Editorial

Physiological Effects of Thermally Treated Foods

The objective of this COST Action 927, *Health Implications of Thermally Processed Foods,* chaired by Professor Vincenzo Fogliano from the University of Naples Federico II, Italy, is to improve the nutritional quality and safety of heat-processed foods, taking into consideration consumers' needs and preferences.

One of the key tasks for COST 927 is to gain basic knowledge about the formation of beneficial and harmful compounds formed during the heat treatment of various foods. Analytical protocols for the chemical characterisation and quantitation of novel markers of thermal treatment will be developed. The health effects of compounds formed during the heat treatment of foods will be investigated in *in vitro* studies, in animal feeding experiments as well as in controlled human trials and epidemiological studies on large populations.

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After the health effects of the chemically characterised markers of heat treatment have been proven, the processing conditions of the respective food items will be optimised in order to lower the content of harmful compounds and to increase the amounts of beneficial ingredients.

Finally, suggestions will be given to the EC food regulatory authorities to improve the safety and traceability of thermally treated foods.

The scientific activities carried out in the frame of this COST action are divided into the following five working groups (WG), each of them chaired by a European expert in the respective field:

WG 1: Analytical methods, formation pathways and EU regulation (WG leader: Dr. F. J. Morales, Instituto del Frío, Madrid / Spain)

WG 2: Biological methods, risk assessment, consumer perception (WG leader: Dr. S. Salvini, CSPO – Scientific Institute of Tuscany / Italy)

WG 3: Process optimisation and new developments (WG leader: Dr. E. Shimoni, Technion – Israel Institute of Technology / Israel)

WG4: Absorption and physiological effects (WG leader: Prof. K. H. Wagner, University of Vienna / Austria)

WG5: *In vitro* transformations and maintaining health (WG leader: Dr. K. Sebeková, Slovak Medical University Institute of Preventive and Clinical Medicine / Slovakia)

From these activities, a much clearer understanding of the chemical nature and the risks and benefits to health of heat-induced compounds in various foods is expected.

The main topics addressed in the present issue of Molecular Nutrition & Food Research are the formation of Maillard reaction products in foods and their biological effects. One of the most discussed Maillard reaction products formed in heat treated foods is acrylamide. This issue reports on its formation in potatoes prepared using different household cooking techniques, and on empirical models suitable to predict its formation in fried potato products.

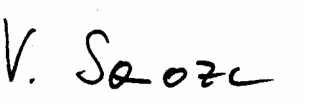
Another class of Maillard reaction products, generated when meat is cooked, are heterocyclic aromatic amines. These pyrolysis products of amino acids are assumed to be involved in the aetiology of colon cancer. One study reported here provides a novel perspective on the potential of lactic acid bacteria to detoxify these harmful compounds by covalent binding. Another pathway of detoxification might be the inhibition of sulfotransferase 1A1, which plays a key role in the activation of 2-amino-1-methyl-6-phenylimidazo-[4,5-b]pyridine (PhIP). Potent inhibitors of this enzyme are present in, for example, Brussels sprouts which are reported to reduce PhIP-initiated DNA damage in human lymphocytes.

The structural analogues of food-borne Maillard reaction products formed in the human body are named "Advanced Glycation End Products" (AGEs). These compounds are hypothesized to be associated with progression of various diseases, such as diabetes mellitus or chronic inflammation. The results presented in this context mostly indicated harmful effects when high doses of MRPs or AGEs were used in *in vitro* assays or administered in human trials. In this issue, glycated proteins containing high levels of AGEs were

demonstrated to be unable to activate pro-inflammatory signalling pathways in lung epithelial cells. This result is in contrast to most of the findings reported so far and clearly indicates the need for more structure-based research in this area. However, another contribution to this special issue reports that AGE-induced 'carbonyl stress' can be prevented by vitamin B.

Next to harmful Maillard reaction products formed in heat-treated foods, we also know that beneficial compounds, such as antioxidants, are generated at the same time. Although very few active structures have been identified, ongoing research is focussed on the antioxidant, antibacterial and anti-mutagenic activity of different molecular weight fractions isolated from severely heat-treated foods such as cocoa and coffee.

In summary, all of these contributions only cover a very small part of the research which still needs to be done. But with the interdisciplinary European approach of COST Action 927, an excellent scientific basis is provided to improve the quality and safety of thermally treated foods.



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