

CRISPR Cas9

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In News

Genome editing (also called gene editing) is a group of technologies that give scientists the ability to change an organism's DNA. These technologies **allow genetic material to be added, removed, or altered at particular locations in the genome.** Several approaches to genome editing have been developed. A recent one is known as CRISPR-Cas9, which is short for **clustered regularly interspaced short palindromic repeats and CRISPR-associated protein 9.**

More About CRISPR Cas9

- The CRISPR-Cas9 system has generated a lot of excitement in the scientific community because it is **faster, cheaper, more accurate, and more efficient** than other existing genome editing methods.
- CRISPR-Cas9 was **adapted from a naturally occurring genome editing system in bacteria.** The bacteria capture snippets of DNA from invading viruses and use them to **create DNA segments known as CRISPR arrays.**
- The CRISPR arrays allow the bacteria to **remember the viruses** (or closely related ones). If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA. The bacteria then use Cas9 or a similar enzyme to **cut the DNA apart, which disables the virus.**
- The CRISPR-Cas9 system works similarly in the lab. Researchers create a small piece of RNA with a **short guide sequence** that attaches (binds) to a specific target sequence of DNA in a genome. The RNA also binds to the Cas9 enzyme.
- As in bacteria, the **modified RNA is used to recognize the DNA sequence,** and the Cas9 enzyme cuts the DNA at

the targeted location.

- Once the DNA is cut, **researchers use the cell's own DNA repair machinery to add or delete pieces of genetic material, or to make changes to the DNA by replacing an existing segment with a customized DNA sequence.**
- Genome editing is of great interest in the **prevention and treatment of human diseases.** Currently, most research on genome editing is done to understand diseases using cells and animal models. Scientists are still working to determine whether this approach is safe and effective for use in people.
- It is being explored in research on a wide variety of diseases, including **single-gene disorders** such as cystic fibrosis, hemophilia, and sickle cell disease. It also holds promise for the treatment and prevention of more **complex diseases**, such as cancer, heart disease, mental illness, and human immunodeficiency virus (HIV) infection.