Talking to patients about CRISPR

What is it, what can it offer, and what are its limits?

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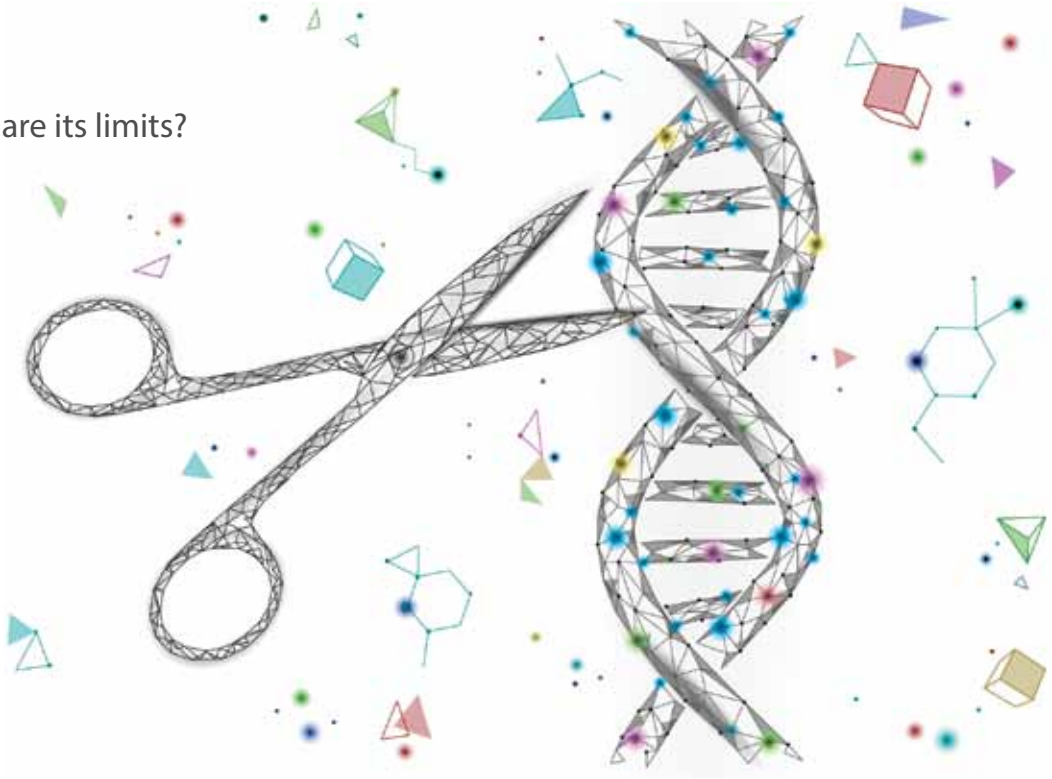

There have been many headlines on CRISPR (clustered regularly interspaced short palindromic repeats) technology lately. When a patient gets an upper respiratory tract infection from some virus, the body's immune system takes care of the symptomatology and then provides an immunity protecting the body against further infections from the same virus. CRISPR is simply the bacteria's way of doing this.

When a virus gets into a bacterium's DNA, the bacterium sticks a long chain of CRISPR of DNA on both sides of the viral DNA. An RNA matching strand attached to a pair of DNA scissors (an enzyme called Cas) then binds to this area and snips out the viral DNA the next time it tries to infect the bacterium. However, this revolutionary technology is not limitless.

This technology will *not* be used to improve athletic performance, simply because athletic ability depends on many, many genes. There is *animal* research using gene editing to increase the lean muscle mass in pigs, but that won't help Usain Bolt, the Olympic sprinter, who is more than a human with big muscles. Those muscles are part of a human body including a brain that gives him the ability to run really fast, and CRISPR is not going to work here.

This technology will *not* be used to increase human intelligence for the same reason. Intelligence depends on too many genes, and science doesn't really even know how to measure intelligence.

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This technology will *not* be used to change germ lines, namely eggs and sperm, that alter the human genome, as that it is illegal in Canada under the Assisted Human Reproduction Act of 2004.

But this technology *will* hopefully be useful in treating patients with single genetic point mutations, like sickle cell anemia and thalassemia. Trials on sickle cell anemia in which some of a patient's bone marrow is taken, then edited, then injected back into the patient are starting now. Difficult, unresolved questions remain about how much bone marrow needs to be edited, what percentage of the edited cells will wind up back in the bone marrow, and how effective they will be if they transport back to the bone marrow, but answers are forthcoming.

This technology has been around for roughly 7 years, and complicated patent issues are ongoing. But eventually, if the sickle cell trials are successful, it will likely be standard treatment for this single point mutation illness. ■

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This article has been peer reviewed.