

Acrylamide in Food

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Acrylamide is formed in food containing starch such as French fries, potato crisps, crunch muesli, and crisp bread through the processes of turning brown like baking, roasting and frying. High acrylamide concentrations in food were detected first in 2002. This finding caused distinct concern in the scientific community, since animal experiments had shown that acrylamide is a genotoxic and carcinogenic agent. Acrylamide and its metabolite glycidamide have been the subject of a large number of scientific studies ever since. However, till today the effects of acrylamide on human health have not been entirely elucidated. Against this background, the Federal Institute for Risk Assessment (BfR) has summarised the current state of research: it has evaluated a large number of human and animal experiments as well as epidemiological studies. In addition, it has conducted exposure estimates for acrylamide on the basis of current contents in food as well as consumption data.

Subjects of human and animal studies were in particular the fate of acrylamide in the organism as well as its ability to change genetic material and its carcinogenic properties. Long-term studies with rats and mice have conclusively shown the cancer-causing properties of acrylamide. A threshold value under which the substance may have no genotoxic or carcinogenic effects is discussed in the literature, but cannot be derived from the studies available. In the opinion of the BfR, there is insufficient knowledge about the molecular effects of the substance in low dose levels. These molecular effects and a possible hormonal effect of acrylamide should be clarified in additional studies.

The BfR has assessed 13 epidemiological studies investigating various cancer types in connection with acrylamide intake. The results of these studies are inconsistent. Some studies indicate an increased cancer risk associated with higher acrylamide intake, whereas other studies do not find such associations. Hence, a correlation between acrylamide intake and cancer development can neither be assumed nor excluded. It could be that the risk of getting cancer, if this risk really exists, can hardly be proven given the current (low) intake level.

The BfR has compared various exposure estimates of the acrylamide intake of consumers on the basis of German and European data representing the acrylamide contents in food and the consumption frequency of specific food items. In addition, the BfR suggests that blood and/or urine biomarkers may be more suitable for determining the acrylamide intake of consumers than the estimation via the acrylamide contents in food and consumption data.

In order to characterize the cancer risk, the BfR has performed model calculations. These calculations were based on the assessment concept (margin of exposure approach) recommended by the European Food Safety Authority (EFSA). This concept determines the margin between the acrylamide intake and a dose derived from animal experiments which has been shown as harmful. The model calculations reveal that the margin for consumers and children eating large amounts of foods with high acrylamide contents is low and that this may therefore pose a health risk. In the view of the BfR, efforts should be continued to minimise acrylamide contents in industrially processed food. Consumers and restaurants should hold on the rule "baking golden brown instead of charring", as the acrylamide content is increasing with a higher browning degree. The cooking instructions on the packaging should always be considered.

The full version of this BfR Opinion is available in German on <http://www.bfr.bund.de/cm/343/acrylamid-in-lebensmitteln.pdf>