

CHEMICAL FOOD SAFETY AND HEALTH – PUBLIC HEALTH IN THE 21ST CENTURY*Chemical Food Safety and Health*

Pedreschi Plasencia, F. – Ciesarová, Z. (Editor)
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“The best way to prevent foodborne illness is to prevent contaminants from getting into food. Prevention is therefore the principal focus of all safety quality systems”. This is the leading idea, highlighted by Maria Angélica Fellenberg in the introduction section of the book “*Chemical Food Safety and Health*“, edited by Franco Pedreschi Plasencia (Chile) and Zuzana Ciesarová (Slovakia), which was published in 2013. The book is included in the Food Science and Technology Series from Nova Science Publishers, New York and, in 218 pages, divided into 10 chapters, puts into context food contaminants, from their mechanisms of formation and forms of mitigation, to the ways to improve food safety and preserve consumers’ health.

The two first chapters of the book are devoted to acrylamide, a hazardous contaminant that can be formed during the thermal processing of foods. The description of the potential sources of acrylamide and the estimation of its exposure in human diet explain why there is a European concern about acrylamide occurrence in foods. A high number of patented solutions for its mitigation are presented and their impact on the sensorial quality of the foods is discussed. A transversal approach taking into account the available technology and the food matrix composition is presented as a compromise for food acceptance and safety.

At high temperatures, to which foods are exposed, a class of compounds that should be controlled may also be formed: 5-hydroxymethyl-furfural and furfuryl alcohol. These compounds are derived from sugars, formed especially in acidic environments and at low water activity. Their formation, activation by sulphotransferases forming health risk compounds, exposure and analysis are discussed in Chapter 3.

The presence and persistence of pesticides in the food chain is presented in Chapter 4, with emphasis on the studies published in the 21st century. The types of insecticides, herbicides, fungicides, and nematocides and their toxicity when present in foods from animal, vegetal and cereal origins are discussed. The chapter ends with a question about the future, where biopesticides may be part of the solution.

Polyphenols and selenium as food antioxidants and health promoters are the objects of discussion in Chapters 5 and 6, respectively. The polyphenols have been associated in the last years with the prevention of the oxidative damage of cells. A description of the antioxidants available in foods, the mechanism of action of polyphenols, and their application in meat products are presented in Chapter 5. The action of selenium, which is dependent on its oxidation state and form of incorporation into the organic molecules, has been associated with chemoprotection, namely, the selenomethylselenocysteine derivatives. The selenium metabolism and its

implication in human health are presented. Also, its use as nutritional biomarker is proposed due to its relation to the plasma protein profile.

The effect of food microstructure on nutrient bioavailability and health is presented in Chapter 7. The definitions of bioavailability and bioaccessibility and methods for their determination are presented and discussed. Also, this chapter shows the effect of food microstructure on nutrient bioavailability and the relevance of its modification by food processing, giving examples of the nutritional availability affected by the microstructure on examples of carotenoids, lycopene, folates, polyphenols and starch. Microencapsulation strategies designed to improve the nutrient delivery and the activity of food allergens dependent on the foods microstructure are also presented and discussed.

The importance for food safety of the shelf-life calculation and temperature-time indicators are presented in Chapter 8. This chapter emphasizes the quality degradation in foods caused by microbial growth and the modulation of its effect connected to the kinetics of quality loss. The application of temperature-time indicators is proposed as a dynamic, simple method and integrated approach to evaluate the shelf-life of foods.

The last two chapters of the Chemical Food Safety and Health book exemplify strategies to extend the shelf-life of food by controlling the glass transition temperature of the matrices (Chapter 9) or by developing chitosan films with antioxidant and antimicrobial properties as active packaging (Chapter 10). Chapter 9 starts with the definitions of water activity and glass transition temperature and explains the parameters that can influence these characteristics. The relevance of the glassy state on food stability is discussed concerning the effects of foods viscosity on diffusion of bioactive compounds, the theoretical aspects of crystallization and melting, the texture of the matrix and the oxidation process of lipids and phenolic compounds, the non-enzymatic browning and the microbial stability. These concepts are applied to the encapsulation and to the stability of the food systems. Concerning the active packaging, plant volatiles and extracts are proposed as antimicrobial agents for food packaging. Antimicrobial food packaging systems production and the controlled release of bioactive compounds, with emphasis on chitosan-based materials, are discussed.

Overall, this book comprehensively compiles information concerning the chemical food safety and health that allows the reader to understand the risks, the causes of contamination, and the available mechanisms to overcome the problems and provide solutions for the improvement of the chemical food safety, as well as the generalized promotion of healthier foods for all consumers in the 21st century.

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