

A “Toolbox” for the Reduction of Acrylamide in Breakfast Cereals

Acrylamide

Acrylamide is a substance that is produced naturally in foods as a result of high-temperature cooking (e.g. baking, grilling and frying). Acrylamide can cause cancer in animals and experts believe it could cause cancer in humans. Although acrylamide has probably been part of our diet since man first started cooking, because of concerns over safety, world experts have recommended that we reduce the levels of acrylamide in foods.

Acrylamide has been found in a wide variety of cooked foods, including those prepared industrially, in catering and at home. It is found in staple foods such as bread and potatoes as well as in other everyday products such as crisps, biscuits and coffee.

The FoodDrinkEurope Acrylamide Toolbox

Following the discovery of acrylamide in food, the industry and other stakeholders, including regulators, took action to investigate how acrylamide is formed and possible methods that can be employed to reduce levels of acrylamide in foods using the ALARA principle. FoodDrinkEurope coordinated the efforts and pooled the results together to produce the Acrylamide Toolbox.

What does the Toolbox do?

- Details existing methods to reduce acrylamide in foods.
- Allows users to assess and evaluate which reduction measures to use.

ALARA

ALARA is an acronym for the concept “*As Low As Reasonably Achievable*”. This simply means that a Food Business Operator (FBO) should take appropriate measures to reduce the presence of a given contaminant in a final product to a minimum: taking account of the risk presented, but also taking account of other legitimate considerations, such as potential risks from other contaminants, organoleptic properties and quality of the final product, and the feasibility and effectiveness of controls.

To ensure continuing compliance with the ALARA concept the FBO should monitor the effectiveness of the implemented measures and should review them as necessary.

What can you do?

- Use this brochure to identify methods that you can use to reduce acrylamide levels.
- Not all methods will apply to your manufacturing needs.

- You will need to examine your production methods, recipes, product quality and national legislation in order to identify the most appropriate “tools”.

Acrylamide in breakfast cereals

This brochure is designed to help manufacturers of breakfast cereals. For more detailed advice contact CEEREAL (European Breakfast Cereals Association) at jess@ceereal.eu

Read the full toolbox at:

<http://www.fooddrinkeurope.eu/publication/fooddrinkeurope-updates-industry-wide-toolbox-to-help-manufacturers-further/>

Methods of formation

- Acrylamide is formed via the reaction of asparagine, which is naturally present in all grains, and reducing sugars such as fructose and glucose.
- Acrylamide is formed at temperatures higher than 120°C. Formation accelerates rapidly as moisture falls below 5%.
- The amount of acrylamide formed depends on
 - Recipe
 - Process time and temperature
 - Toasting conditions
 - Amount of asparagine in the grain

Methods of Reduction for Breakfast Cereals

The vast range of different recipes, grains, ingredients and processes used in breakfast cereal manufacture means there is no single, simple way to reduce acrylamide formation. For example, wheat based cereals generally contain more than rice or maize based cereals, but each grain has its own distinctive nutritional and eating characteristics. Manufacturers are advised to select those “Tools” that are most suitable to the type of product that they are producing and to contact CEEREAL, the EU association for manufacturers of breakfast cereal for more advice (jess@ceereal.eu).



Raw Materials Selection	Recipe Design	Process Design
<p>Free asparagine (Asn) concentration is the critical component for the formation of acrylamide (AA) in cereal products.</p> <p>The sugars composition of cereal grains is not a key determinant.</p> <p>↳ <i>It is impossible currently to source grains with consistently controlled low levels of Asn, due to variation in variety, growing conditions, and climate).</i></p> <p>Agronomy: For wheat grain the importance of maintaining soil sulphur levels must be stressed to farmers.</p> <p>Sulphur-deprived soils have been shown to impact the free Asn concentrations in certain cereal crops considerably.</p> <p>↳ <i>Less sulphur in the soil results in higher Asn levels in the crop and therefore higher risk of AA formation.</i></p>	<p>Minimise the use of reducing sugars particularly in the pressure cook phase for batch process cereals.</p> <p>↳ <i>In general an excess of reducing sugar at this stage creates too dark a cereal.</i></p> <p>Consider inclusions contribution to overall acrylamide levels. If baked pieces resembling biscuits are present, study the toolkit for biscuits. High roasted almonds contain more AA than low roast almonds. Some dried fruit found with higher AA levels e.g. prune, pears.</p> <p>↳ <i>A few mueslis containing baked pieces made with ammonium bicarbonate have been found in some countries.</i></p> <p>↳ <i>Low roast almonds have good appearance but inherently less flavour and fruits provide specific characteristics of the product.</i></p> <p>Consider choice of cereal ingredients.</p> <p>All of the major grains may be used in breakfast cereals and some grains yield more AA than others within a common process. Wheat, barley and oats yield markedly more AA than maize, or rice. Using less whole meal/less bran might reduce AA formation (Asn is more concentrated in the bran).</p> <p>↳ <i>The choice of grain defines the food and therefore it is not possible to simply replace the grain by another grain without changing the whole product and losing the product identity the consumers like.</i></p> <p>↳ <i>Using less whole meal and/or bran, and more endosperm will significantly reduce the product’s nutritional value and change organoleptic properties.</i></p>	<p>Do not over bake or over toast.</p> <p>Baking / toasting at a lower temperature but to the same final moisture content has been effective in lowering AA in some products.</p> <p>↳ <i>Take care not to under-bake the product as this could lead to staling on storage. Capacity may be reduced if one cannot compensate for the lower temperature by other means.</i></p> <p>Manage the toasting for uniform colour of the product; darker pieces are likely to contain most acrylamide.</p> <p>↳ <i>Manufacturers normally seek to avoid “two toning”. Acrylamide (AA) adds another reason to do so.</i></p>