

Beverage Quality and Safety

Edited by
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and
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*INSTITUTE OF
FOOD TECHNOLOGISTS*



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Foreword

As an industry professional, I have always found the Institute of Food Technologists (IFT) to be a valuable educational resource. This book is a result of a workshop entitled Emerging Beverage Technology, in which many of my colleagues presented on a variety of topics. As I look back on what was “emerging” then, I see how these issues have surfaced for beverage manufacturers. Both basic and cutting-edge issues are addressed in this book. This publication covers the basics of plant sanitation, as presented by Martha Hudak-Roos and Bruce Ferree. It goes into depth on Good Agricultural Practices to ensure safe juice, as discussed by Richard Stier and Nancy Nagle. Donald Kautter, who helped develop the Food and Drug Administration’s Juice Hazard Analysis and Critical Control Point (HACCP) regulation, speaks directly to the final rule. Emerging issues, such as the roles of genetically modified organisms (GMOs), nutraceuticals, and alternative technologies, are presented by Susan Harlander, Dennis Gordon, Kiyoko Kubomura, and Purnendu Vasavada, respectively.

In order to stay competitive, manufacturers must forever improve their technology, products, and processes. It is not enough to maintain the status quo, or your competitor will suddenly overtake you. Beyond competition, there are always new food safety concerns in the beverage world and new technologies to be explored. As much as consumers want a new and exciting beverage, they never want to worry about its safety. In the quest to satisfy consumers’ thirst for new and interesting beverages, technology is key. Academia, industry, and scientific organizations will need to continue to work together to meet consumer expectations. New beverage technology and the opportunity it presents are expanding. The role of innovation will continue to drive the juice and beverage markets and in the end drive consumer loyalty. This publication is only one step in the ongoing process of continuous improvement.

Linda Frelka
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Foreword

Beverage Quality and Safety is based on information presented in a program held at the Annual Meeting of the Institute of Food Technologists (IFT). It is compiled from the extensive knowledge of a team of experienced food industry experts, whose expertise is based on many years of direct involvement with the food and beverage industries. Their qualifications are described elsewhere, but their collective dedication in sharing their knowledge with others in the industry has made it possible for the Institute of Food Technologists' Continuing Education Committee not only to present the information provided for this book to readers everywhere, but also to present it as oral educational programs to IFT members and nonmembers. IFT is dedicated to providing the latest technical information relating to food processing, and its Professional Development Department coordinates this effort throughout the year. Topics selected by IFT for presentation and publication are peer reviewed for maximum interest by different segments of the food industry.

The beverage market continues to grow, despite recent setbacks in the world economy. New technology in processing and packaging continues to please consumers with the introduction of new beverage products. We hope this book will act as a reference for researchers, processors, marketers, and consumers. IFT sincerely thanks all of the contributors, and especially the editors, Tammy Foster and Purnendu Vasavada, for their expertise and effort.

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Preface

The fruit juice, soft drink, and beverage industry has experienced rapid growth in recent years. While traditional drinks and beverages have maintained consumer interest, new, innovative, value-added products, including exotic juice and beverage blends, energy drinks, sports drinks, ready-to-drink teas and coffees, bottled water, and beverages containing nutraceuticals, botanicals, and herbal ingredients have generated much excitement in the beverage sector. The global market for functional foods, estimated to be over \$35 billion, is expected to reach 5% of the total world food expenditure in the near future. Beverages constituted a significant proportion (33 to 73%) of various health-promoting new products or product lines introduced in the U.S. in 2000. According to a recent industry report, the U.S. functional beverage market generated revenues of \$4.7 billion in 2000 and is predicted to exceed \$12 billion by 2007. Another industry report indicated that refrigerated juices, nectars, juice blends, cocktail drinks, and refrigerated teas generated over \$3.5 billion and \$105 million, respectively, in sales in 2002.

In recognition of the significance of the juice and beverage sector in the food industry, the Institute of Food Technologists (IFT) developed and offered a short course, Beverage Technologies and Regulatory Outlook, as a part of the IFT Continuing Education Program prior to the IFT annual meeting in 2001. The short course was designed to offer information on the latest beverage industry trends and developments relating to products, processing, and packaging technologies and to provide an update on regulatory issues such as federal Hazard Analysis and Critical Control Point (HACCP) regulations and Codex Alimentarius Commission activities related to fruit juice. From discussions with the IFT Continuing Education Committee (IFT-CEC) and industry colleagues, it was felt that a publication providing discussion of the industry and regulatory trends as well as the quality and safety of fruit juice and beverages would be useful. This book contains chapters based on many of the presentations at the short course. It is not intended as a comprehensive review of the details of recent research on the topic of fruit juice and beverage technology. Rather, it is designed to provide an applied, “practitioner’s” viewpoint on the fruit juice and beverage industry from “grove to glass.”

The book opens with a chapter on minimizing contamination in the production sector followed by a discussion of the role of genetically modified organisms (GMOs) in beverage production. The role of nutraceuticals and functional food applications in beverage production is discussed in [Chapter 3](#). The production and processing of organic fruit, juice, and beverages are detailed in [Chapter 9](#).

The processing and packaging of juices and beverages are discussed in [Chapters 4, 9, and 10](#), and cleaning and sanitation of beverage plants are discussed in [Chapter 8](#). The microbiological aspects of fruit juices and beverages, particularly the importance of microorganisms in spoilage and safety of fruit juice, are discussed in

Chapters 4 and 5. Traditionally, pathogenic organisms were not a major cause for concern in fruit juices and fruit beverages. However, reports of foodborne illness outbreaks, consumer illness, and recalls associated with fruit, fruit juice, and juice products during the past decade have led to a recognition of emerging pathogens as a major threat to the safety of fruit juice and beverages. In the wake of the food safety concerns, the U.S. Food and Drug Administration (FDA) has issued guidance to minimize microbial food safety hazards in fresh and minimally processed fruits and vegetables, required a warning label on any unpasteurized juices, and mandated implementation of the Hazard Analysis Critical Control Point (HACCP) system designed to ensure safety of fruit juice and juice products. Chapters 5, 6, and 7 provide detailed discussions of the design and implementation of HACCP in the juice and beverage industry.

The IFT short course featured a presentation on the Codex activity regarding fruit juice and vegetable juice standards by the FDA representative serving on the U.S. delegation to the Ad Hoc Intergovernmental Task Force on Fruit and Vegetable Juices. We would have liked to include a chapter on the Codex activities dealing with the fruit juice and vegetable juice standards. However, the Codex fruit juice and vegetable juice standards have not been finalized and are being currently debated by the Codex Ad-Hoc Intergovernmental Task Force on Fruit and Vegetable Juices. Detailed reports of recent meetings of the ad-hoc commission are available on the Internet at the U.S. Codex Web site.

We are grateful to all the contributors for providing manuscripts and to Linda Frelka, vice president, Odwalla, Inc., and Dean Duxbury, the IFT director of professional development, for writing Forewords for this book. We would also like to thank Dean Duxbury and the IFT-CEC staff for their encouragement and support. Finally, we would like to thank Eleanor Riemer and Erika Dery of CRC Press for their patience and valuable assistance in the production of this book. The contributors, who are specialists well known in their fields, and the editors have the best intentions and efforts in producing the book and hope that, despite any shortcomings, it will be a useful source of information for professionals in food industry.

Tammy Foster
Purnendu C. Vasavada

About the Editors

Tammy Foster is food safety manager for Tropicana Products, Inc., in Bradenton, Florida. She has held various positions in food microbiology, safety, and quality assurance and is currently responsible for standardizing sanitation programs/systems for Tropicana worldwide, reviewing new equipment and new processes for sanitary design, reviewing and ensuring that Hazard Analysis and Critical Control Point (HACCP) plans are in compliance with federal regulations, and monitoring water quality within all manufacturing facilities. She is a member of the American Society of Quality, the Institute of Food Technologists (IFT), and the International Association for Food Protection (IAFP) and has served as a member and chair of the IFT Continuing Education Committee. Ms. Foster received a B.S. degree in microbiology from South Dakota State University.

Purnendu C. Vasavada is professor of food science at the University of Wisconsin–River Falls and food safety and microbiology specialist with the University of Wisconsin (UW) Extension. He has developed and taught undergraduate courses in food science and technology and has been an invited participant in international conferences, workshops, and symposia dealing with rapid methods and automation in microbiology, food safety and microbiology, food quality assurance, HACCP and TQM (Total Quality Management), and food science education in the U.S., Canada, the U.K., Ireland, Mexico, Australia, New Zealand, Singapore, Malaysia, Argentina, Chile, Brazil, Hungary, Norway, Sweden, and Finland. He has organized the UW River Falls International Food Microbiology Symposium and Rapid Methods in Food Microbiology Workshop for the past 22 years. Dr. Vasavada is author or coauthor of more than 70 publications, including technical abstracts, research papers, book chapters, and articles in professional and trade publications. A fellow of the American Academy of Microbiology, Dr. Vasavada is the recipient of the Joseph Mityas Laboratorian of the Year Award (1987) from the Wisconsin Laboratory Association, the Educator award from the International Association of Milk, Food, and Environmental Sanitarians (IAMFES; 1997), the Sanitarian of the Year award from the Wisconsin Association of Milk and Food Sanitarians (1998), and the Chairman's Award from Minnesota IFT (1998). He is a member of IFT and the International Association for Food Protection and has served as a member and chair of the IFT Continuing Education Committee. He received B.Sc. and M.Sc. degrees in microbiology in India, an M.S. in microbiology from the University of Southwestern Louisiana in Lafayette, and a Ph.D. in food science and dairy manufacturing from the University of Georgia in Athens.

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