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BfR MEAL study: High acrylamide levels detected in vegetable crisps

Under certain conditions, the heating of food can lead to the formation of undesirable and potentially harmful substances. These include acrylamide, which is formed as a by-product when starchy foods are heated. It can be found in potato products, coffee and tobacco smoke, for example.

As part of the BfR MEAL study (Meals for Exposure Assessment and Analysis of Food), the first total diet study in Germany, the average occurrence level of substances - including acrylamide - were analysed in various foods. The highest acrylamide levels were found in vegetable crisps. A detailed presentation of the results is published at <https://www.sciencedirect.com/science/article/pii/S2590157524002906>.

The BfR MEAL Study analyses the average concentrations of substances contained in food and the health risks that can be formed during the processing and preparation of food. The results of the BfR MEAL Study serve, for instance, as a basis for recognising possible risks from the consumption of food. Consumption recommendations can be derived from the data. They also form an important basis for comparison in order to quickly and reliably assess the concentrations of undesirable substances in the event of a crisis.

Acrylamide is an organic (carbon-containing) compound that is highly soluble in water. In food, acrylamide forms as a by-product of the browning reaction ("Maillard reaction") during baking, roasting, grilling, deep-frying and frying. This reaction starts at temperatures above approx. 120 °C and rises sharply above 170 – 180 °C. Acrylamide can therefore be detected in larger quantities after intense heating of carbohydrate-rich foods, which have a high concentration of the amino acid asparagine and a low water content. Examples include crisps, deep-fried potato products, cereal-based baked goods and roasted coffee. For consumers and catering establishments, the rule of "gilding instead of charring" still applies, as the acrylamide content increases with the degree of browning.

Acrylamide, and in particular the metabolite glycidamide formed from acrylamide, are suspected of causing cancer, which is why food manufacturers in the EU are required to minimise the acrylamide content and optimise the manufacturing process accordingly.

The acrylamide content of 230 foods was analysed as part of the BfR MEAL study. The result: the highest concentrations were found in vegetable crisps (1430 µg/kg), followed by potato pancakes (558 µg/kg) and fried potatoes (450 µg/kg). Potato crisps, on the other hand, had a concentration of 190 µg/kg.

Due to their significance for acrylamide formation, 143 foods were also prepared with different degrees of browning. The degrees of browning were selected to reflect the different consumer behaviour of the population during preparation as far as possible (from 1 = light browning to 5 = very heavy browning). Some foods such as French fries and sweet potatoes were also prepared using different cooking methods, i.e. in the oven, deep fryer or hot air fryer. French fries and sweet potato fries had high acrylamide contents, whereby, as expected, the acrylamide contents increased with the degree of browning. For example, acrylamide levels in French fries were more than 3 times higher for browning degree 2 compared to browning degree 1 and even more than 30 times higher for browning degree 3. In the case of French fries, the cooking method with the lowest acrylamide levels for all browning degrees was baking, while for sweet potato fries, preparation in an air fryer led to lower acrylamide formation. The data confirm the BfR's recommendation that food should preferably only be lightly browned ("gilding instead of charring"). Consumers can influence their acrylamide intake through their choice of cooking method and thus through their own behaviour.

Further information on the BfR website on acrylamide and the BfR MEAL study

A-Z Index Acrylamide:

https://www.bfr.bund.de/en/a-z_index/acrylamide-129902.html#fragment-2

BfR MEAL study:

<https://www.bfr-meal-studie.de/en/meal-homepage.html>

Questions and answers on acrylamide:

https://www.bfr.bund.de/en/gilding_instead_of_charring_questions_and_answers_about_acrylamide_in_food-128397.html

Opinion Acrylamide in food:

<https://www.bfr.bund.de/cm/349/acrylamide-in-food.pdf>

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