HEATOX Report Summary

Project ID: 506820
Funded under: FP6-FOOD
Country: Sweden

Final Report Summary - HEATOX (Heat-generated food toxicants, identification, characterisation and risk minimisation)

Heating food offers many advantages: it adds colour, flavour and aroma, and minimises harmful germs. However, various hazardous compounds may form during the process.

The HEATOX project focused on health risks associated with these compounds and aimed to identify innovative heating and cooking methods to minimise their formation, thereby providing safe, nutritious and high-quality foodstuffs. Moreover, recommendations for minimising the amount of heat-generated toxicants in foods, while ensuring product quality from a nutritional and sensory point of view, were provided to consumers, restaurants and the food industry.

More specifically, the project objectives were to:

1. elucidate the involved chemical reaction mechanisms, and develop and validate innovative or improved production methods and technological minimisation strategies;
2. provide validated analytical (i.e. screening and confirmatory) methods and quality controlled detailed data;
3. perform hazard characterisation;
4. evaluate the exposure of heat-induced toxicants;
5. provide extensive risk assessment and communicate the project findings.

The project was structured in six distinct, yet interrelated, work packages (WPs). Particular emphasis was placed on acrylamide, with the experimental effort focusing on reducing its exposure without increasing the formation of other hazardous compounds. It was highlighted, though, that acrylamide was not the sole problem associated with food heating, since 52 other compounds were also suspected to increase health hazards.

Validated methods for food analysis and exposure biomarkers were also developed. Potato was extensively analysed, in the forms of raw vegetable, French fries and chips. Both domestic and industrial frying methods were studied. A similar approach was implemented for baby foods, bread and baking processes. A database for numerous heat-induced toxicants was designed based on the findings of these analyses.

Different hazards were explored and characterised in various toxicological models: genotoxicity, carcinogenicity, neurodevelopmental and reproductive toxicity. Molecular characterisation on experimental animal and human cell systems was performed using toxicogenomics. The exposure assessment via Monte Carlo simulations was combined with hazards data to provide risk characterisation of intake of heat-treated carbohydrate-rich foods.

In addition, a risk communication strategy and a tailored action plan were successfully developed and implemented throughout the project. Training on probabilistic modelling of exposure to acrylamide was organised for the European Food Safety Authority (EFSA) as well as for national organisations. Moreover, the exchange of young scientists was strongly encouraged. Dissemination was achieved through various activities such as publications, participation in conferences and
organisation of the HEATOX workshops.

**Related information**

<table>
<thead>
<tr>
<th>Result In Brief</th>
<th>Turning up the heat on food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documents and Publications</td>
<td>Final Report - HEATOX (Heat-generated food toxicants, identification, characterisation and risk minimisation)</td>
</tr>
</tbody>
</table>

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**Subjects**

Food - Medicine and Health

**Last updated on** 2011-04-14  
**Retrieved on** 2018-11-16

**Permalink:** https://cordis.europa.eu/result/rcn/51664_en.html  
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