Gene Editing: The Dual-use Conundrum

Dual-use may be best understood by considering the functions of a knife. Used against an enemy, a knife can be deadly. In the hands of a skilled surgeon, a knife may be life-saving, removing a gangrenous appendage or excising a cancerous mass.

Wikipedia defines dual-use this way: “In politics and diplomacy, dual-use is technology that can be used for both peaceful and military aims. More generally speaking, dual-use can also refer to any technology which can satisfy more than one goal at any given time.”

Behind the debate over the Iran nuclear deal lurked the dual-use issue. On the one hand, there were those claiming that Iran had every right to develop nuclear power in pursuit of peaceful aims. In the other camp were those who maintained that possession of nuclear technology was a path towards developing nuclear weapons, and in the hands of a regime hostile to America’s purported friend and ally, Israel, was too dangerous to be allowed to manifest.

Dual-use has implications reaching beyond nuclear science. Those watching the development of what is termed “biodefense” are uncomfortably aware that the production of countermeasures for biological weapons also necessitates the development and possession of the weapon itself. Increasingly, accusations are being levied that countermeasure research may be a “cover” for weapons development.

In the biological sciences, the debate concerning dual-use technology just ramped up a notch. Recently, the office of the US Director of National Intelligence issued a report declaring that genome editing constituted a “weapon of mass destruction.” Stated the report: “Given the broad distribution, low cost, and accelerated pace of development of this dual-use technology, its deliberate or unintentional misuse might lead to far-reaching economic and national security implications.”

Although the report did not cite Crispr-Cas9 by name, the reference to this gene editing tool was clear. The Crispr-Cas9 was developed in 2012 by Jennifer Doudna, a Berkeley professor of biochemistry and molecular biology and is considered revolutionary in its potential impact on life sciences. Cheap (one can acquire the components for $60 online) and easy to use, the Crisp-Cas9 allows scientists to edit genes in order to correct genetic illnesses.

Doudna’s discovery has some folks positively chirping. Gushes Techcrunch,

“Doudna found a protein in Streptococcus bacteria that will “snip” certain DNA at precise areas. It’s like a sort of biological scissors that cuts the DNA where you want to cut. And it has the potential to eradicate cancer, Parkinson’s, herpes, or even do away with disease-bearing mosquitoes. It can also make microorganisms produce spider silk, the scent of roses, glow in the dark and many other actions
so far. What Doudna has embarked upon, in short, is the find of the century.”

Applied to the human germline, however, some darker concerns emerge. “Germline editing” would impact those cells which would transmit the alterations to future generations. And it is this potential that has Director of National Intelligence James Clapper worried.

For not only can the Crispr-Cas9 replace cells which are causing illness; it can also be used in editing heritable cells in embryos which will pass on the changes. It is now possible for scientists (and whomever else has the 60 bucks) to create a new “line” of human beings. And here potentially lies the dual-use conundrum of Crispr-Cas9.

The office of the DNI declined to comment further on the inclusion of germline editing as a potential “weapon of mass destruction.” However, the DNI report contains some language that deserves further scrutiny and elucidates why this technology has hit the intelligence community’s radar.

According to the DNI report, “Research in genome editing conducted by countries with different regulatory or ethical standards than those of Western countries probably increases the risk of the creation of potentially harmful biological agents or products.”

The regulatory standards of Western countries, however, do not necessarily prohibit this kind of research.

While Great Britain is often cited as having laws which prohibit germline editing, the British government permits, at its discretion, this research. Recently, Time Magazine reported that Great Britain has given the green light to a germline editing research project. According to Time, “The U.K.’s Human Fertilization and Embryo Authority (HFEA) decided to approve a researcher’s request to use Crispr to permanently change DNA in a human embryo.”

The project, which is launched by the Francis Crick Institute, is specifically a research-only project, we are told. “I promise you she has no intention of the embryos ever being put back into a woman for development,” Robin Lovell-Badge, group leader at the Crick Institute, told TIME.”

Germline editing got a big dose of publicity last year, when it was reported that researchers in China had accomplished germline editing on embryos, also without implanting the embryos. As a result, an international summit was called last December, for the purposes of examining the ethics of this technology. The summit, which took place in Washington, DC, issued a statement which fell short of condemning this research. Instead, the summit asserted that the technical and ethical issues should be settled before anyone attempts to edit the human germline.

The closing statement read: “It would be irresponsible to proceed with any clinical use of germline editing unless and until the relevant safety and efficacy issues have been resolved, based on appropriate understanding and balancing of risks, potential benefits, and alternatives, and there is broad societal consensus about the appropriateness of the proposed application.”

The US does not prohibit the use of germline editing. The National Institute of Health has declared, “NIH will not fund any use of gene-editing technologies in human embryos. The concept of altering the human germline in embryos for clinical purposes has been debated over many years from many different perspectives, and has been viewed almost universally as a line that should not be crossed.”

While appearing to condemn the use of this technology, what the NIH has done here is to allow it to be privately funded. This opens the door for wealthy eugenicists, such as Bill Gates, to create an entirely new strain of human beings, and to do so without violating any law.

This may be seen as an aspect of a duality in US law, which appears to discourage while actually is encouraging certain types of activity.

The fix may be in. Recently, the Hastings Center announced it received a grant to study the ethics of human genome editing. In its news release, Hastings stated that “The three-year project, which is supported with nearly $1 million from the Templeton Foundation, is examining a variety of fundamental questions about how use of gene editing in humans might affect “human flourishing” and core human values such as love, compassion, acceptance, and respect for those with disability.”
The Templeton Foundation funds research into eclectic areas and provides grant money to speculative research on spiritual issues. Sir John Templeton was a follower of the Chicago School neoliberal giant, Milton Friedman, whose ideas translated into dollar signs for the well-to-do and a short stick for anyone else. Along with funding research into “goodness” and “moral character,” the Foundation has provided donations to the neoconservative think tank, the Cato Institute, and has funded research into GMOs.

At least one of the principal researchers in the Hastings Center genome research project may have her mind already made up. Addressing the argument that parents will want to use this new technology to provide their children with a better prospective future, Hastings’s research director Josephine Johnston wrote: “It will be difficult to ban the use of gene editing for this purpose, because doing so would restrict both parental rights and reproductive freedom.”

Erik Parens, who is also one of the chief researchers in this project, has already been found leaning towards a future which involves genetically modified humans. In an article entitled, “Can Parents Be Trusted with Gene Editing Technology?” Parens discusses the obligation of parents to not only accept their children, but to shape them. Parens writes, “Grasping the nature of this tension in the context of embryo editing forces us to revisit the question, ‘Is eugenics inherently bad?’ It forces us to see why it won’t be enough to assert, ‘You can’t do that, it’s eugenics!’ — and why we need to distinguish between good and bad eugenic practices.”

There is some essential hubris involved in the very concept of this level of tinkering with nature. Gene drives, defined by Science Magazine as “... stimulating biased inheritance of particular genes to alter entire populations of organisms,” have got some thinking about the potential for eradicating entire populations. MIT’s Sculpting Evolution recently waxed rhapsodic about these possibilities:

“Gene drives could benefit human health by altering insect populations that currently spread diseases such as malaria, schistosomiasis, dengue, and Lyme so that they can no longer transmit the disease to humans. They could improve the sustainability of agriculture by reducing the need for and toxicity of pesticides and herbicides. Finally, they could aid ecological restoration by removing invasive species and bolstering the defenses of threatened organisms. Collectively, they offer a way to solve biological problems with biology instead of broadly toxic pesticides and bulldozers. On a metaphorical level, we are finally learning to speak with the living world using nature’s own language.”

Through the centuries, the potential of remaking the world in a “better” image has motivated both political activists and mad dictators, Gandhis and Hitlers. Before the final weighing in on dual-use technologies such as genome editing, it might be best to revisit the dual nature of humanity and how power tends to corrupt whomever bears its mantle.

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