Microbiology of Fresh Produce
Emerging Issues in Food Safety
SERIES EDITOR, Michael P. Doyle

Microbiology of Fresh Produce
Edited by Karl R. Matthews

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Microbiology of Fresh Produce

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This is the first book in a new series of monographs that will address emerging topics of the microbiological safety of foods. Reports of estimates of tens of millions of cases of foodborne illness in the United States annually indicate the magnitude of this problem. Epidemiologists report that in the United States foodborne illnesses are more common than influenza or the common cold. Microorganisms or their metabolites are responsible for the vast majority of foodborne illnesses, but there are many unknowns regarding disease agents, including their epidemiology, mechanisms of pathogenicity, infectious or toxic dose, host sensitivity, detection and subtyping methods, and treatments for inactivation. Microbiologists continue to unravel these mysteries, often renouncing age-old beliefs that were long considered dogma. Hence, the need exists to provide scientists interested in the microbiological safety and quality of foods a medium for an authoritative presentation of seminal issues of major significance to the field.

Fresh produce consumption in the United States is increasing at a dramatic rate, more than doubling over the past two to three decades. Concomitant with this has been a substantial increase in the importation of fruits and vegetables and in the incidence of foodborne illnesses associated with fresh produce consumption. An incredible amount of new information has been published during the past few years addressing the microbiological safety of fresh produce. In some instances, questions have been raised regarding long-held dogmas, an example being that the internal contents of intact fruits and vegetables are sterile. Recent reports have dispelled this principle with experimental findings revealing that tomatoes and lettuce can be internally contaminated by harmful microorganisms, depending on
growing and processing conditions. Therefore, it is most fitting that the first monograph in this series focuses on this important and timely topic.

My compliments to Karl Matthews and his team of coauthors who have been truly remarkable in pulling together in record time the state-of-the-art information regarding the microbiological safety of fresh produce. Well done.

MICHAEL P. DOYLE, Series Editor
Emerging Issues in Food Safety
The microbiological quality of fresh fruits and vegetables is essential to ensuring the availability of a high-quality, safe product for the consumer. Consumption of fresh fruits and vegetables is an important part of a healthy diet, supplying much-needed vitamins, minerals, and fiber. Health promotion aspects of fruits and vegetables are beginning to be widely acknowledged through their role in the prevention of heart disease, cancer, and diabetes. Consumers now expect fresh produce year-round and in the United States purchase grapes, cantaloupe, or lettuce grown in Central or South America within days of harvest.

Preventing the exposure of raw fruits and vegetables to microorganisms while in the field, orchard, or vineyard is impossible. Fruit and vegetables are produced in a natural environment and are therefore exposed to a wide range of microorganisms. The majority of microorganisms that are recovered from raw fruits and vegetables at harvest do not represent a human health risk but may cause spoilage. However, the number of outbreaks caused by foodborne pathogens associated with fresh produce has increased during the past three decades. Without further efforts to understand the complex interactions between microbes and fresh fruits and vegetables and the mechanisms by which contamination occurs from the farm to the fork, this trend will likely continue.

Consumers now demand fresh fruits and vegetables that may have been produced in remote areas of the world packaged for convenience and available at a reasonable price at the local supermarket. Produce must be of high quality microbiologically, or the product will spoil or potentially cause human illness. Knowledge of the microbiology of fresh fruits and vegetables
preharvest and at all stages postharvest (i.e., processing, packaging, storage, and at retail outlets) is imperative to the development of new technologies and implementation of innovative methods to ensure that a wholesome, microbiologically safe product reaches the consumer.

This book provides the essential information on the microbiology of fresh produce. It focuses on the unique challenges to the control of microorganisms on produce from the farm to the consumer. The latest technologies for reducing microbial load, packaging, and detection are discussed. Consumer knowledge of produce handling, foodborne illness risks, and future product desires are covered. The association of human pathogens with outbreaks of foodborne illness and a perspective on the microbiological safety of produce are presented. This book will be of interest to microbiologists, food safety experts, extension specialists, food scientists, and specialists in academia, government, and industry concerned with the microbiological quality of fresh fruits and vegetables.

I am grateful to each of the subject experts who authored chapters of this book and to the many people who have made important contributions to it. Their promptness and cooperation made possible the timely completion of this book.

KARL R. MATTHEWS
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