

# Preface

The purpose of this book is to provide a comprehensive resource on what is known and what we need to know about toxicants present in food packaging materials and household plastics. This includes identifying human exposure scenarios for consumers, summarizing relevant known and emerging health effects, and recommending additional research needed to address data gaps that will allow for improved risk assessment for human populations. This book is meant to be a resource across disciplines and should be useful to toxicologists, environmental health scientists, food scientists, and regulators in the areas of food safety and environmental health sciences.

This book is unique in several ways:

**Format:** Each chapter starts with a bulleted list of **Key Take Home Points** and ends with a section on research needed to address data gaps.

**Breadth:** The toxicants included in the book range from more widely known chemicals such as bisphenol A (Chap. 1), various phthalates (Chap. 2), brominated flame retardants (Chap. 3), perfluorinated compounds (Chap. 7), and the heavy metals lead (Chap. 9), and cadmium (Chap. 10), to chemicals that are just starting to emerge as potential toxicants from food packaging and household plastics, as well as chemicals that will be entering use in the food packaging industry. This includes the alkylphenols nonylphenol and octylphenol that have been identified in food packaging and foodstuff (Chap. 5), chemicals used in UV-cured print inks (benzophenone and 4-methylbenzophenone) that can migrate through porous printed cartonboard and most secondary packaging to foods (Chap. 6), the metal antimony used as a catalyst in the manufacturing of PET-single-use beverage bottles (Chap. 8), methylnaphthalene detected in breakfast cereal box liners (Chap. 10), and nanoparticles (Chap. 4) that will be used in polymer food packaging in future and present emerging toxicological concerns. Several chapters also provide information on the challenges of the use of replacement chemicals, especially for the phthalates (Chap. 2), and the Brominated flame retardant (BFR) (Chap. 3).

**International Focus on Exposure:** Authors have been encouraged, whenever possible, to include international data on chemical exposure. This includes identification of data gaps where information on a chemical's level in products or biomonitoring data may be limited to one or only a few geographic locations. This is especially important because of the global nature of our food supply and household consumer goods.

**Inclusion of Emerging Toxicological Endpoints:** Chapters that include Health Effects sections for chemicals have drawn on studies with a wide range of relevant toxicological endpoints, including not only traditional cancer and reproductive endpoints, but when appropriate, emerging research on endocrine disruption, cardiovascular disease, diabetes and obesity, immune function, neurological function and behavior, and transgenerational effects.

**Regulatory Approaches and Challenges in the United States and Europe:** One of the most unique aspects of this book is the inclusion of information to educate the reader on current approaches and practices used to monitor and evaluate the risk of chemicals that are present as intentional or unintentional substances in food processing and packaging (food contact materials). An overview of the use and functions of food packaging is presented in Chap. 4, Sect. 4.3, and a summary the U.S. Food and Drug Administration's (FDA) approach to address the migration of substances from food contact materials is presented in Sect. 4.5. The final chapter of this book (Chap. 11) provides an overview of several areas, including the use, safety, and exposure to chemicals used in food contact materials, and a comparison of current regulations and risk assessment approaches used by agencies in the U.S. and Europe. Current challenges faced in evaluating chemical risk arising from use of food contact materials are highlighted, including interpreting low-dose effects (non-monotonic dose responses), mixture effects, developmental origins of disease, and transgenerational effects.

**New Approaches:** This book focuses on a small number of the chemicals used in food packaging and in the manufacturing of household plastics. For thousands of other chemicals, we lack basic toxicological risk information. Realistically, new approaches will be needed, including high-throughput screening, to better identify and assess the toxicological risk of chemicals that are present in household plastics and food packaging materials. Some of these approaches are outlined in Chap. 11, Sect. 11.5.6.

In closing, I would like to thank all the contributing authors for their most precious resource, their time, in developing the concepts and content of their chapters. Their efforts have been outstanding. I thank them for developing carefully thought out and researched chapters that truly make a significant contribution to our understanding of exposure and health risks of toxicants associated with food packaging and household plastics, how they are regulated, and the new avenues that need to be pursued to address what we still need to know about exposure and health effects in human populations.

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Exposure and Health Risks to Consumers

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