



Short Communication

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Meet CRISPR

Alisha Rangara.

Corresponding Author: Alisha Rangara,

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Abstract

AIM- *The CRISPR-Cas9 (clustered regularly interspaced short palindromic repeats with CRISPR-associated protein 9) system is a revolutionary genome editing system that is easy to design, highly specific, efficient, robust, and well suited for high-through out and multiplexed gene editing for a variety of cell types and organisms. In this review we describe about CRISPR impact in dentistry.*

Keywords- *CAS-9, Gene editing, Gene Expression, Genetic disorder, Impact in dentistry, orofacial defect, Tumor promoting, Oral pathology, other diseases.*

Introduction

CRISPR -- Gene editing technology is a new tool that can be used to introduce targeted modifications into the genome. Currently, there are three well-defined technologies for gene editing: Zinc Finger Nucleases (ZFNs), Transcription Activator-Like Effector Nucleases (TALENs), and Clustered Regularly Interspaced Palindromic Repeats (CRISPRs) with CRISPR-associated (Cas) nucleases. Each of these systems is characterized by an adaptable sequence-specific DNA binding domain and a nuclease domain that creates a double-strand cleavage.

What is CRISPR-?

CRISPR- stands for clustered Regularly interspaced Short Palindromic Repeats.

The name refers to clusters of DNA Sequence that are found at regular intervals in genome of living organisms. It is a defense system commonly used by bacteria to fight phages/viruses, plasmid, transposons, and genome islands. Cas-9 is an RNA guided DNA endonuclease enzyme that acts like a pair of molecular scissors to cut strands of DNA.

CRISPRs constitute a family of short DNA repeats that are important components of the adaptive immune system in bacteria and archaea. These elements protect the microbes against various viral invasions. Cas proteins have functional domains that are similar to nucleases, helicases, polymerases, and polynucleotide-binding proteins. When a bacterium detects viral DNA, it produces two strands of short RNA called guide RNA, which then go on to form a complex with an endonuclease enzyme called Cas-9

How does it work?

Find the offending gene and manipulate the genetic structure to produce a normal genome sequence.

The CRISPR system comprises of two components:

- 1) A guide RNA (gRNA)-Target DNA sequence and is GPS that guides it to appropriate site
- 2) Non-specific CRISPR-associated endonuclease protein CAS9 and function as molecular scissor.

What is CRISPR- role in dentistry?

By now, you probably have heard about the revolutionary gene-editing tool, CRISPR. Scientists claim they can precisely and permanently modify any part of the genome without harming any other gene. With this simple yet powerful technology, researchers can delete or modify the genes that cause genetic diseases.

The Human Oral cavity provides the perfect portal of entry for viruses and bacteria in the environment to access new hosts. Hence the oral cavity is one of the most densely populated habitats of the human body containing some 6 billion bacteria and potentially 35 times that of many viruses. CRISPR-CAS9 system will be able to identify the causative genes in many oral pathologies and disorders including early childhood dental caries. It can overcome genetic Oro-facial defect anomalies.

CRISPR will also help in the identification of genes that suppress the tumor-promoting properties of the genes that cause oral cancer. Gene editing technology with its ability to identify, delete or replace genes can improve the prognosis of Squamous Cell Carcinoma of the oral cavity that arises due to viral and bacterial factors.

Conclusion

CRISPR technology has opened a world of endless possibilities for the diagnosis and treatment of genetic diseases and also its positive impact on dentistry.