. On the basis of the recommendations of the SCF, it is not permitted to add safrole, methyleugenol and estragole to foods for flavouring purposes, according to Annex III of Regulation (EC) No. 1334/2008. Moreover, maximum levels of these substances, which are naturally occurring in certain flavourings and food ingredients with flavouring properties, apply in certain foods, such as dairy, meat and fish products, soups and sauces, as well as non-alcoholic beverages.

For other alkenylbenzenes, such as elemicin, myristicin and apiol, which are also naturally occurring in certain flavourings and food ingredients with flavouring properties, no maximum levels apply to date.

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the German Federal Ministry of Food and Agriculture (BMEL). It advises the German federal government and states on questions of food, 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.