

Preface

Since early 1970s, with the development of methods for construction of recombinant DNA technology and variety of procedure for transfer of genes from one species to another, bypassing all reproductive barriers, transgenic microorganisms, plants and animals have been developed to confer novel characteristics with obvious advantages to the host organisms and overall benefit to man. In addition to many ethical, regulatory and ecological issues, safety of transgenics for the consumer is still questionable and genetically modified organisms (GMOs) are not readily accepted because of presence of foreign DNA sequences in host organisms. Scientists have been in search for newer technologies which could overcome the issues that GMOs face; one such technique is genome editing, which is the subject matter of this book. Genome editing is relatively new area of genome manipulation aimed for improvement of microorganisms, plants, animals, and human gene therapy. Hallmark of this technology is that it changes endogenous DNA sequences of the host with no foreign sequences left behind in the host organism. With a battery of tools in the hands of gene editors, genome editing has presently become technology of the time. We are in the beginning of Era of genome engineering.

L. Dahlberg and A.M.G. Carmona of Western Washington University have compiled the ongoing efforts in their article "CRISPR-Cas technology in and out of the classroom" published online in April 2, 2018 issue of *The CRISPR Journal* to bring CRISPR-Cas technology out of the classroom and into the teaching laboratory. They provide information on the institutions, instructors, course type, biological system/model organism, and student activities and/or prerequisites. They have stressed on formal discussions of how the CRISPR-Cas systems were discovered and how they are being used, exploited, and modified. Graduates from undergraduate institutions in biology-related departments and programs can enhance the discourse around genetic engineering and genomic technologies. One strategy for achieving this goal is through the introduction of Course-Based Undergraduate Research Experiences (CUREs) into undergraduate curricula. Given student interest and the increased need to communicate cutting-edge research to undergraduate students, many American colleges and universities have begun instituting, since 2015, CRISPR-Cas-related CUREs with great success.

Agricultural, medical, veterinary universities all over the world are introducing courses to teach genome editing theory and practical to their senior undergraduate and graduate (M.Sc. and Ph.D.) students. At present, there is no textbook available for the teachers and the students. Some excellently edited books on genome-editing tools have recently appeared but they provide very much specialized information on the subject and are thus not suitable for teaching purpose. The book *Genome Editing: A Comprehensive Treatise* will be useful all over the world to the teachers for teaching genome editing course(s). This book will also be useful as a reference book to the scientists working in biotechnology companies, agriculture research stations and other professionals using genome-editing tools for microbial strain development, crop/animal improvement and human gene therapy.

I have discussed in detail in a reader-friendly way, discovery, development, improvement, uses, advantages, limitations, and future prospects of different genome-editing tools. I have compiled in

tabular form present status of the achievements of different genome-editing tools in prokaryotes, yeasts, plants, animals and cultured cells. The book will benefit not only new entrants in this fast expanding area of research on genome manipulation but will also be useful to experts in this area. The book is expected to inspire present generation of students, who are in fact future teachers and scientists, to opt for career in teaching and research in the area of genome editing. The reader is required to have basic knowledge about principles, discoveries, methods, tools and applications of molecular genetics; and recombinant DNA technology procedures and genetic transfer methods.

Fundamental knowledge of genome editing is very essential to present and future professions dealing with improvement of bacteria, yeasts, plants, animals and human gene therapy. My only reason for authoring a book on genome editing is to deal with the principles, procedures, limitations, advantages applications and future prospects of different genome-editing tools in a comprehensive manner. The present scenario, future prospects, of genome-editing technology have also been discussed keeping in view safety, regulatory and other issues.

This book provides a brief historical background in introductory paragraph(s) of every chapter. Recent progress on the topic is discussed. Work of numerous Nobel laureates who contributed in the development of genome-editing technology finds a special mention. Various principles, terms, concepts, phenomena, and methods of genome editing have been dealt with in a simple and lucid language. The text is supported by a large number of original and recent references, tables, figures and flow diagrams where necessary. Special attention has been paid to precise definitions of various terms in the subject in light of the present knowledge. Important literature relevant to the subject matter has been cited in the text and all such references have been listed at the end of every chapter. Numerous thought-provoking problems are also included in every chapter. Where there are six or more authors in a publication, only first three authors have been mentioned, followed by *et al.* Throughout efforts have been made to briefly pin-point applications/implications/merits/demerits of different tools used in the genome editing. Extensive cross-referencing has been done for benefit of the reader.

Genome Editing: A Comprehensive treatise should be extremely useful to those who are preparing for national and international level competitive examinations, entrance tests, and interviews for jobs/fellowships. I trust the book will provide enjoyable reading experience. Strenuous efforts have been made to include all important information relevant for senior/upper undergraduate and higher level (M.Sc. and Ph.D.) students; however, if some important aspect(s) is/are missing, the readers are urged to inform the author so that deficiencies can be corrected in a subsequent printing/edition. Style of presentation and selection of examples are purely my choice. I am responsible for any omission and commission. Readers' feedback will be greatly appreciated and acknowledged.

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