

## Communication 032/2024

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### **Acrylamide is also produced in the body itself**

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Acrylamide is formed when starchy foods are heated and is found, for example, in French fries, potato crisps and coffee. Another source is tobacco smoke. As the substance is suspected of causing cancer, food manufacturers and restaurants in the EU must take steps to minimise the acrylamide content in food. A team of researchers from the German Federal Institute for Risk Assessment (BfR) has now confirmed an interesting discovery: there is clear evidence that acrylamide is also produced in the body itself - and to a greater extent than previously assumed. The researchers published their findings in the journal "Archives of Toxicology" (<https://link.springer.com/article/10.1007/s00204-024-03798-z>).

In the study, the amount of acrylamide present in the body was compared between mixed food eaters, vegans and raw food eaters. Both urine and blood samples were analysed for acrylamide reaction products. As the raw foodists had not eaten any heated food for at least four months, a very low amount in the body was to be expected. However, it turned out that the amount of acrylamide reaction products in their bodies was 25 % (urine) and 48 % (blood) compared to the amounts found in mixed food eaters. This is explained by the formation of acrylamide in the body itself. The study also showed that a vegan diet leads to a significantly higher acrylamide intake compared to a mixed diet.

Acrylamide is an organic (carbon-containing) compound. It is used in industry as a raw material for plastics (polymers) and pigments. Around two decades ago, it was discovered that acrylamide is also formed from carbohydrate-rich foods at high temperatures, for example during roasting, baking or frying. Particularly high concentrations can be found in potato products such as French fries or crisps, breakfast cereals, bread (especially crispbread) and coffee. Another source is tobacco smoke.

In animal experiments, acrylamide has been shown to be genotoxic, mutagenic and carcinogenic. In contrast, epidemiological studies (population studies) have not yet established a clear link between the intake of the substance and an increased risk of cancer.

A total of 36 mixed food eaters and vegans and 16 strict raw food eaters took part in the BfR study. Raw foodists only eat natural foods and presumably only ingest very small amounts of

acrylamide. In order to estimate the short-term exposure to acrylamide in the body, the excretion of the metabolic product acrylamide mercapturic acid was measured in urine collected over 24 hours. The medium-term exposure over several months was determined by analysing the reaction products of acrylamide with the red blood pigment haemoglobin (adducts).

The fact that the proportion of acrylamide adducts in raw food eaters is 48 % of that of mixed food eaters indicates a considerable “self-production” of acrylamide by the human organism, which has not yet been measured to this extent. What could be the source of this acrylamide if it is not supplied from outside? One possibility is oxidative stress. This produces aggressive, reactive oxygen compounds in the cell. These may favour the formation of acrylamide. Another possibility is the formation by intestinal bacteria. It is also known that other toxic substances such as ethanol (potable alcohol) and nitrosamines can be produced by the body itself. With regard to acrylamide, it will be necessary to discuss what conclusions can be drawn from this internal (endogenous) formation for risk assessment.

### **Vegans ingest more acrylamide than mixed dieters**

The study also found that vegans have a larger acrylamide intake than mixed dieters. The level of acrylamide adducts was found to be around 40 per cent higher in vegans. This is presumably due to a higher average consumption of fried vegetables, meat substitutes made from tofu or seitan and bread. Data from the BfR MEAL study on nutrition in Germany also shows that vegetable crisps, potato pancakes and fried potatoes can contain comparatively high levels of acrylamide.

#### **Further information on acrylamide on the BfR website**

Questions and answers on acrylamide:

[https://www.bfr.bund.de/en/questions\\_and\\_answers\\_about\\_acrylamide-128397.html](https://www.bfr.bund.de/en/questions_and_answers_about_acrylamide-128397.html)

Statement Acrylamide in food:

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

<https://www.bfr.bund.de/cm/349/effects-of-acrylamide-on-humans-not-entirely-clear-yet.pdf>

## About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the Federal Ministry of Food and Agriculture (BMEL) in Germany. It advises the Federal Government and the States ('Laender') on questions of food, chemicals and product safety. The BfR conducts independent research on topics that are closely linked to its assessment tasks.

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