

Brewing Microbiology

Current Research, Omics and Microbial Ecology

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Preface

Research into brewing yeast and other organisms associated with beer and brewing has experienced many important advances in the past decade. These have been nudged in no small way by staggering technological advances in tools fundamental to the investigation of microbes and their metabolism. Cutting-edge approaches, such as highly parallel nucleotide sequencing, genetic modification and mass spectrometry, are leading to new discoveries across the field of brewing microbiology.

The goal of this volume is to survey the most recent discoveries in brewing microbiology, with an emphasis on omics techniques and other modern technologies. The chapters span an array of subjects, including yeast genomics and evolution; the physiology, handling, metabolism and genetic regulation of brewing yeasts; genetic modification; taxonomy of both *Saccharomyces* and non-*Saccharomyces* yeasts; the biology and management of spoilage organisms (both fungal and bacterial); microbial ecology of traditional and 'wild' fermentations; and fungal contamination of barley and malt.

Advances in each of these topics have not only furthered our knowledge of brewing processes, they have yielded applications that touch all aspects of brewing practice, from barley growth and malting to yeast management, strain selection, fermentation control, and quality assurance. Consumer interests and brewing technologies continue to shift, yielding new challenges and research frontiers. For example, trends towards lower-alcohol beers have

altered quality assurance demands, and a growing global interest in 'wild' and otherwise sour beers has spurred the need to better understand the ecology of traditional beer fermentations and biology of non-*Saccharomyces* yeasts. Other recent research has revealed that lager yeasts, which are responsible for fermentation of the majority of beers consumed globally, are actually the progeny of hybridization events that occurred only a few centuries ago (likely selected by contemporaneous advances in cave brewing technology), and hence only a few distinct lager strain lineages are available. Now, novel techniques for high-throughput hybridization have yielded dozens more, broadening the range and characteristics of strains available to brewers.

The chapters in this volume aim not only to illuminate recent progress, but also to discuss its impact on brewing practices. We also discuss future research directions, setting out a vision for the next decade of discovery. We are on the cusp of many great innovations, and have only begun to tap the potential of the new tools that pave the way.

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