Current Trends in Biomedical Engineering & Biosciences
ISSN: 2572-1151

Juniper Publishers
key to the Researchers

Opinion
Volume 9 Issue 2 -september 2017
DOI: 10.19080/CTBEB.2017.09.555760

Curr Trends Biomedical Eng & Biosci

CRISPR-Cas9: A Game Changing Tool in Cancer Research

Md Shariful Islam*

Department of Biotechnology and Genetic Engineering, Mawlana Bhashani Science and Technology University, Bangladesh

Submission: September 10, 2017; **Published:** September 25, 2017

***Corresponding author:** Md Shariful Islam, Department of Biotechnology and Genetic Engineering, Mawlana Bhashani Science and Technology University (MBSTU) Tangail-1902, Bangladesh, Email: sharifbge@gmail.com

Opinion

Cancers arise from the uncontrolled proliferation and spread of clones of transformed cells. So, some time-saving approaches are necessary to mimic the cancer initiation and progress [1]. The recent new technology clustered regularly interspaced short palindromic repeats-CRISPR-associated 9 (CRISPR-Cas9) system renews the genome editing approach into a more convenient and efficient way. This system accelerates the establishment of animal cancer models, promoting in vivo studies for cancer research. CRISPR-Cas9 system is modified into diverse advanced tools for observing the dynamic bioprocesses in cancer studies, such as image tracing for targeted DNA, regulation of transcription activation or repression.

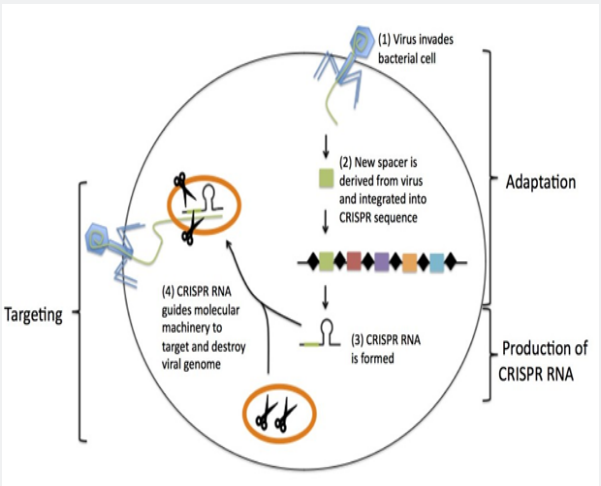

Figure 1: Mechanism of action of CRISPR [2].

The CRISPR system can sense the invaded DNA or RNA via CRISPR loci, which is arranged of short spacer sequences and interval short repeated segments. The system composes of a guide RNA component and a Cas9 nuclease as an enzyme component [2]. From Figure 1 we can observe that CRISPRs are regions in the bacterial genome that help defend against invading viruses. These regions are composed of short DNA repeats (black diamonds) and spacers (colored boxes). When a previously unseen virus infects a bacterium, a new spacer derived from the virus is incorporated amongst existing spacers. The CRISPR sequence is transcribed and processed to generate short CRISPR RNA molecules. The CRISPR RNA associates with and guides bacterial molecular machinery to a matching target sequence in the invading virus. The molecular machinery cuts up and destroys the invading viral genome.

CRISPR Screening: Gene Discovery in Cancer Research

Cancer genome carries a diversity of genetic aberrations, which are accumulated by innate and acquired mutations, and trigged by a succession of clonal expansions [3]. A major challenge in clarifying cancer initiation and progression is to identify the genes driving tumor evolution [4]. Large-scale genomic screening is a powerful technology capable of detecting the genes whose mutation initiates various cancers [5]. However, the poor knockdown efficiency of siRNA and shRNA strategies is problematic, making gene silent difficult and library screening labor intensive.

CRISPR: friendly access to animal cancer model

Besides large-scaled screening, CRISPR also accelerates the establishment of cancer models [6]. CRISPR provides a more accessible and efficient tool to introduce genetic alterations into mouse embryonic stem (ES) cells or into zygote [7].

Future Perspective

With the fast progression of the CRISPR-based engineering system in cancer biology, we can predict this technology will change general picture in cancer research, provide new approaches for personalized therapy, or contribute to gene

therapy, immunotherapeutic applications, genetic disorder treatment, and etc.

Conclusion

The efficiency of CRISPR-Cas9 system in near future may accelerate the application in cancer research. Some new methodology may provide alternative possibilities in gene editing processes. With commencement of researchers in the world, the genome-wide specificities should be further improved; and the CRISPR-Cas9 system should be becoming a more preferable technology that can be applied in all fields of life sciences. We believe it will be a big evolution in gene therapy for cancer and genetic diseases in future.

References

1. Sanchez-Rivera FJ, Jacks T (2015) Applications of the CRISPR-Cas9 system in cancer biology. Nat Rev Cancer 15(7): 387-395.
2. Barrangou, R, Marraf×ni L (2014) CRISPR-Cas Systems: Prokaryotes Upgrade to Adaptive Immunity. Mol Cell 54(2) : 234-244.
3. Jinek M, Chylinski K, Fonfara I, Hauer M, Doudna JA, et al. (2012) A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity. Science 337(6096): 816-821.
4. Hanahan D, Weinberg RA (2011) Hallmarks of cancer: the next generation. Cell 144(5): 646-674.
5. Garraway LA, Lander ES (2013) Lessons from the cancer genome. Cell 153(1): 17-37.
6. Maddalo D, Manchado E, Concepcion CP, Bonetti C, Vidigal JA, et al. (2014) In vivo engineering of oncogenic chromosomal rearrangements with the CRISPR/Cas9 system. Nature 516(7531): 423-427.7.
7. Yang H, Wang H, Shivalila CS, Cheng AW, Shi L, et al. (2013) One-step generation of mice carrying reporter and conditional alleles by CRISPR/Cas-mediated genome engineering. Cell 154(6): 1370-1379. .

DOI: 10.19080/CTBEB.2017.09.555760

How to cite this article: Md Shariful Islam.CRISPR-Cas9: A Game Changing Tool in Cancer Research. Curr Trends Biomedical Eng & Biosci. 2017; 9(2): 555760. DOI: 10.19080/CTBEB.2017.09.555760