

Preface

Vaccines have saved more lives than any other biomedical invention. During the last two decades, novel conjunctions of scientific disciplines have revolutionized vaccine design and production. In particular, plant genetic engineering, bioinformatics, and molecular immunology have led to a novel manufacturing platform named plant-based vaccines, which has opened new paradigms for vaccine development.

During the last two decades, this concept has been elevated from merely performing conventional plant transformation approaches and orally administering raw plant material to sophisticated expression and processing technologies. At present, a substantial advancement on several aspects of this technology has been achieved, resulting in cases that are near to be introduced into the market.

This book aims to provide an insight into the principles, evolution, and state of the art of plant-based vaccines through contributions from leading experts within academia. An integrated view is provided by means of analyzing the incidence of the distinct fields of knowledge that converge in this multidisciplinary task, which include plant biology, recombinant DNA technology, biorreactor engineering, and immunology.

Section I presents the basis of plant-based vaccines. In Chapter 1, a general description of the methodologies involved in the design, production, and evaluation of plant-based vaccine candidates is provided as an introductory outlook of this technology. Chapter 2 covers in detail the immunology aspects involved in the induction of immunoprotective responses, with emphasis in the mucosal immunization routes.

Section II contains 4 chapters considering the principles of plant-based recombinant protein expression modalities as a key aspect in the development of plant-based vaccines. Among these, transient viral-based and plastid expression approaches have led to improved yields, allowing viable dosage for many prototype vaccines. Chapter 6 describes the principles of bioreactor-based plant biomass production as a critical part for implementing full contained production systems, which represents an advantageous approach in terms of biosafety.

The following part, Section III, shows the potential of plant-based production systems for developing novel vaccine candidates against relevant diseases, with emphasis in those considered in advanced development stages. In this comprehensive review, concrete vaccine candidates against important diseases are analyzed in

6 chapters as an outlook of the most advanced vaccines based in the use of plants as expression hosts.

The final part of this book, Section IV, is devoted to the discussion of perspectives that arise in this field comprising research goals related on advancing in the characterization of oral vaccines, addressing critical parameters to meet the regulatory standards, such as safety, potency, and reproducibility, as well as putative new target diseases to be addressed under this technology. Identified scientific goals are expected to be advanced in the short term, allowing for higher yields and stability, a more detailed characterization, and, as the ultimate consequence, improved applicability.

The present book is intended to serve as an accepted guide and tool for teaching and research activities, facilitating the study of this rapidly developing technology. I thank all my colleagues and students whose time and effort constituted a relevant support in this project. Special thanks go to my brothers for their unconditional love and support during the process of editing this book.

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Editor

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Against Wide Spread Diseases

An Integrated View

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