



# **Code of Practice for managing acrylamide formation during the production of bread and bread products\* following the ALARA (as low as reasonably achievable) principle**

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\*relates exclusively to food category 7.1 (bread and rolls)

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### 1. Introduction

The EFSA Scientific Opinion (June 2015) confirms previous evaluations that acrylamide in food potentially increases the risk of developing cancer for consumers in all age groups: <http://www.efsa.europa.eu/en/press/news/150604.htm>

This Code of Practice is directed to small and large bakeries. It raises awareness and introduces practices for reducing the acrylamide formation in line with the ALARA (as low as reasonable achievable) principle.

The European bakers have joined efforts to reduce acrylamide levels from 2002 onwards, when acrylamide was first detected in some foods in Sweden. Together with FoodDrinkEurope, AIBI has developed and revised the Acrylamide toolbox: [http://ec.europa.eu/food/food/chemicalsafety/contaminants/docs/toolbox\\_acrylamide\\_201401\\_en.pdf](http://ec.europa.eu/food/food/chemicalsafety/contaminants/docs/toolbox_acrylamide_201401_en.pdf)

AIBI issued bread brochures listing best practices to minimise the formation of acrylamide. These documents are available in 23 Union languages and Norwegian on the GD SANTE website and AIBI website:

[http://ec.europa.eu/food/food/chemicalsafety/contaminants/acrylamide\\_en.htm](http://ec.europa.eu/food/food/chemicalsafety/contaminants/acrylamide_en.htm)

#### Bread remains the healthy basis of nutrition:

Bread and cereals can be consumed in a safe way at present consumption levels; the diet pattern should not be changed. This is recommended by all nutrition agencies in Europe. <http://www.eufic.org/article/en/expid/food-based-dietary-guidelines-in-europe/>.

### 2. Identifying best practice

It is not possible to reduce acrylamide levels in baked products to zero, but it is possible to prevent too dark coloured baked breads through effective colour tables, which are present in bakery production. The quality control through visual checks suffices.

The use of colour tables in bakeries and bake off shops help to identify bread and bread products baked to too brown colour.

### 3. RECOMMENDED PRACTICES FOR bread and bread products

#### Raw materials

Free asparagine is the key determinant of acrylamide formation in cereal products. Its concentration can vary widely within and between individual cultivars and also depends on specific growing conditions. At present it is not possible to source specific cereals or grains with controlled low levels of asparagine.

## **Product design, processing and heating**

1. Baking bread to a lighter colour endpoint to reduce acrylamide formation must be considered vis-a-vis the individual product design and technical possibilities. A lighter colour of the final product may result in a lower level of acrylamide. Optimisation may rely on the use of a colour table, for example in the final baking stage of bake-off products, to reduce too strong browning or burning of the product.
2. In bread production, an extended yeast fermentation time contributes to acrylamide reduction as yeast metabolises asparagine. Therefore, the possibilities to extend fermentation time in accordance with the product design and the technical possibilities must be considered.
3. Thermal input rather than temperature alone is critical to control acrylamide formation. Therefore, the possibilities to lower thermal input by optimising baking temperature and time must be considered. Solutions may vary depending on the particular product and processing equipment and optimisation can rely on the use of a colour table.
4. Another factor for acrylamide control is the optimization of the specific moisture content of a baked product. This factor has to be given consideration in the setup of the baking process, without compromising quality and food safety standards. This is only relevant for crisp bread.
5. For bread that is to be finished at home, in bake-off areas, retail shops or in catering establishments, appropriate baking instructions shall be provided.
6. The substitution of co-ingredients that have the potential to raise acrylamide levels in the final product must be considered where product design and technical possibilities allow this. Examples are the use of (roasted) nuts and seeds at lower rather than higher temperatures.
7. If used in bread and bread products and where the product design allows, the replacement of fructose with glucose particularly in recipes containing ammonium bicarbonate (E503) must be considered. For example, replacing invert sugar syrup and honey, which contain higher levels of fructose, with glucose syrup.
8. In products with low moisture content such as crisp breads, the use of the enzyme asparaginase to reduce asparagine and mitigate the potential for acrylamide formation must be considered. Its use depends on the possibilities of product design in the individual case and on the legal situation in the member states as enzyme law has not yet been harmonised. The efficacy of asparaginase depends on recipe, ingredients, moisture content and process.

## **4. Monitoring**

1. Every bakery shall have a browning/colour table to analyse bread as end products. Bread baked to a too brown colour shall not be marketed. The working procedure is included in the quality control manual.
2. The relevant browning/colour table will be easily accessible in bakery shops and bake off areas.

3. Bakeries are invited to test their bakery products on acrylamide content and to collaborate with their national associations providing anonymously the data. The results help to indicate the effect of the control measures in keeping acrylamide levels ALARA.
4. To validate the efficiency of the use of browning tables in the monitoring process, color tables show the range of colors of bread and bread products.
5. More European research projects on acrylamide reduction including investigating suitable enzymes and yeasts and monitoring of acrylamide levels shall be funded and promoted at European and national level.

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