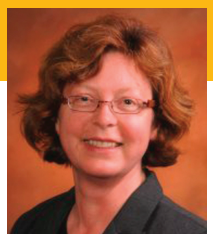
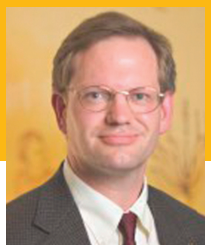
Editorial





Acrolein

This special issue of *Molecular Nutrition and Food Research* is dedicated to acrolein (2-propenal), a constituent of many foods that has poorly understood long-term effects on human health. It is therefore not a surprise that the number of publications on acrolein has steadily increased from 61 publications per year in 2000 to 197 in 2010 (source: http://gopubmed.org/). Acrolein is primarily formed from carbohydrates, lipids and certain amino acids in foods by heat treatment. Besides intake of acrolein via the diet, humans are exposed to acrolein through inhalation of vapors emitted from heated cooking oils, cigarette smoke and inhalation of combustion products of fossil fuels. Finally, acrolein is formed endogenously as a product of polyamine metabolism and oxidative stress. The adverse effects of acrolein on human health originate from its capability to form Michael-type adducts with cysteine, lysine and histidine residues in proteins and with amine groups in DNA bases. These and other aspects are covered in this special issue by nine reviews and three research articles.

Abraham et al. (this issue) provide an overview of the metabolism of acrolein, its toxicity and carcinogenicity and its occurrence in various foods and beverages. They conclude that exposure to acrolein via the diet probably does not pose immediate health risks, but, at the same time, point out that a risk assessment is difficult to make due to technical difficulties with measuring acrolein levels in foods. An accurate risk assessment is further complicated by lack of knowledge regarding the immediate and especially the long-term consequences of acrolein's ability to interfere with many metabolic pathways and (redox-sensitive) signaling networks. The contributions by Bein and Leikauf, Conklin et al., Fabisiak et al. and by Myers et al. provide a wealth of new information with respect to the effects of acrolein on gene regulation.

Other contributions emphasize the chemical diversity of the cellular damage exerted by acrolein and the molecular consequences of acrolein exposure in cultured cells, laboratory animals and humans. Knowing how and to what extent acrolein modifies DNA and proteins is necessary for elucidating the mechanisms by which acrolein causes cellular dysfunction. The mechanisms of acrolein-related toxicity that affect the nervous system (spinal cord trauma), the brain and the lung are discussed in this issue by experts in the field. Also discussed are strategies aimed at mitigating the deleterious effects of acrolein by using acrolein scavengers such as flavonoids and other (dietary) phytochemicals, vitamins, neutraceuticals and pharmaceuticals.

Progress in understanding acrolein's impact on health would not have been possible without the advent of new analytical technologies. Recent analytical breakthroughs include the development of acrolein-specific immunochemical techniques and microarray technologies for assessing acrolein toxicity. Substantial progress has been achieved in assessing acrolein exposure at the molecular level in vivo. Modern mass spectrometry-based techniques enable the analysis of acrolein-mediated DNA damage (reviewed by Chen in this issue) and the analysis of acrolein adducts in mitochondrial proteomes (Wu et al.).

"… an overview of the astounding progress that has been made in unraveling the multifaceted effects of acrolein on biological systems and human health…"

This special issue on acrolein offers an overview of the astounding progress that has been made in unraveling the multifaceted effects of acrolein on biological systems and human health. Despite the advances made in understanding the biological consequences of acute acrolein exposure, many questions remain unanswered regarding the health impact of chronic acrolein exposure via the diet and the environment. We agree with the

contributors of this issue that further progress in this area requires the development of methods for reliable quantification of acrolein in foods and beverages as well as methods for probing the interaction of acrolein with its biological environment.

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We are grateful to the Editor-in-Chief for providing us the opportunity to invite distinguished authors to contribute to this issue, to the reviewers for their invaluable comments and to the Editorial Office for tireless support in smoothing the path towards completion of this special issue.

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