

Preface

The 21st century began in the midst of a biotechnology revolution. To many scientists and biotechnologists, the amount of information concerning new and novel methodologies and their impact is overwhelming. The development and application of biotechnology is forging ahead, bringing with it rapid changes in everyday life. Because all living organisms depend on molecular activity for survival and reproduction, research on molecular biotechnology and the utility of genetically altered cells has acquired a more dominant role in multidisciplinary activities. In addition, the biosafety and economic feasibility of genetically modified crops, microbes, and animals—often referred to as genetically modified organisms (GMOs)—have become paramount issues for consumers, farmers, and governments, as well as the agriculture, chemical, food, and pharmaceutical industries. An intense global debate is focused on ethical issues and the potential benefits and risks of genetic engineering technology.

Although there is general agreement that attention must be focused on educating the public on the potential and technical challenges of GMOs, it is equally important to recognize the complexities that arise from a heightened public awareness of the safety and environmental impacts of biotechnology. If GMO technology is to succeed, all concerned parties require a greater understanding of this special research.

Updating one's knowledge of GMO biotechnology, the most recent advances, the accepted guidelines for commercial application, and the new opportunities GMO research offers to the benefit of humankind is a continual challenge. *The GMO Handbook* introduces and explains the fundamentals of molecular biotechnology as a scientific discipline, provides an understanding of how current GMO research is conducted, discusses the problems that have arisen from genetic technology, explains the tools needed to address and resolve conflicts on GMO issues, and provides in-depth discussions on how GMO-derived technology may impact our lives in the future.

The GMO Handbook is divided into three sections. In each section, special emphasis is placed on explaining the wide range of current technologies and new strategies employed from cell biology, molecular biology, and biochemistry in constructing GMOs. In addition, large scale expression and production of recombinant products in cultured cells is described. Furthermore, the significance of public acceptance of GMOs and the economic benefits for the agricultural and pharmaceutical markets is also discussed. Finally, the unknown challenges and ethical concerns associated with GMOs are raised.

In most instances, *The GMO Handbook* addresses special topics by first reviewing the molecular details and then explaining their broader applications. Whereas many books on GMOs address registration procedures, regulation policies, environmental impacts on the food chain, or biosafety concerns with deliberate release, many fail to explain the basic principles, methodologies, and concepts behind the methods of construction of GMOs. They rarely provide the reader with critical information on the limitations of the technology, the pitfalls, and the necessary guidelines for commercialization. This book intends to fill these gaps. An extensive glossary is provided to help the reader understand the terminology employed in GMO biotechnology.

This book is the culmination of the efforts of many. The chapters were written by scientists who have made significant contributions to GMO research and can address some of the latest developments in the field. *The GMO Handbook* presents the work of scientists from a broad range of disciplines including botany, entomology, plant pathology, chemical engineering, microbiology, virology, genetics, public health, and government policy.

The GMO Handbook gives a cross section of current accomplishments in GMO research and provide insight into its future. The handbook targets a unique range of scientists. Young researchers beginning their undergraduate- and graduate-level studies will benefit from the ability to see the full range of techniques and applications used to culture and analyze animal, microbial, and plant GMOs. The chapters are written so as to facilitate their use as a teaching aid. Experienced scientists, biotechnology business managers, and manufacturing managers engaged in major GMO technologies are challenged to contemplate the potential of these technologies. The hope is that the book will illuminate the collaboration among scientists of many differing disciplines that has resulted in the invention of state-of-the-art techniques for developing GMOs.

Each individual chapter presents the opinions and views of its author(s). Although every effort has been made by the editor to provide a consistent style, the results presented, views expressed, and final content of the chapters remain the sole responsibility of the chapter authors. It is our hope that the information presented here will prove to be a useful contribution not only to science, but also to the general public interest.

I wish to express my appreciation to all of the contributing authors. I am especially grateful to the members of the international advisory board and Anne Gregg, information scientist, at Dow AgroSciences. Anne provided critical help in editing and organizing this book. Thanks are also owed to many associate friends for their advice and collaboration, as well as to Humana Press and their team members for the opportunity to publish this book.

Finally, with love and affection, I am indebted to my wife, Ranna, and my daughter, Puja, for their patience and understanding.

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