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GENE EDITING TECHNOLOGIES: FROM CRISPR TO FUTURE FRONTIERS IN BIOTECHNOLOGY

CRISPR/Cas9, a revolutionary gene-editing technology, offers simplicity and precision compared to older methods like homologous recombination and TALEN. Originating from bacteria and archaea, it defends against foreign DNA by guiding the Cas9 protein to specific sequences with the help of guide RNA.

CRISPR/Cas9 has three main steps. First, it collects bits of DNA from invaders like viruses and adds them to its own genetic code. Then, it makes special guide molecules that help the scissors find the right spot on the DNA to cut. Finally, it snips the DNA at that spot, either removing a piece, adding something new, or changing what is already there.

People use CRISPR/Cas9 in lots of ways. In farming, it helps make crops better by making them resistant to pests and diseases. Scientists can also use it to study diseases by changing genes in animals, making them useful models for understanding how diseases work.

In medicine, CRISPR/Cas9 shows promise for treating genetic diseases. It has been used to fix genetic problems in animals, like fixing cataracts (a kind of eye problem) and other inherited diseases. Researchers are also looking into using it to fight diseases like HIV and cancer by changing certain cells in the body.

There are some challenges of using this technology. Sometimes CRISPR/Cas9 makes mistakes and cuts DNA in the wrong places. There are also ethical issues about whether we should change genes in ways that could affect future generations.

Even with these challenges, scientists are working hard to make CRISPR/Cas9 better and safer. They want to use it to help more people and make sure it is done in the right way.

In the future, CRISPR/Cas9 could be used in even more ways, like storing information in DNA, which could change how we think about technology and health.