

Now for GM weapons

It's time to get tough with the biotech firms over germ warfare

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For the first 10 days we worried about commercial aeroplanes being hijacked and used as missiles. Now, the American people are worried about a new, even more deadly threat: bacteria and viruses raining from the sky over populated areas, infecting and killing millions of people.

The FBI reports that several of the World Trade Centre hijackers had made a number of visits to a facility in Florida housing crop-duster planes. According to the proprietors, the hijackers asked questions about the load capacity and range of the planes.

The FBI has subsequently ordered all 3,500 of the nation's privately owned crop dusters grounded, pending further investigation. Meanwhile, universities, including the University of Michigan, Penn State, Clemson and Alabama, have barred aircraft from flying over their stadiums during football games, for fear of a biowarfare attack. Policy makers are scurrying to catch up, by allocating funds to stockpile antibiotics and vaccines, and upgrading emergency procedures at hospitals and clinics.

Unfortunately, to date, the politicians, military experts and media have skirted a far more troubling reality about bio-terrorism. The fact is, the new genomic information being discovered and used for commercial genetic engineering in the fields of agriculture, animal husbandry and medicine is potentially convertible to the development of a wide range of novel pathogens that can attack plant, animal and human populations.

Moreover, unlike nuclear bombs, the materials and tools required to create biological warfare agents are easily accessible and cheap, which is why this kind of weapon is often referred to as the "poor man's nuclear bomb". A state-of-the-art biological laboratory could be built and made operational with as little as \$10,000-worth of off-the-shelf equipment and could be housed in a room as small as 15ft by 15ft. All you really need is a beer fermenter, a protein-based culture, plastic clothing and a gas mask.

Equally frightening, thousands of graduate students in laboratories around the world are knowledgeable enough in the rudimentary uses of recombinant DNA and cloning technology to design and mass-produce such weapons.

Ironically, while the Bush administration is now expressing deep concern over bioterrorism, just this summer the White House stunned the world community by rejecting new proposals to strengthen the biological weapons convention. The stumbling block came around verification procedures that would allow governments to inspect US biotech company laboratories. The companies made it clear that they would not tolerate monitoring of their facilities for fear of theft of commercial secrets.

Biological warfare involves the use of living organisms for military purposes. Biological weapons can be viral, bacterial, fungal, rickettsial, and protozoan. Biological agents can mutate, reproduce, multiply, and spread over a large geographic terrain by wind, water, insect, animal, and human transmission.

Once released, many biological pathogens are capable of developing viable niches and maintaining themselves in the environment indefinitely. Conventional biological agents include *Yersinia pestis* (plague), tularemia, rift valley fever, *Coxiella burnetii* (Q fever), eastern equine encephalitis, anthrax and smallpox.

Biological weapons have never been widely used because of the danger and expense involved in processing and stockpiling large volumes of toxic materials and the difficulty in targeting the dissemination of biological agents. Advances in genetic engineering technologies over the past decade, however, have made biological warfare viable for the first time. Recombinant DNA "designer weapons" can be created in many ways. The new technologies can be used to program genes into infectious micro-organisms to increase their antibiotic resistance, virulence and environmental stability.

Scientists say they may be able to clone selective toxins to eliminate specific racial or ethnic groups whose genotypic makeup predisposes them to certain disease patterns. Genetic engineering can also be used to destroy specific strains or species of agricultural plants or domestic animals.

The new genetic engineering technologies provide a versatile form of weaponry that can be used for a wide variety of military purposes, ranging from terrorism and counterinsurgency operations to large-scale warfare aimed at entire populations.

Most governments, including the US, claim that their biological warfare work is only defensive in nature and point out that the existing biological weapons treaty allows for defensive research. Yet it is widely acknowledged that it is virtually impossible to distinguish between defensive and offensive research in the field. Professional military observers are not sanguine about the prospect of keeping the genetics revolution out of the hands of the war planners. As a tool of mass destruction, genetic weaponry rivals nuclear weaponry, and it can be developed at a fraction of the cost.

The revelation that Iraq had stockpiled massive amounts of germ warfare agents and was preparing to use them during the Gulf war renewed Pentagon interest in defensive research to counter the prospect of an escalating biological arms race.

Saddam Hussein's government had prepared what it called the "great equaliser", an arsenal of 25 missile warheads carrying more than 11,000lb of biological agents, including deadly botulism poison and anthrax germs. An additional 33,000lb of germ agents were placed in bombs to be dropped from military aircraft. Had the germ warfare agents been deployed, the results would have been as catastrophic as those visited on Hiroshima and Nagasaki. A study conducted by the US government in 1993 found that

the release of just 200lb of anthrax spores from a plane over Washington DC could kill as many as 3m people.

Iraq is not alone in its interest in developing a new generation of biological weapons. In a 1995 study, the CIA reported that 17 countries were suspected of researching and stockpiling germ warfare agents, including Iraq, Iran, Libya, Syria, North Korea, Taiwan, Israel, Egypt, Vietnam, Laos, Cuba, Bulgaria, India, South Korea, South Africa, China and Russia.

In the 20th century, modern science reached its apex with the splitting of the atom, followed shortly thereafter by the discovery of the DNA double helix. The first discovery led immediately to the development of the atomic bomb, leaving humanity to ponder, for the first time in history, the prospect of an end to its own future on Earth. Now, a growing number of military observers are wondering if the other great scientific breakthrough of our time will soon be used in a comparable manner, posing a similar threat to our very existence as a species. No laboratory, however contained and secure, is failsafe. Natural disasters such as floods and fires, and security breaches are possible. It is equally likely that terrorists will turn to the new genetic weapons.

In November, 143 nations will assemble in Geneva to review the 1972 biological weapons convention, a treaty designed to "prohibit the development, production and stockpiling of biological and toxin weapons". Negotiators, including the US representatives to the talks, need to address the serious loophole in the existing treaty that allows governments to engage in defensive research when, in fact, much of that research is potentially convertible to offensive purposes.

And the commercial concerns of US and other biotech companies around the world to protect trade secrets and other commercial information should not be allowed to derail protocols designed to verify and enforce the provisions of the biological weapons convention. It is time to get tough and do the right thing. One would think that the welfare of human civilisation would be more important than the parochial interests of a handful of life science companies.

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