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ISSN: 2329-6682
Gene Technology

Commentary

Advancements in Gene Editing: Genetically Modified Rabbits as Disease Models

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DESCRIPTION

The ability to create genetically modified animals has significantly advanced genetic research, providing insights into gene function and enabling the study of genetic disorders. While mice have been the traditional model organism for genetic modifications, recent innovations have expanded the scope of gene-editing technologies to other species. A notable advancement is the use of Transcription Activator-Like Effector Nucleases (TALENs) to generate genetically modified rabbits, a development that creates the path for biomedical research, particularly in the study of human diseases. The generation of genetically modified rabbits using TALENs provides several advantages over traditional genetically modified models, making it an exciting step forward in the field of genetic engineering and animal modeling.

TALENs are a type of genome-editing tool that can be used to make precise modifications to DNA. Like CRISPR-Cas9, TALENs rely on a customizable DNA-binding domain to target specific sequences in the genome. The key advantage of TALENs is their ability to make highly specific cuts in the DNA, reducing the risk of off-target effects compared to other genome-editing technologies. This precision makes TALENs an attractive option for generating genetically modified animals, where the goal is often to introduce specific mutations that deactivate a gene of interest. In the case of the genetically modified rabbit, TALENs were used to target genes involved in important physiological processes, allowing researchers to study the resulting phenotypic changes.

Rabbits have long been recognized as valuable animal models in biomedical research due to their physiological similarities to humans, particularly in areas such as immunology, cardiovascular research and reproductive biology. However, generating genetically modified rabbits has been more challenging than working with other animals like mice. Traditional methods of gene editing in rabbits, such as homologous recombination, have been inefficient and technically demanding. The introduction of TALENs has provided a more efficient and precise approach for generating genetically modified rabbits, overcoming some of the limitations of previous techniques.

The use of TALENs to create genetically modified rabbits holds particular potential for the study of human diseases. Many diseases, particularly those related to the immune system, reproductive health and genetic disorders, have been difficult to model in traditional rodent systems due to the differences between species. Rabbits, alternatively, share more similarities with humans in terms of organ size, immune function and reproductive physiology, making them a valuable model for studying human diseases. By knocking out specific genes in rabbits, researchers can study the effects of these mutations in a way that closely mirrors the human condition. This has significant implications for the development of new treatments and therapies for human diseases.

One of the most exciting applications of genetically modified rabbits is in the field of regenerative medicine. Rabbits are often used as models for organ transplantation and tissue regeneration studies due to their larger size compared to rodents, which allows for better visualization and experimentation with surgical procedures. By generating genetically modified rabbits with specific genetic modifications, researchers can better understand how certain genes contribute to tissue regeneration and repair, potentially leading to new approaches for treating injuries or degenerative diseases in humans. Additionally, genetically modified rabbits may be used to study the development of organ-specific diseases, such as cardiac or renal diseases, providing a more accurate representation of human disease progression and response to treatment.

In conclusion, the generation of genetically modified rabbits using TALENs represents a major breakthrough in genetic research and animal modeling. This technique has the potential to provide valuable insights into gene function, human diseases and the development of new therapeutic strategies. The advantages of using TALENs for generating genetically modified rabbits, particularly their precision and efficiency, make them a powerful tool for advancing biomedical research. As the

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Received: 29-Nov-2024, Manuscript No. RDT-24-28171; **Editor assigned:** 02-Dec-2024, PreQC No. RDT-24-28171 (PQ); **Reviewed:** 16-Dec-2024, QC No. RDT-24-28171; **Revised:** 23-Dec-2024, Manuscript No. RDT-24-28171 (R); **Published:** 30-Dec-2024, DOI: 10.35248/2329-6682.24.13.297

Citation: Schmidt F (2024). Advancements in Gene Editing: Genetically Modified Rabbits as Disease Models. Gene Technol. 13:297.

technology continues to improve, it is likely that genetically modified rabbits will become an increasingly important model organism in fields such as regenerative medicine, vaccine development and disease modeling. However, as with all advances in genetic engineering, it is essential to consider the ethical implications and ensure that these technologies are used responsibly to benefit both science and society.