



Acrylamide in foodstuffs

Frying and baking with consequences

Acrylamide was detected in foodstuffs for the first time in 2002. Acrylamide is formed as a by-product of the Maillard reaction in carbohydrate-rich foods such as French fries, chips, crunchy cereal and crispbread during baking, roasting, grilling, frying and broiling. A high content of the amino acid asparagine is needed here as a reaction partner in order to form large amounts of acrylamide. Acrylamide formation begins at temperatures of over 120 °C and increases sharply at 170–180 °C. Because acrylamide has proven carcinogenic in animal tests and is genotoxic, its intake quantities should be kept “as low as reasonably achievable” (ALARA principle).

In 2013, the European Commission published acrylamide reference values for various foodstuffs, to serve as a basis for examinations by companies and government agencies.¹ If the reference values are exceeded, the companies and government agencies should seek ways to reduce contamination by acrylamide.

Foodstuffs companies and other stakeholders were called upon to submit analytical data on the occurrence of acrylamide in foodstuffs and beverages, collected outside the scope of official monitoring from 2010 onward. This information is meant to support the development of risk assessments by the EFSA for this processes contaminant.²

In addition to general information on the subject of acrylamide, FoodDrinkEurope published recommendations for reducing acrylamide levels in five categories of foodstuffs (1. biscuits, crackers, crispbread; 2. bread, bread products; 3. breakfast cereals; 4. potato chips; 5. fried potato products, French fries).³

After a comprehensive evaluation, the European Food Safety Authority (EFSA) in 2015 published a scientific appraisal of acrylamide in foodstuffs; it confirms the earlier assessment that acrylamide in food increases the risk of cancer for all age groups.^{4,5}

Apparently also concluded was that voluntary measures by foodstuffs companies are not sufficient to achieve appropriate reductions in acrylamide content in view of the risks. As a consequence of the EFSA's assessment, the EU commission specified regulatory measures to reduce acrylamide levels in foodstuffs: EU regulation 2017/2158 for establishing minimization measures and reference values for reducing acrylamide levels in foodstuffs. The reference values applicable from 11th April 2018 are listed in the table on the second page (Table 1).



Food	Benchmark level [$\mu\text{g}/\text{kg}$]
• French fries (ready-to-eat)	500
• Potato crisps from fresh potatoes and from potato dough	750
• Potato-based crackers	
• Other potato products from potato dough	
Soft bread	
• Wheat based bread	50
• Soft bread other than wheat based bread	100
Breakfast cereals (excl. porridge)	
• Bran products and whole grain cereals, gun puffed grains	300
• Wheat and rye based products ⁽¹⁾	300
• Maize, oat, spelt, barley and rice based products ⁽¹⁾	150
• Biscuits and wafers	350
• Crackers with the exception of potato based crackers	400
• Crispbread	350
• Ginger bread	800
• Products similar to the other products in this category	300

Table 1: Benchmark levels for acrylamide⁶

Food	Benchmark level [$\mu\text{g}/\text{kg}$]
• Roast coffee	400
• Instant (soluble) coffee	850
Coffee substitutes	
• Coffee substitutes exclusively from cereals	500
• Coffee substitutes from a mixture of cereals and chicory ⁽²⁾	4000
• Coffee substitutes exclusively from chicory	4000
• Baby foods, processed cereal based foods for infants and young children excluding biscuits and rusks ⁽³⁾	40
• Biscuits and rusks for infants and young children ⁽³⁾	150

⁽¹⁾ Non-whole grain and/or non-bran based cereals. The cereal present in the largest quantity determines the category.

⁽²⁾ The benchmark level to be applied to coffee substitutes from a mixture of cereals and chicory takes into account the relative proportion of these ingredients in the final product.

⁽³⁾ As defined in Regulation (EU) No 609/2013.

In the framework of the HACCP concept, it is advisable to deal systematically with the problems posed by endangered products. It may well be possible to achieve significant reductions in acrylamide content through adaptations of baking/frying technology, as well as treatment and/or selection of raw materials. For meaningful risk assessment and planning of measures, however, the effective bandwidth of product-specific acrylamide content must first be known or analytically determined. The LC-MS/MS method used by Labor Veritas AG meets the performance criteria required in EU regulation 2017/2158.

Literature, sources

- ¹ Commission recommendation of 8 November 2013 to examine acrylamide content of foodstuffs (2013/647/EU)
- ² EFSA: Call for acrylamide occurrence data in food and beverages intended for human consumption collected outside official controls, 30.06.2013
- ³ FoodDrinkEurope: Acrylamide pamphlets in 23 languages, 15.01.2014
- ⁴ EFSA: Scientific opinion on acrylamide in food, panel on contaminants in the food chain (CONTAM), EFSA Journal 2015;13(6):4104
- ⁵ EFSA: Acrylamide in food – EFSA explains risk assessment, 04.06.2015
- ⁶ Commission regulation (EU) 2017/2158 of 20 November 2017 for establishing mitigation measures and benchmark levels for the reduction of the presence of acrylamide in food



Contact persons



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