Genome Editing And Engineering From Talens Zfns A

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KIRK ROWAN

Genetic Engineering

Springer

Over the last few decades, various techniques have been developed to alter the properties of plants and animals. While the targeted transfer of recombinant DNA into crop plants remains a valuable tool to achieve a desirable breeding outcome, integration of transgenes into the host genome has been random, which in part, leads to reduced acceptance of GMOs by the general population in some parts of the world. Likewise, methods of induced mutagenesis, such as TILLING, have the disadvantage that many mutations are induced per plant, which has to be removed again by expensive backcrossing. Advances in genome sequencing have provided more and more information on differences between susceptible and resistant varieties, which can now be directly targeted and modified using CRISPR/Cas9 technology. By selecting specific gRNAs occurrence of off-target modifications are comparatively low. ZFNs and TALENs-based approaches required re-engineering a new set of assembled polypeptides for every new target site for

each experiment. The difficulty in cloning and protein engineering prevented these tools from being broadly adopted by the scientific community. Compared to these technologies, designing the CRISPR toolbox is much simpler and more flexible. CRISPR/Cas9 is versatile, less expensive and highly efficient. It has become the most widely used technology for genome editing in many organisms. Since its inception as a powerful genome-editing tool in late 2012, this breakthrough technology has completely changed how science is performed. The first few chapters in this book introduce the basic concept, design and implementation of CRISPR/Cas9 for different plant systems. They are followed by in-depth discussions on the legal and bio-safety issues accompanying commercialization and patenting of this emerging technology. Lastly, this book covers emerging areas of new tools and potential applications. We believe readers, novice and expert alike, will benefit from this all-in-one resource on genome editing for crop improvement. Chapter 17 is available open access under a Creative Commons

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The CRISPR/Cas Tool Kit for Genome Editing

Springer

Genome Editing: A Practical Guide to Research and Clinical Applications is geared towards investigators interested in learning how to use CRISPR-Cas9-based technologies, with a focus on cardiovascular research and clinical applications. Covering a range of topics from the basics of genome editing to design considerations, to assessments and applications, this reference allows readers to get started and establish a full workflow from the beginning of the project to its full completion. With worked examples drawn from real-life experiments, as well as troubleshooting and pitfalls to avoid, the book serves as an essential reference for researchers and investigators in both cardiovascular and biomedical research. Help readers familiarise with the variety of genome-editing approaches that are being applied in cardiovascular research and medicine, i.e., both research applications and clinical applications Understand the use of genome editing through

worked examples (based on real-life experiments) in which CRISPR-Cas9 is employed, online tools to design CRISPR-Cas9 reagents, methods to interpret data from genome-editing experiments, the downsides of genome-editing technology - both the scientific and ethical pitfalls to avoid Written in an easy-to-follow manner, guiding readers from the design of the project to its completion Includes unpublished and new methods *Rice Genome Engineering and Gene Editing* Harvard University Press This timely volume explores the use of CRISPR-Cas9 for genome editing, presenting cutting-edge techniques and their applications in treatment of disease. The chapters describe latest methods such as use of targetable nucleases, investigation of the non-coding genome, mouse genome editing, increasing of knock-in efficiency in mouse zygotes, and generation of reporter stem cells; the text contextualizes these methods in treatment of cardiovascular disease, diabetes mellitus, retinitis pigmentosa, and others. The final chapters round out the book with a discussion of controversies

and future directions. Genome Editing is an essential, of-the-moment contribution to this rapidly growing field. Drawing from a wealth of international perspectives, it presents novel techniques and applications for the engineering of the human genome. This book is essential reading for all clinicians and researchers in stem cells, regenerative medicine, genomics, biochemical and biomedical engineering-especially those interested in learning more about genome editing and applying it in a targeted, specific way. *Genes, Genomes and Society* Academic Press GENOME EDITING IN DRUG DISCOVERY A practical guide for researchers and professionals applying genome editing techniques to drug discovery In Genome Editing in Drug Discovery, a team of distinguished biologists delivers a comprehensive exploration of genome editing in the drug discovery process, with coverage of the technology's history, current issues and techniques, and future perspectives and research directions. The book discusses techniques for disease modeling, target identification with CRISPR,

safety studies, therapeutic editing, and intellectual property issues. The safety and efficacy of drugs and new target discovery, as well as next-generation therapeutics are also presented. Offering practical suggestions for practitioners and academicians involved in drug discovery, Genome Editing in Drug Discovery is a fulsome treatment of a technology that has become part of nearly every early step in the drug discovery pipeline. Selected contributions also include: A thorough introduction to the applications of CRISPRi and CRISPRa in drug discovery Comprehensive explorations of genome-editing applications in stem cell engineering and regenerative medicine Practical discussions of the safety aspects of genome editing with respect to immunogenicity and the specificity of CRISPR-Cas9 gene editing In-depth examinations of critical socio-economic and bioethical challenges in the CRISPR-Cas9 patent landscape Perfect for academic researchers and professionals in the biotech and pharmaceutical industries, Genome Editing in Drug Discovery will also earn a

place in the libraries of medicinal chemists, biochemists, and molecular biologists.

Genome Editing
Springer Nature
A Best Book of 2021 by Bloomberg BusinessWeek , Time, and The Washington Post The bestselling author of Leonardo da Vinci and Steve Jobs returns with a “compelling” (The Washington Post) account of how Nobel Prize winner Jennifer Doudna and her colleagues launched a revolution that will allow us to cure diseases, fend off viruses, and have healthier babies. When Jennifer Doudna was in sixth grade, she came home one day to find that her dad had left a paperback titled The Double Helix on her bed. She put it aside, thinking it was one of those detective tales she loved. When she read it on a rainy Saturday, she discovered she was right, in a way. As she sped through the pages, she became enthralled by the intense drama behind the competition to discover the code of life. Even though her high school counselor told her girls didn’t become scientists, she decided she would. Driven by a passion to understand how nature works and to turn discoveries into inventions, she would

help to make what the book's author, James Watson, told her was the most important biological advance since his codiscovery of the structure of DNA. She and her collaborators turned a curiosity of nature into an invention that will transform the human race: an easy-to-use tool that can edit DNA. Known as CRISPR, it opened a brave new world of medical miracles and moral questions. The development of CRISPR and the race to create vaccines for coronavirus will hasten our transition to the next great innovation revolution. The past half-century has been a digital age, based on the microchip, computer, and internet. Now we are entering a life-science revolution. Children who study digital coding will be joined by those who study genetic code. Should we use our new evolution-hacking powers to make us less susceptible to viruses? What a wonderful boon that would be! And what about preventing depression? Hmmm…Should we allow parents, if they can afford it, to enhance the height or muscles or IQ of their kids? After helping to discover CRISPR, Doudna became a leader in wrestling with these moral issues and, with her collaborator Emmanuelle

Charpentier, won the Nobel Prize in 2020. Her story is an “enthralling detective story” (Oprah Daily) that involves the most profound wonders of nature, from the origins of life to the future of our species.

Genome Engineering for Crop Improvement CRC Press

Genome editing is a powerful new tool for making precise alterations to an organism's genetic material. Recent scientific advances have made genome editing more efficient, precise, and flexible than ever before. These advances have spurred an explosion of interest from around the globe in the possible ways in which genome editing can improve human health. The speed at which these technologies are being developed and applied has led many policymakers and stakeholders to express concern about whether appropriate systems are in place to govern these technologies and how and when the public should be engaged in these decisions. Human Genome Editing considers important questions about the human application of genome editing including: balancing potential benefits with unintended risks, governing the

use of genome editing, incorporating societal values into clinical applications and policy decisions, and respecting the inevitable differences across nations and cultures that will shape how and whether to use these new technologies. This report proposes criteria for heritable germline editing, provides conclusions on the crucial need for public education and engagement, and presents 7 general principles for the governance of human genome editing.

Genome Editing

Springer Nature

This volume provides readers with wide-ranging coverage of CRISPR systems and their applications in various plant species. The chapters in this book discuss topics such as plant DNA repair and genome editing; analysis of CRISPR-induced mutations; multiplexed CRISPR/Cas9 systems; CRISPR-Cas12a (Cpf1) editing systems; and non-agrobacterium based CRISPR delivery systems. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily

reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Comprehensive and thorough, Plant Genome Editing with CRISPR Systems: Methods and Protocols is a valuable resource for any researcher interested in learning about and using CRISPR systems in plants. *Heritable Human Genome Editing* Simon and Schuster eBook content that offers a clear and comprehensive introduction to CRISPR and related topics. Entries include foundational concepts, key scientific figures and historical themes, ethical issues , and advances in the science. Editing Humanity Humana Site-specific endonucleases create double-strand breaks within the genome and can be targeted to literally any genetic mutation. Together with a repair template, a correction of the defective locus becomes possible. This book offers insight into the modern tools of genome editing, their hurdles and their huge potential. A new era of in vivo genetic engineering has begun. Genome Engineering via CRISPR-Cas9 System National Academies Press Reprogramming the Genome: Applications of CRISPR-Cas in Non-mammalian

Systems, Part A presents a collation of chapters written by global, eminent scientists. CRISPR-Cas9 system is an RNA-mediated immune system of bacteria and archaea that protects from bacteriophage infections. It is one of the revolutionized technologies to uplift biology to the next stages. Chapters in this release include An Introduction and applications of CRISPR-Cas Systems, History, evolution and classification of CRISPR-Cas associated systems, CRISPR based bacterial genome editing and removal of pathogens, CRISPR based genome editing and removal of human viruses, CRISPR based development of RNA editing and diagnostic platform, and much more. Additional sections cover Genome engineering in insects for control of vector borne diseases, Development of insect cell line using CRISPR technology, CRISPRing protozoan parasites to better understand the biology of diseases, CRISPR based genome editing of Caenorhabditis elegans, and a variety of other important topics. Offers a basic understanding and clear picture of genome editing CRISPR-Cas systems in different organisms Explains how

to create an animal model for disease diagnosis/research and reprogram CRISPR for removal of virus, bacteria, fungi, protozoan, and many more Discusses the advances, patents, applications, challenges and opportunities in CRISPR-Cas9 systems in basic sciences, biomedicine, virology, bacteriology, molecular biology, and many more **Reprogramming the Genome: Applications of CRISPR-Cas in non-mammalian systems part A** Springer Gene-editing technologies (e.g., ZFNs, TALENs, and CRISPRs/Cas9) have been extensively used as tools in basic research. They are further applied in manufacturing agricultural products, food, industrial products, medicinal products, etc. Particularly, the discovery of medicinal products using gene-editing technologies will open a new era for human therapeutics. Though there are still many technical and ethical challenges ahead of us, more and more products based on gene-editing technologies have been approved for marketing. These technologies are promising for multiple applications. Their development and implications should be explored in

the broadest context possible. Future research directions should also be highlighted. In this book, the applications, perspectives, and challenges of gene-editing technologies are significantly demonstrated and discussed. *Genetic Engineering and Genome Editing for Zinc Biofortification of Rice* BoD – Books on Demand Genome Editing in Plants: Principles and Applications addresses the information of genome editing starting from principles and historical aspects to the latest advancements in the field. As genome-editing technology has emerged as promising and cutting edge, researchers around the world have started producing original research outputs, which have significantly improved our current understanding and potential of this technology. The initial chapters of this book describe different genome-editing tools as well as their principles and applications. Other chapters are dedicated to the present status and future applications of genome-editing techniques in various crop improvement programmes. Some of the advanced applications of CRISPR/Cas tools, such as

base editing and RNA detection, along with regulatory aspects of genome-edited crops are described in detail. This book serves as a valuable resource to researchers in the field of crop improvement; graduate and postgraduate students engaged in plant molecular biology and biotechnology; academicians; and policy makers. Key Features: Addresses topics associated with historical development and principles of genome-editing technology Addresses basic mechanisms operating under each genome-editing technology Addresses its application in plants to design crops as per the current and future demands Addresses the regulatory mechanisms of genome-edited crops

Genome Editing Applications in Animal Research

Elsevier

With the advent of CRISPR gene-editing technology, designer babies have become a reality. Françoise Baylis insists that scientists alone cannot decide the terms of this new era in human evolution. Members of the public, with diverse interests and perspectives, must have a role in determining our future as a species.

Redesigning Life John Wiley & Sons

This book presents descriptive overviews of gene editing strategies across multiple species while also offering in-depth insight on complex cases of application in the field of tissue engineering and regenerative medicine. Chapters feature contributions from leaders in stem cell therapy and biology, providing a comprehensive view of the application of gene therapy in numerous fields with an emphasis on ophthalmology, stem cells, and agriculture. The book also highlights recent major technological advances, including ZFN, TALEN, and CRISPR. Precision Medicine, CRISPR, and Genome Engineering is part of the highly successful Advances in Experimental Medicine and Biology series. It is an indispensable resource for researchers and students in genetics as well as clinicians.

Genome Editing

Academic Press

This book discusses CRISPR/Cas- one of the most powerful tools available to scientists for genome editing. CRISPR/Cas is not only a genome editing tool, but researchers have also engineered it for gene regulation, genome imaging, base editing and epigenome regulations. This book

describes the entire toolkit for CRISPR/Cas. The opening section gives an introduction to the technique and compares it with other genome editing tools. Further section gives a historical perspective of the tool, along with its detailed classification. The next chapters describe bioinformatic tools in CRISPR/Cas, and delivery methods for CRISPR/Cas. The book also discusses about the applications of CRISPR/Cas beyond genome editing and use of CRISPR for rewriting genetic codes. The book dedicates a section to the use of CRISPR in plants. The book culminates with a chapter on the current status, challenges and shortcomings of the CRISPR/Cas genome editing tool. The book would be highly interesting to students and researchers in molecular biology, biochemistry, biotechnology, food science, agriculture and plant sciences.

Genome Editing and Engineering

Academic Press

One of the world's leading experts on genetics unravels one of the most important breakthroughs in modern science and medicine. IIf our genes are, to a great extent, our destiny, then what would happen if mankind could

engineer and alter the very essence of our DNA coding? Millions might be spared the devastating effects of hereditary disease or the challenges of disability, whether it was the pain of sickle-cell anemia to the ravages of Huntington's disease. But this power to "play God" also raises major ethical questions and poses threats for potential misuse. For decades, these questions have lived exclusively in the realm of science fiction, but as Kevin Davies powerfully reveals in his new book, this is all about to change. Engrossing and page-turning, Editing Humanity takes readers inside the fascinating world of a new gene editing technology called CRISPR, a high-powered genetic toolkit that enables scientists to not only engineer but to edit the DNA of any organism down to the individual building blocks of the genetic code. Davies introduces readers to arguably the most profound scientific breakthrough of our time. He tracks the scientists on the front lines of its research to the patients whose powerful stories bring the narrative movingly to human scale. Though the birth of the "CRISPR babies" in China made international news, there is much more to the story of

CRISPR than headlines seemingly ripped from science fiction. In Editing Humanity, Davies sheds light on the implications that this new technology can have on our everyday lives and in the lives of generations to come.

Modern Prometheus

National Academies Press

CRISPR in Animals and Animal Models, Volume 152, the latest release in the Progress in Molecular Biology and Translational Science series, explores the genome editing CRISPR system in cells and animal models, its applications, the uses of the CRISPR system, and the past, present and future of CRISPR genome editing. Topics of interest in this updated volume include a section on CRISPR history, The genome editing revolution, Programming CRISPR and its applications, CRISPR Delivery methods, CRISPR libraries and screening, CRISPR investigation in haploid cells, CRISPR in the generation of transgenic animals, CRISPR therapeutics, and Promising strategies and present challenges. Accessible to students and researchers alike Written by leading authorities in the field

Gene Editing

Academic Press

This essential should serve as an introduction for a contemporary public discussion on genetic engineering. Genetic engineering affects us all in many areas and we must dare to think more colorful and further. In fact, the complete genetic material of viruses and bacteria can already be chemically produced and "brought to life". With genetic surgery, medicine is at a crossroads: do we want to treat hereditary diseases or "repair" them genetically? And the analysis of thousands of human genetic material reveals information that is related to complex diseases, but also to characteristics such as intelligence. How should we use this knowledge? The question is hardly whether we want genetic engineering, but rather how we use it. This Springer essential is a translation of the original German 1st edition essentials, Gentechnik by Röbbe Wünschiers, published by The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Fachmedien Wiesbaden GmbH, part of Springer Nature in 2019. The translation was done with the help of artificial intelligence (machine translation by

the service DeepL.com). A subsequent human revision was done primarily in terms of content, so that the book will read stylistically differently from a conventional translation. Springer Nature works continuously to further the development of tools for the production of books and on the related technologies to support the authors.

CRISPR in Animals and Animal Models

Frontiers Media SA This book serves the teachers, researchers and the students as a handy and concise reference as well as guidebook while designing and planning for use of the advanced technologies for crop improvement. The content of the book is designed to cover the latest genome engineering techniques for crop improvement. The conventional breeding has got its limitations such as non-availability of desired genes within the genepool. In many cases, breeding has been highly used and it has nearly reached its highest limit so far as the productivity and production of crops are concerned. However, with increasing need of food and decreasing resources, including water, land, labour, etc., to feed the growing population,

the alternative available ways of increasing crop productivity need to be explored and exploited. Genome engineering has a wide scope that includes technologies such as genetic engineering and transgenesis, RNA technologies, CRISPR, cisgenics and subgenics for better productivity and more efficient biotic and abiotic stress management. Therefore, the book is planned to enlighten the readers with the advanced technologies with examples and case studies, whenever possible. Efforts will be made to emphasize on general efforts on various major food crops; however, it would also be made clear that such efforts could be taken as proofs of concepts and that this could be extrapolated keeping the demand in mind.

Precision Medicine, CRISPR, and Genome Engineering

Springer Nature

This new volume of Methods in Enzymology continues the legacy of this premier serial with quality chapters authored by leaders in the field. This volume covers recent research and methods development for changing the DNA sequence within the genomes of cells and organisms. Focusing on

enzymes that generate double-strand breaks in DNA, the chapters describe use of molecular tools to introduce or delete genetic information at specific sites in the genomes of animal, plant and bacterial cells. Continues the legacy of this premier serial with quality chapters authored by leaders in the field Covers research methods in biomineralization science Contains sections on such topics as genome editing, genome engineering, CRISPR, Cas9, TALEN and zinc finger nuclease