Starting a Revolution Isn't Enough - By Jennifer A. Doudna - The Atlantic, September 12, 2022

CRISPR is changing the world—but it can do more.

Two years ago, I was working on my laptop in an airport lounge in Newark, New Jersey, when I glanced up and saw a couple walking with their two boys. The younger boy slowly made his way on crutches, displaying the telltale signs of a hereditary disease called muscular dystrophy. Generally manifesting in childhood, the disease steadily robs those who have it of their ability to walk. Eventually, I knew, the crutches would no longer be enough.

My heart skipped a beat. Most types of muscular dystrophy originate with genetic mutations that weaken key muscle proteins, and I had just come from a meeting where a cure appeared possible, using CRISPR technology to rewrite the DNA of kids just like him.

Imagining how the technology I'd helped create could change this boy's life, I was overwhelmed with emotion. Beyond hope and wonder, I was filled with a sense of fierce urgency to expand CRISPR's impact to the people around the world who need it most. […]

In the mid-2000s, I was leading a research lab at UC Berkeley. […] In a life-changing collaboration with the French scientist Emmanuelle Charpentier, we figured out how we could […] cut the genome with unprecedented ease and accuracy in virtually any cell. This niche discovery has spurred an entire biotech revolution of its own. In animal and plant cells, cutting DNA with CRISPR-Cas9 allows us to turn some genes off and to turn others on. […] CRISPR has been used to enable T cells to find and destroy cancer cells, and to disrupt production of a disease-causing protein in patients with hereditary transthyretin amyloidosis, a genetic disease that irreversibly damages the nerves and heart. […] Using CRISPR to breed a tomato variety, approved for sale in Japan, has enhanced its nutritional qualities. For other crops, CRISPR is being used to increase yield, reduce pesticide and water use, and protect against disease.

These advances—and more like them to come in preventive medicine, diagnostics, agriculture, biomanufacturing, and synthetic biology—promise to improve the lives of millions of people. […]

Sometimes, when I think about my part in all this, I am overcome. Few scientists get to experience what I have. And while I'm immeasurably pleased by the progress that's happened since the publication of our first CRISPR-Cas9 paper a decade ago, I also feel a continual sense of urgency: Are we dreaming big enough? Moving quickly enough? I think back to the advent of the cellphone—another groundbreaking technology in our shared memory. […] Who could have predicted that this once niche and luxury technology would become so ubiquitous as to outnumber the human population, creating new economies and changing the way we live?

CRISPR may well be on a similar precipice. But for this technology to be widely adopted, it needs a push, just like mobile phones did. […] Governments, universities, and investors will need to make significant and sustained investment in cutting-edge science at labs and at biotechnology companies, as well as investments in infrastructure and manufacturing to ensure that this work is scalable. With this kind of concerted and collective effort, the applications and benefits of CRISPR could become as accessible, commonplace, and useful as the phones in our pockets. […]

Powerful technology, of course, comes with the potential for misuse, and CRISPR's powers raise important questions. How do we ensure that genome editing is deployed only when medically necessary? Who determines what *medically necessary* means? How do we ensure that those in need have access when people or companies with money and power cut in line? The clinical applications I've described so far concern individuals, where genome editing affects only the treated patient. But genome editing could also alter germ lines—eggs, sperm, or embryos—to create heritable changes that can be passed to future generations. Some environmental applications of CRISPR, too, can rapidly change the genetics of large populations. These strategies could help fight the spread of invasive species and devastating diseases such as malaria, but without careful assessment and governance, they could also pose a risk to whole ecosystems. […] Without guardrails, we may not only harm humans and our environment, but also risk societal backlash against the very technologies that could preserve and improve our health and make our planet more livable. […]

Jennifer Doudna is a UC Berkeley biochemist, founder of the Innovative Genomics Institute, and a Nobel Prize–winning co-inventor of CRISPR gene-editing technology.