Crispr May Cure All Genetic Disease —One Day

Megan Molteni

Jennifer Doudna. Cole Wilson for WIRED

Jennifer Doudna was sitting in her UC Berkeley office when she got the first call from a reporter asking what she thought about scientists using Crispr to modify embryos. At the time, the embryos in question were monkeys. It was late 2014, and Doudna was just beginning to become the face of Crispr/Cas9—the bacterial enzyme behind today's gene editing revolution. Since then she has fielded an ongoing avalanche of questions about the implications of her discovery. How it's going to change the future of everything from medicine to agriculture to energy production. But inevitably the questions always get around to super-babies.

Today, at WIRED's 2017 Business Conference in New York, it took just a few minutes. Doudna said it was exactly this possibility—Crispr custom-designed human offspring—that made her take a step back from her own research and get involved in public discussions around the technology. For the last few years she's been speaking to scientists, politicians, and federal regulators around the world about the potential risks and rewards of Crispr. "I think it's really likely that in the not-too-distant future it will cure genetic disease," she said. "But globally we need to come up with a consensus on moving forward in a responsible way."

In 2015, Doudna was part of a broad coalition of leading biologists who agreed to a worldwide moratorium on gene editing to the "germ line," which is to say, edits that get passed along to subsequent generations. But it's legally non-binding, and scientists in China have already begun experiments that involve editing the genome of human embryos. Using Crispr to cure inheritable genetic diseases is still a long way off, and fraught with ethical potholes. Which is why Doudna said people who are excited about the possibilities of Crispr shouldn't look to the clinic for its first big successes, but rather to the farm field.

"When I think about where we are likely to see the biggest impacts in the shortest amount of time, I really think it's going to be in agriculture," she said. Plant breeders have always been geneticists at heart. And with the precision and ease of Crispr, identifying and separating out desirable traits has the potential to speed up new crop development by several orders of magnitude. Agro-giants DuPont and Monsanto have invested in Crispr licenses to accelerate their R&D efforts toward creating crops that can withstand changing climates and new disease and pest burdens. In test plots around the world gene edited crops are already growing—from longer-lasting potatoes and flood-resistant rice to drought-hardy corn and mildew-proof wheat, to name just a few.

As a tomato farmer, Doudna was most excited about a paper that came out just last month. In it, scientists from Cold Spring Harbor Laboratory in New York tackled some of the crop's trickiest modern traits. While wild plants benefit from dropping fruit—it helps seed dispersal—farmers want plants where the fruit stays on, so mechanical pickers have an easier time harvesting them. When breeders found a trait called 'jointless' that did keep the fruit on the vine, they rushed to incorporate it into their domesticated tomato varieties. But when they crossed 'jointless' into existing tomato breeds, the resulting plants put out all these extra branches, actually diminishing the number of fruits they produced.

Using genetics to trace back 10,000 years of tomato domestication, Cold Spring Harbor researchers discovered which genes led to that weird branching. Then they used Crispr to edit their activity. The result—tomato plants with great yields that don't drop their fruits.

"For me, that really illustrates the potential for this," Doudna said. "Crispr allows plant breeders to do things that would have been very difficult, sometimes impossible in the past."