

Preface

The essential and determining feature of an industrial bioprocess is the culturing of cells that yield a desired product. Mammalian, microbial, and plant cells are traditionally used for the manufacture of products derived directly or semisynthetically from cellular metabolites. These cells are increasingly used as the cellular machinery to express recombinant proteins of considerable economic and therapeutic value. The choice of cell culture type determines the degree of success in obtaining a clinically useful product, as well as in achieving an economical process, by facilitating acceptable yield and purity. Each of the major classes of industrially relevant cultures is manipulated by a variety of means, selected for desired phenotypes, and is exploited either in bioreactors or in the field by functionally similar approaches.

The knowledge of how best to achieve this utility has its roots in empirical learning that reaches back many thousands of years. Much later, Pasteur, Koch, and others dramatically advanced our knowledge of the underlying cellular nature of bioprocesses during classical studies in the 19th century using modern scientific methods. Following World War II, the advent of modern industrial production methods, inspired by the discovery and isolation of penicillin, brought the first boom in natural product biotechnology. More recently, the dramatic acceleration in identifying protein biopharmaceutical candidates, as well as the current rebirth in natural product discovery, have been driven by molecular genetics. Likewise, plant cell culture and engineered crops have already impacted agriculture and are poised to revolutionize biotechnology.

The progression of transgenic animal and plant methodologies from laboratory to industrial scale production has resulted in the most recent, and perhaps most dramatic, step in using cells to make products. Supporting the production of novel therapeutics in mammalian, microbial, and plant cells is an impressive array of new methodologies from the fields of molecular genetics, proteomics, genomics, analytical biochemistry, and screening. For an industrial bioprocess, manipulation and propagation of cells in order to elicit expression of a product is followed by the recovery, analysis, and identification of these products. The methodology for successfully developing a commercial process is functionally similar across the spectrum of cell types.

Handbook of Industrial Cell Culture: Mammalian, Microbial, and Plant Cells attempts to link these common approaches, while also delineating those specific aspects of cell types, to give the reader not only an overview of the best current practices, but also of today's evolving technologies, with examples of both their practical applications and their future potential. Many scientists currently in the field find their careers transitioning across work with mammalian, microbial, and plant bioprocesses; thus they are very much in need of a book linking these disciplines in a single format. Moreover, the next generation of scientists and engineers will interface across these disciplines and likely see even more dramatic enhancements in technology. Our hope is that this Handbook will prove especially useful not only to those involved in biotechnology as a broad discipline, but also assist experienced practitioners in perfecting the special art of industrial cell culture.

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<http://www.springer.com/978-1-58829-032-8>

Handbook of Industrial Cell Culture

Mammalian, Microbial, and Plant Cells

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2003, X, 536 p. 163 illus., 1 illus. in color., Hardcover

ISBN: 978-1-58829-032-8

A product of Humana Press