

HEATOX project completed – brings new pieces to the Acrylamide Puzzle

- **Increasing toxicological evidence suggests that acrylamide in food might be a cancer risk factor.**
- **There are ways to decrease exposure to acrylamide, but not to eliminate it.**
- **Sufficient analytical methods to detect acrylamide in relevant foods are now available.**
- **Acrylamide is not the only risk factor in cooked foods.**

These are conclusions of the European research project HEATOX.

Acrylamide formation in heated food became a totally new research field, when its presence in various foods was revealed in 2002. The EU Commission reacted swiftly and in DG Research Framework Programme 6 (FP6) a strategic targeted research project, HEATOX, was established. The three-year project included 24 partners from 14 countries, mostly universities and research institutes, but also authorities and a European consumer organisation.

When the project started in November 2003, little was known about the formation of acrylamide in cooked foods. Since then, there has been a tremendous global effort among industry and researchers, with a unique cooperation across national borders, interests and company competition. HEATOX has been an ardent participant in this interaction. For instance HEATOX had an external panel with members from authorities, industry, consumers and researchers, and its website collected scientific articles from all stakeholders.

Identified risk

- The HEATOX risk characterization concludes that the evidence of acrylamide posing a cancer risk for humans has been strengthened.
- Experiments have improved the scientific basis for estimating the health risk of low acrylamide doses for humans from high dose animal tests.
- Acrylamide levels in bread and potatoes have been reduced in laboratory experiments. Thus, human exposure can potentially be decreased.
- Food frequency questionnaires, as used in epidemiological studies, often give an imprecise measure of actual acrylamide exposure. The best way to estimate dietary exposure is the analysis of biomarkers in blood or urine.
- Acrylamide is not the only genotoxic compound formed when heating food. Furan, HMF and other compounds have been investigated. A database of more than 800 heat-induced compounds, of which around 50 have been highlighted as potential carcinogens based on their chemical structure, has been compiled to aid future research.

Managing the risk

Food industry

A large proportion of acrylamide intake comes from industrially-prepared food. Mitigation methods can be efficient, since raw materials and production processes are well controlled.

HEATOX has been a contributor to the European food industry's approach to minimize acrylamide formation – called the CIAA Toolbox.

- Formation factors in potatoes have been elucidated, illustrating the importance of raw material selection, additives, and processing, e.g. blanching and vacuum frying.
- The importance of heat transfer and oil/potato ratio in semi-industrial fryers has been investigated.
- Acrylamide formation in bread can be minimized by long yeast fermentation. New baking technologies have been evaluated.
- The influence of raw material and baking conditions on acrylamide levels in bread has been shown.

Research on mitigation methods need to be continued and the applicability in real food production need to be tested by industries. HEATOX scientists have calculated that successful application of all presently known methods would reduce the acrylamide intake by 40 % at the very most.

Home cooking

HEATOX has estimated that the acrylamide contribution from home-cooked food is in general relatively small, when compared with industrially or restaurant-prepared foods. However, high intake risk groups might exist. Furthermore, minimising acrylamide formation in home cooking is a national challenge, since cooking and eating habits vary considerably between countries. General advice, resulting from this project, is to avoid overcooking when baking, frying or toasting carbohydrate rich foods.

Consumption

By following the general dietary recommendations (i.e. a balanced diet without excessive fat or calorie intake) a further reduction of the acrylamide intake can be achieved. Consumers should also avoid eating overcooked baked/fried food.

Other outputs of HEATOX

The HEATOX multidisciplinary approach of chemists, toxicologists and food scientists has resulted in intake calculations, chemical reaction models, exposure assessment, *in vivo* and *in vitro* toxicity testing, mitigation proposals to reduce intake, establishing analytical methods for biomarkers and levels in food items and a final risk characterization. More than 20 PhD students have been involved and given opportunity to create a European network. More than 40 individual research papers have been published in international scientific journals by HEATOX scientists.

Links

For HEATOX partners, results in summary and more, look at The Final Leaflet and deliverables at <http://www.heatox.org>

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