

Can CRISPR make cheap, GM-based WMDs?

Here's a quiz. What do these items have in common:

- Development of nuclear ballistic missiles in North Korea
- Russia's new ground-launched cruise missile, which might violate the 1987 INF treaty
- Chemical weapons in Syria and Iraq
- CRISPR-Cas9

Stumped? They were [all cited](#) as weapons of mass destruction and a “major threat to the security of the United States, its deployed troops, and allies,” according to the latest Worldwide Threat Assessment of the U.S. Intelligence Community. National Intelligence Director James Clapper presented the report to the U.S. Senate Armed Services Committee in February.

The report, while not naming CRISPR directly, clearly implicates the new gene editing technique for possible “dual use,” which means it could be used to advance science and medicine, but also could advance a terrorist's more nefarious motives:

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. 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. Advances in genome editing in 2015 have compelled groups of high-profile US and European biologists to question unregulated editing of the human germline (cells that are relevant for reproduction), which might create inheritable genetic changes. Nevertheless, researchers will probably continue to encounter challenges to achieve the desired outcome of their genome modifications, in part because of the technical limitations that are inherent in available genome editing systems.

Though Clapper and the latest Threat Assessment both state that genetic engineering has been a prime suspect for “dual use” by terrorists and scientists, this is the first time a GM technique has been targeted as a WMD.

CRISPR, [short for](#) clustered, regularly interspaced, short palindromic repeat, when combined with a nuclease enzyme like Cas9, is able to precisely cleave junctions in strips of nucleic acids, making it easier, faster and more efficient to make changes to genes. While the technique has not been perfected (Cas9 has made a few errors, which scientists are working on reducing), it has opened the door for a wider array of possible changes to genomes. And that's scared some people: a meeting last summer concluded that the technique should not be applied to human germlines (at least not yet, anyway).

Now, the questions have become: Can CRISPR-Cas9 be harnessed by terrorists? Can it be used to make

a cheap biological weapon?

The answer is; technically yes, but making such a weapon would be very, very difficult. CRISPR is simply another technique for working with genomes; in itself, it does not discover novel sequences like PCR or sequencing might. Even then, producing an enhanced pathogen would require a deep knowledge of that pathogen's genetics. Most terrorist organizations would probably not have many scientists with that knowledge, but a sovereign government might.

Clapper's Senate testimony took a number of scientists and even intelligence experts by surprise.

Piers Millet, an expert on bioweapons at the Woodrow Wilson Center in Washington, D.C., said that making a bioweapon—even with the cheaper, easier techniques offered by CRISPR—requires mastering a “wide raft of technologies.”

Any development of bioweapons—by any person, state or institution—is banned by the Biological and Toxin Weapons Convention, a treaty signed in 1972 by the U.S., China, Russia and 172 other countries. Meetings of intelligence experts have so far resulted in assessments that concluded that terrorist groups don't have the capacity to develop a virulent form of anthrax, or an enhanced Ebola virus.

[Other scientists](#), though, agree with Clapper's warning. [Robin Lovell-Badge](#), a scientist at Great Britain's Francis Crick Institute who co-discovered the SRY gene on the human Y chromosome, recently shared his concerns that some rogue researchers might be doing gene editing work outside the bounds of treaties and the law. And Dalhousie University bioethicist Francoise Baylis warned that “I think bioterrorism is a reality, and a risk factor we need to take into consideration. It's like any dual-use technology that can be used for good or evil.”

So, who would these rogue scientists be? Is there terrorism in the lab?

Some information identifying terrorists with CRISPR capabilities is no doubt classified, and so far, groups like ISIL or Al-Qaeda have not introduced any such bioweapon (that we know of). But, a number of [“DIY” science groups](#) have sprung up worldwide, for another dual use: to take advantage of cheaper, easier techniques like CRISPR-Cas9, and to introduce scientific experimentation to a larger group of people.

Also called “biohackers,” a number of these groups allow amateur scientists to attend lectures on biotechnology, discuss lab techniques and even perform some experiments using those techniques. All known “DIY” labs are at a biosafety level of 1 (meaning they can't work with pathogens or even mammalian cells). In addition, some of these organizations have reported formal visits from the FBI and Department of Defense.

But biohacking and WMD-conspiracies aside, it's important to remember that the last—and so far, only—act of bioterrorism that caught public attention was the development and mailing of anthrax spores to several destinations in the United States. The culprit? Prosecutors insist that it was Bruce Ivins, a scientist working at the high-security U.S. Army biodefense facility in Fort Detrick, Maryland (Ivins committed suicide before he could face trial).

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