

# Editorial



## The Maillard reaction in food and medicine: Current status and future aspects

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, was to improve the nutritional quality and safety of heat-processed foods, considering as well the consumer's needs and preferences.

From January 2004 until April 2009, a total of 28 European countries joined this Action to exchange and discuss their latest news in ten workshops and three meetings of the International Maillard Reaction Society (<http://imars.case.edu/>).

Fifty-seven young scientists completed Short-Term Scientific Missions (STSMs) that allowed them to study at another institution or laboratory in another COST country. Overall, this COST Action 927 supported scientists from all over Europe, and even the USA and Australia, working in the field of the Maillard reaction in their networking activities to contribute to the knowledge on the formation of Maillard reaction products in foods, as well as in living organisms, and their biological implications.

Analytical protocols for the chemical characterisation and quantification of novel and already known compounds generated upon thermal treatment have been developed and the health effects of these compounds were studied *in vitro* and *in vivo*.

The main topics addressed in this issue of *Molecular Nutrition & Food Research* are first novel analytical techniques for the evaluation of heat-treated dairy foods and for quantification of heterocyclic amines in

plasma and urine. The second part of this special issue is focused on two putatively harmful compounds found in heat-treated foods: furanes and acrylamide (AA). Scientists from the University of Stockholm first described the formation of AA in heated, protein- and carbohydrate-rich foods in 2002 [1]. Since high dietary AA intake has been demonstrated to cause neurotoxic effects, initiate several types of cancers and exhibit a genotoxic potential, AA mitigation in thermally processed foods is one of the key targets food companies are trying to meet worldwide [2].

However, health implications of AA ingested with a mixed diet are still controversially discussed. From a recently published study that included more than 120 000 men and women, Dutch researchers reported

that they found no association between lung cancer and AA exposure in men and an unexpected 18% lower risk in women for a 10- $\mu$ m/day average intake of AA [3]. On the following pages, results from colleagues who joined the COST 927 Action on the formation and mitigation of AA in different model systems and biscuits are presented. Also, the effect of sulforaphane, a well-known chemopreventive component in e.g.

broccoli, on glutathione S-transferase-dependent detoxification of AA in Caco-2 cells is demonstrated. Last but not least, one contribution is focused on the effect of dietary Maillard reaction products on iron bioavailability in male adolescents.

Although all these contributions cover only a very small part of the research, which still needs to be done to fully elucidate the key question whether the dietary intake of Maillard reaction products poses a health risk to humans, with the interdisciplinary European approach of COST Action 927 an excellent scientific basis has been provided to improve the quality and safety of thermally treated foods.

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## References

- [1] Tareke, E., Rydberg, P., Karlsson, P., Eriksson, M., Törnqvist, M., Analysis of acrylamide, a carcinogen formed in heated food-stuffs. *J. Agric. Food Chem.* 2002, 50, 4998–5006.
- [2] Seal, C. J., de Mul, A., Eisenbrand, G., Haverkort, A. J. *et al.* Risk-benefit considerations of mitigation measures on acrylamide content of foods – a case study on potatoes, cereals and coffee. *Br. J. Nutr.* 2008, 2, S1–S46.
- [3] Hogervorst, J. G. F., Schouten, L. J., Konings, E. J. M., Goldbohm, R. A., van den Brandt, P. A., Lung cancer risk in relation to dietary acrylamide intake. *J. Nat. Cancer Inst.* 2009, 1, 651–662.



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The funds provided by COST – less than 1% of the total value of the projects – support the COST cooperation networks (COST Actions) through which, with EUR 30 million per year, more than 30 000 European scientists are involved in research having a total value, which exceeds EUR 2 billion per year. This is the financial worth of the European added value, which COST achieves.

A “bottom up approach” (the initiative of launching a COST Action comes from the European scientists themselves), “à la carte participation” (only countries interested in the Action participate), “equality of access” (participation is open also to the scientific communities of countries not belonging to the European Union) and “flexible structure” (easy implementation and light management of the research initiatives) are the main characteristics of COST.

As precursor of advanced multidisciplinary research COST has a very important role for the realization of the European Research Area (ERA) anticipating and complementing the activities of the Framework Programmes, constituting a “bridge” towards the scientific communities of emerging countries, increasing the mobility of researchers across Europe and fostering the establishment of “Networks of Excellence” in many key scientific domains such as Biomedicine and Molecular Biosciences; Food and Agriculture; Forests, their Products and Services; Materials, Physical and Nanosciences; Chemistry and Molecular Sciences and Technologies; Earth System Science and Environmental Management; Information and Communication Technologies; Transport and Urban Development; Individuals, Societies, Cultures and Health. It covers basic and more applied research and also addresses issues of pre-normative nature or of societal importance.

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