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Never Heard of CRISPR-Cas9? You're in for a Treat!

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CRISPR-Cas9 might sound vaguely familiar to you, but even if it doesn't, that's okay because we're going to go over the basics of it right here. Even if you're not very science minded, odds are that you will find the gene-editing capabilities of CRISPR-Cas9 to be pretty darn cool.

What Exactly Is CRISPR-Cas9 Anyway?

CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats, and they are a group of DNA sequences that originate from single-celled organisms, such as bacteria. The Cas9 part stands for CRISPR-associated protein 9, and it is an enzyme that uses the CRISPR DNA sequence to identify certain strands of DNA. Essentially, it serves as a guide to finding and editing DNA.

The Cas9 protein came about from bacteria that were tired of getting attacked by viruses. The bacteria evolved to have DNA-cutting proteins that could cut out the virus-causing genes. Then, the bacteria would take a tiny portion of the virus and insert it into their own DNA so that they would be able to recognize the virus if it came around again.

The sequence of those genes is referred to as a "guide RNA," a repetitive palindromic pattern. Sound familiar? It's where CRISPR technology comes from.

Scientifically Modified

The bacteria naturally did this cut and paste sort of thing with genomes in its DNA. After scientists discovered this, they worked on mimicking that process in the lab, and the result was CRISPR technology. Of course, they went a step further and designed the CRISPR-Cas9 gene editing tool, in order to find genes that lead to genetic disorders or diseases.

They could then use CRISPR to cut out the defective gene, and then they could either leave the gap there or fill it with something else. Leaving the gap means kicking the gene out of the DNA sequence while replacing it with something else means repairing it.

CRISPR Applications

So, what are scientists doing with this fancy CRISPR technology? Researchers have been experimenting with mice and other animal test subjects to see how CRISPR can eradicate certain genetic diseases. The scientists have found some disease-causing genes and worked to cut them out

of the genetic code in mice. This includes diseases such as HIV and muscular dystrophy.

China was the first nation to try using this technique on human subjects, but of course, the practice is not without its detractors. There are some serious ethical questions that are cropping up, as people worry about humans having the power to manipulate life.

That being said, most of the applications right now are to help eliminate the prevalence of genetic disorders in patients, rather than sort out what kind of physical traits babies will have.

On the positive side, CRISPR technology is the most precise method that scientists have for gene editing. It has so many broad applications, plus it's less expensive and less time consuming than ever before.

Right now, the National Academy of Sciences and the National Academy of Medicine support ongoing CRISPR-Cas9 research into gene editing, specifically experiments that are focusing on treating and even preventing disease.
That being said, they specify that they support research related to editing inherited genes that lead to serious disorders and disabilities. In other words, they are not interested in creating "designer babies" with specifically chosen eye and hair colors and personality traits.

One of the most exciting aspects of CRISPR-Cas9 is in the area of cancer treatment and early detection What would it mean if scientists could edit out the gene that causes cancer in human patients? Time will tell, and in the meantime, keep an eye out for CRISPR news, as this technology is rapidly evolving and changing up the health and science fields.

Photo by [redacted] **Hal Gatewood**

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