What is CRISPR?

KS3 KS4 Ages 11-16 ⏰ 5 min read

Every cell in your body contains a complete copy of your DNA — a three-billion-letter instruction manual written in a four-letter alphabet. For most of history, that code was fixed. You were born with it, you lived with it, and if it contained errors that caused disease, there was very little anyone could do. Then came CRISPR.

What is it?

CRISPR (pronounced "crisper") stands for Clustered Regularly Interspaced Short Palindromic Repeats — a name that tells you very little about what it does. In practical terms, CRISPR is a molecular tool that can find a specific sequence of DNA, cut it precisely, and allow scientists to delete, repair, or replace that sequence.

The technology was adapted from a natural defence system bacteria use against viruses. Bacteria store fragments of viral DNA as a kind of "wanted poster" — when that virus appears again, the CRISPR system recognises it and sends a protein called Cas9 to cut it apart. Scientists realised they could reprogram this system to target any DNA sequence they chose.

📝 Imagine your DNA is a book three billion letters long. Before CRISPR, if you wanted to fix a typo on page 1,847,293, you'd need to either find it by hand (essentially impossible) or use crude tools that made corrections but also damaged surrounding text. CRISPR is like giving scientists a precise Find and Replace function — they can search for the exact string of letters they want, jump straight to it, and make a clean edit.

What can it do?

The potential is extraordinary. In medicine, CRISPR has already been used to treat sickle cell disease — a painful inherited blood disorder — with results that look close to curative. Trials are underway for cancers, inherited blindness, HIV, and high cholesterol. In agriculture, CRISPR is being used to develop crops that are resistant to disease, need less water, or produce higher yields without the controversy of older genetic modification techniques.

What are the concerns?

The most serious concern is "off-target effects" — the molecular scissors sometimes cut in the wrong place, which could cause unintended mutations. In most therapies this is manageable, but the stakes are higher in anything that affects reproductive cells, because those changes would be inherited by future generations. In 2018, a Chinese scientist controversially created the first CRISPR-edited human babies, sparking international condemnation and leading to his imprisonment. The scientific consensus is clear: editing human embryos for reproduction is not yet safe or ethically acceptable. Using it to treat disease in living patients is a very different matter — and one that looks increasingly promising.