The Torch
Vol. 2 (8)

CRISPR-Cas9 gene-editing tool

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In recent years, gene editing has given rise to many interesting tools among which the CRISPR-Cas9 gene-editing tool has gained more popularity and emerging as a versatile technology as a result of its high efficiency, ease of use, cost-effectiveness and accuracy. CRISPR (clustered regularly interspaced short palindromic repeats) in association with Cas 9 (CRISPR associated protein 9) is a genome editing system, which is found in prokaryotes. It is the adaptive immune system found in bacteria. Gene editing in general is the process by which a portion of the genome can be deleted, inserted or the sequence changed. In a bacterium with the CRISPR-Cas9 system, when a foreign viral DNA enters, the DNA sequence of the virus is read and stored in a CRISPR array. The CRISPR array contains the RNA segments complementary to the entire viral DNA that has been recognised by the system. Therefore, when the bacterium encounters the same type of virus again, it recognises and presents the RNA segment complementary to that virus from the CRISPR array, which attaches to the viral DNA. The RNA segment guides the Cas9 (which is an endonuclease) to the DNA and this selectively destroys the viral DNA. This technique found in bacteria could be used in the human system and it has enormous possibilities for gene silencing, gene knockout and gene insertion. This technique can be used for the treatment of various genetic abnormalities. The possibilities of this area of research are endless but there exist ethical debates as this technology could result in significant environmental consequences, which hinder its scientific progress and valid uses.

Keywords: CRISPR-Cas9, Gene editing, DNA, RNA, Treatment, Diseases

Citation:
Sreedevi PC. CRISPR-Cas9 gene-editing tool. The Torch. 2021. 2(8). Available from:
https://www.styvalley.com/pub/magazines/torch/read/crispr-cas9-gene-editing-tool.