Ashdin Publishing
Journal of Evolutionary Medicine
Vol:10 (2022) Article ID 236083, 02 page
doi:10.4303/JEM/236083

Short Communication

Applications of Genome-Editing Technologies

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Received: 30-August-2022; Manuscript No: JEM-22-80302; **Editor assigned:** 01-September-2022; PreQC No: JEM-22-80302 (PQ); **Reviewed:** 15-September-2022; QC No: JEM-22-80302; **Revised:** 20-September-2022; Manuscript No: JEM-22-80302 (R); **Published:** 27-September-2022; **DOI:** 10.4303/JEM/236083

Introduction

Plant genetics has undergone a revolution in the last three decades thanks to technologies like Genetically Modified (GM) and gene-editing. GM technology is regarded as the most significant technological advancement since the Green Revolution and is crucial to the development of an agricultural sector with a sustainable production system. In 2019, 190.4 million hectares of GM crops were planted worldwide, an increase of 112 times over the 1.7 million hectares cultivated in 1996. According to Brookes and bar foot, GM goods are expected to have generated $224.9 billion in economic growth between 1996 and 2018. However, some scientists think that exogenous Deoxyribonucleic Acid (DNA) in genetically modified goods may be potentially hazardous to human health since it is randomly placed into recipient genomes without knowing its specific position. The safety of GM foods is a worry for the majority of people [1].

With the fast advancement of genetic engineering procedures and DNA sequencing technology during the previous 15 years, the idea of "New Breeding Techniques" (NBTs) has come into existence. It refers to gene-editing methods where DNA is added, changed, replaced, or removed from a living organism's genome at a specific site. The most popular Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas system, Transcription Activator-Like Effector Nucleases (TALENs), and zinc fingers are some of the emerging approaches. NBT proponents anticipate that some of the types produced by these methods won't be regarded as GM goods and won't need genetic alteration to be regulated. It is important to note that gene editing technology can create products that are identical to mutants acquired by traditional mutagenesis, which is not subject to GMO regulations. Because NBTs can insert new DNA or surplus undesirable genes with such carefully, they produce considerably fewer accidental mutations than existing GMOs or traditional breeding. According to a large body of research, the advantages of gene editing include higher agricultural yields, better disease resistance, and better climate adaption. Biotechnology might be transformed *via* gene editing to become a more socially acceptable instrument, particularly in agriculture. However, the success of its application to agricultural crops and goods ultimately rests on industry investment, stakeholder acceptability, and governmental regulatory laws [2].

Description

Over the past few decades, medical practise has had more access to medical genetics, medical genomics, and knowledge about the human genome. Despite these developments, a number of obstacles still stand in the way of fully integrating medical genomics and genetics into standard medical practise. These obstacles include lack of access to genetics knowledge, patient worry, insurance prejudice, and time for practitioners to stay current with developments. These barriers could make it less feasible to apply medical genetics and genomics in the clinic, which would be detrimental to patients. As more clinical genetic and genomic tests become available on the market each year, the danger of advantages being lost will increase. The fields of genetics and genomics have an influence on almost all medical professions. It is ideal for doctors in all specialties to feel at ease using medical genomics and genetics in patient treatment. Up to 80% of uncommon diseases in the United States have a genetic foundation, which means that up to 10% of the population might benefit from practitioners who are proficient in medical genetics and genomics. Personalized medicine, which applies medical genetics and genomics to risk assessment, diagnosis, and treatment of common disorders, has the potential to fun-

damentally alter medical practise and enhance patient outcomes in addition to treating uncommon diseases [3].

In order to expand personalised medicine approaches, it is urgently necessary to train current and future medical professionals in the application of medical genetics and genomics. This need is made even more urgent by the fact that there are not many doctors who are board certified in medical genetics. Physicians and trainees must think that this education is required to be fully competent practitioners and that it has the potential to enhance the health of their patients and communities for such training to successfully influence practise.

Numerous illnesses caused by genome mutation have few effective treatments. Treatment for uncommon and hereditary disorders might be greatly improved by gene editing. Now, a system based on CRISPR-Cas9 is being considered as a viable tool for the treatment of genetic illnesses. Due of its small size and excellent effectiveness, the RNA-guided nuclease SaCas9 enzyme and its HF variants are frequently used for *in vivo* gene editing. The commonly used and updated techniques for modifying genes *in vivo* are gathered in the current study. Using CRISPR-Cas9-based systems has significant promise for therapeutic interventions in gene therapy and can be used to address hereditary illnesses. The delivery methods, the tissue in question, and a number of other aspects of *in vivo* gene editing present a caution. The techniques described in this article have been enhanced to provide great efficiency, delivery, and *in vivo* gene editing [4].

Conclusion

In order to comprehend the gene-function interactions underlying the biology of hematopoietic stem and progenitor cells, genetic editing of these cells can be used. This will help develop novel therapeutic strategies for treating illness. The capacity to gather, refine, and work with primary cells outside the body enables the evaluation of a wide range of gene editing strategies. Gene editing has been transformed by RNA-guided nucleases like CRISPR, which use Watson-Crick base-pairing to target activity to certain genomic loci. Precision modifications or vast random pools may now be tested in high-throughput screening tests because to the accessibility and low cost of synthetic, tailored RNA guides. Researchers now have a wide range of options for directed genomic change thanks to the ever-increasing number of CRISPR nucleases being discovered or engineered, including single base edits, nicks, or double-stranded DNA cuts with blunt or staggered ends, as well as the ability to target CRISPR to other cellular oligonucleotides like RNA or mitochondrial DNA.

Acknowledgement

Authors do not have acknowledgments currently

Conflict of Interest

There are no conflicts of interest.

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