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## CAOBISCO Review of Acrylamide Mitigation in Biscuits, Crackers and Crispbread

- The CIAA Toolbox, giving guidelines for acrylamide reduction, was published on the CIAA and Commission websites in January 2006.
- CAOBISCO has launched a Review and Monitoring of CIAA toolbox implementation in the Biscuit, Crackers and Crispbread sector.
- More than 100 approaches on different tools in the toolbox have already been tested. 39 changes were applied to products on the market, even though ONLY 8 of these did not impact in some way or other on product quality.
- CAOBISCO is committed to continuous research on acrylamide and to the promotion and sharing in a non competitive manner of its findings through the updating of the CIAA toolbox and the sharing of best practice with all companies including SMEs and non-member companies.

### BACKGROUND

Since the discovery of acrylamide (AA) in heat-processed foods, the biscuit, cracker and crispbread sector has been actively involved in research to understand the formation of AA and mitigate against its development in our products without adversely affecting consumer acceptability. To this end we have contributed information on AA levels in finished products to the JRC acrylamide database and carried out "in house" tests at bench pilot and industrial scale so as to contribute to the development of the CIAA Toolbox.

The toolbox approach is very important to our sector, since it is clear that no single strategy will be appropriate for the entire range of products given the diversity of ingredients, processing and baking conditions needed to assure each its identity, quality and consumer preference. CAOBISCO has shared the CIAA toolbox, throughout its development, with its members, ensuring the information is available to the SME's as well as the larger manufacturers.

### CURRENT ACTIVITIES: CAOBISCO Review and Monitoring of the implementation of CIAA TOOLBOX

In December 2005, CAOBISCO initiated an Acrylamide Research Project, to create a non-competitive mechanism for biscuit, cracker and crispbread manufacturers to both share their experiences of application of the CIAA Acrylamide Toolbox, and to update the Toolbox with new information reflecting real operational experiences.

Large Manufacturers and Member associations responded to a questionnaire designed to gather information on the mitigation strategies tested, implemented and under consideration whilst maintaining contributor confidentiality. Due to the wide variety of products involved, results were categorised and recorded separately for "short dough sweet biscuits", "hard dough sweet biscuits", "crackers", "crispbread", "gingerbread" and "wafer". Approaches related to the tools in the agronomy, recipe, process and specification compartments of the CIAA toolbox have been investigated. Each 'Approach' may represent a series of trials on a dough type, starting with model systems, experimenting with bench scale formulations and

processing, continuing to pilot plant and then commercial processing, each step supported by analytical, physical and sensory measurements, concluding with market research for major brands.

## RESULTS OF CAOBISCO REVIEW

Responses confirmed that even with this investment in development, in many cases an approach was only effective for a specific product and/or market, the changes made were often detrimental to product quality and consumer acceptability and could not be applied across a range of products.

**105** approaches have been investigated. **39** changes have already been applied to products on the market, even though only **8** could be implemented without any alteration of the product quality.

For the majority of products companies report that even with significant changes to recipes and/or processes only modest reductions in acrylamide were achieved, and often at the expense of quality. Some effective approaches have been avoided, or are used sparingly, because they are in direct conflict with health targets such as salt reduction, and use of wholegrains. The approaches tested and the successes/limitations in commercial implementation are summarised in the **annex hereafter**.

## FUTURE ACTIVITIES: PROMOTION OF CAOBISCO FINDINGS

Further details of the approaches tried and their impact on AA levels and product quality are included in a comprehensive report. This document will be an important source of information for manufacturers seeking to prioritise the approaches to be tested on particular products, providing details on where an approach has been successful as well the potential pitfalls. CAOBISCO will endeavour to ensure this information is made widely available not only through its membership but via the CIAA toolbox and other routes (leaflets including an HACCP approach), so that the sector can continue to make its contribution towards reducing the acrylamide concentrations in our food whilst ensuring consumers have access to the diversity of high quality products that our industry is renowned for.

### **ANNEX: APPROACHES TESTED AND IMPLEMENTED FROM THE CIAA TOOLBOX**

- **Ammonium bicarbonate replacement:** 9 out of 17 approaches implemented in biscuits, gingerbread and wafer: despite changes to flavour, colour, texture and dimensions. Sodium salts were added in 7 approaches, potassium salts in 2.
- **Fructose replacement:** 7 out of 15 approaches implemented in sweet biscuits containing ammonium bicarbonate: fructose replacement by glucose retained original quality in most products.
- **Colour/moisture specification change :** 9 out of 12 approaches implemented in biscuits, crispbread and wafer: crispbread moisture specification increase, change in colour specification of biscuits and wafer. In some crispbreads, where the product is traditionally very crisp and dry, it has been possible to increase the moisture specification without quality loss, and in gingerbread, spraying water post bake has also had benefit. In biscuits and crackers, moisture specifications are set to prevent checking (hairline fractures caused by moisture imbalance) and loss of shelf life, so improved oven profiles were required to achieve moisture specification with less colour development
- **Substitution with low free asparagine (ASN) cereals:** 5 out of 7 flour approaches implemented: partial/ full replacement of wholemeal flour by high extraction flour in cracker and crispbread, partial substitution of wheat flour by rice flour in short sweet biscuits. Finding cereal grain sources with low ASN has not succeeded, except for one product where seasonal variation has caused a large reduction in free ASN levels of rye, but no conclusive evidence of benefit as yet.

- **Asparaginase:** Promising trials are reported in biscuits and crispbread. Awaiting legal mandate for food use to evaluate further.
- **Oven optimization:** 3 out of 14 trials implemented; crispbread most successful, sweet biscuits disappointing. Oven profile changes useful in enabling less colour with same final moisture.
- **Innovative processing:** No success reported so far, but studies continue.
- **Amino acids (glycine):** Glycine has an impact on flavour and colour which limits use. Other amino acids have not been effective.