

Preface

The approach to study microorganisms in food has changed. In the last few years the field of food fermentations has experienced a very fast development, thanks to the application of methods allowing precise picturing of their microbial ecology. As a consequence, new information is available on the structure and dynamics of the microbial populations taking turns during fermented food production.

This is the age when functional genomics, transcriptomics, proteomics and metabolomics are going to shed light on the overall role of bacteria in food fermentation, considering also their interactions. Nevertheless, the last 10 years can be considered the “detectomics” era, since much research effort has been dedicated to the development and optimization of biomolecular methods for the detection, reliable identification and monitoring of microorganisms involved in food fermentations. The identification of species and strains during the different phases of fermented foods production allows the understanding of the time when they act or play a role in the food matrix, and the molecular methods can, thus, be used for this purpose in a sort of functional diagnostics.

It is well recognized by researchers world-wide that traditional microbiological methods often fail to characterize minor populations or microorganisms for which a selective enrichment is necessary. Moreover, stressed and injured cells need specific culturing conditions to recover and become cultivable on agar media. Lastly, conventional microbiological techniques are not able to detect viable, but not culturable, cells. The use of molecular techniques allows the precise study of the microbial populations involved in the food fermentation, avoiding the biases related with the traditional methods.

This book takes into consideration both well-known fermented foods and non-European foods and describes the latest findings in the microbial ecology as determined by the application of molecular methods. Culture-dependent techniques, defined as identification, molecular characterization and typing of microbes isolated from the food, and culture-independent methods, as description of the microbial populations present (at DNA level) and/or active (at RNA level) without the need of traditional isolation, are taken into consideration.

All the fermentations are dealt with, including dairy, meat, cereal, wine, beer and vegetables, as well as other fermentations such as those for the production of Asian

and South American products. Moreover, critical chapters on the use of 'omics' in food fermentation and on molecular techniques to study probiotic bacteria and gut ecology are included. Finally, two chapters are respectively dedicated to the methods and their technical aspects, and to the use of bioinformatics for the analysis of sequencing data.

The subject is approached in a way that provides the reader with analytical details and suggestions useful in research, as well as criticism in the evaluation of the benefits that can arise by using novel approaches in food fermentation microbiology. The philosophy of the book is to report the most recent advances in the field, and researchers will find details on primers and protocols most suitable for studying their specific food ecosystem. Apart from the research scopes, the book will allow students of different levels to approach the subject and will provide knowledge on the microbiology of fermented foods to allow an early awareness of how certain food processes are studied today.

The above is the overall plot, beyond which we gave the contributors wide autonomy to set about their own subjects with the appropriate contents and criticism. A team of international scientists, experts in the different food fermentations, have contributed to this volume.

A number of books are available on the microbiology of fermented foods, but this is the first to approach the subject from a novel point of view, reporting the new insights drawn in the microbial ecology of fermented foods by using bio-molecular techniques.

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