

WMD Biological warfare

Reviewed by

Kennette Benedict

Senior Advisor, Bulletin of Atomic Scientists

Biological and chemical warfare

Toxic chemicals or infectious micro-organisms have been used as weapons to harm or kill humans for millennia, from the ancient practice of poisoning an enemy's wells and throwing plague-infected bodies over the walls of cities under siege, to the horrifying usage of germ warfare during the Second World War in Asia, or the use of nerve gases in the Iran-Iraq War. Biological and chemical attacks not only cause sickness and death but also create panic. Up to now, their destructive effect has been locally contained. However, new technological developments give cause for concern. In particular, developments in synthetic biology and genetic engineering make it possible to modify the characteristics of micro-organisms. New genetically engineered pathogens – released intentionally or inadvertently – might cause a pandemic of unprecedented proportions.

What is the risk of biological weapons?

Unlike nuclear weapons, which require rare materials and complex engineering, biological and chemical weapons can be developed at low cost, placing them within the reach of all states as well as organized non-state actors. Chemical and biological weapons are both outlawed, but due to dual-use materials and their accessibility, they carry various levels of risk.

Technology advances in biology are vital to fighting disease, protecting the environment, and promoting economic development – but these innovations also exacerbate risks of deliberate or accidental misuse, as technological innovation is outpacing national oversight mechanisms. There is no international organization dedicated to reducing emerging risks associated with advances in technology.

Toxic chemicals could be aerosolised or placed into water supplies, eventually contaminating an entire region. The continuum of biorisks is even higher, ranging from naturally occurring diseases to bioengineered pathogens that could spread worldwide and cause a pandemic.

“Unlike nuclear weapons, which require rare materials and complex engineering, biological and chemical weapons can be developed at low cost...”

Recent developments in synthetic biology and genetic engineering are of particular concern. We know that the normal evolution of most highly lethal



pathogens ensures that they will fail to spread far before killing their host. Technology, however, has the potential to break this correlation by enhancing the pathogen with “gain of function” by creating a highly lethal and highly infectious agent.

Such pathogens could be released accidentally from a lab, or intentionally released with the intention to cause harm in large population centres. Current trends towards more open knowledge-sharing can both contribute to, and mitigate, such risks. The COVID-19 pandemic – while not an engineered pathogen release – has shown the existential and economic consequences such a pandemic can cause. Concerns over the security of biolabs has increased, as there are no binding international standards for safe, secure, and responsible work on pathogens – and safety lapses and accidents do happen.

What are key factors affecting risk levels?

- Global frameworks controlling research on chemical and biological weapons, including revised strategic trade controls and potentially sensitive dual-purpose goods, technology and materials; biological and chemical safety and security measures; and an ongoing commitment and capacity to abide by disarmament and arms control conventions.
- The lack of verification in international instruments adds urgency to impartially assessing claims of a hostile outbreak or even the existence of weapon-producing chemical and biological labs, as seen in the allegations by the Russian Federation against Ukraine.
- The unknown number of laboratories researching potential pandemic pathogens for military and civilian purposes, along with the public availability of dangerous information circulating for scientific purposes.
- Further developments in synthetic biology and genetic engineering lowering skill levels and costs to modify existing pathogens or even to develop new pathogens.
- Strengthened biosecurity norms and development of innovative tools to uphold them, working across the public and private sectors to develop practical solutions, including tools and incentive structures to reduce biological risks throughout the research and development life cycle.
- COVID-19 has revealed the lack of meaningful health prevention and preparedness to address biological threats. Only rapid countermeasures will effectively curb any potential outbreak of a pathogen release or even a pandemic to avoid massive harm and economic disruption to populations.

Chemical weapons: Impunity for use?

Inhumane chemical weapons like sulphur mustard gas have instilled horror since their use in World War I and after, resulting in the 1993 Chemical Weapons Convention. These are the most-widely used and easily proliferated weapons of mass destruction. While today, 98 per cent of the world population lives under the protection of the Convention, isolated incidents like the 1995 attack in the Tokyo subway against civilians by the domestic terrorist group Aum Shinrikyo are difficult to prevent. Releasing a toxic substance in enclosed or crowded spaces – such as gas, liquid, or solid, in order to cause public panic, injury or loss of life



– can be achieved by obtaining common household and professional grade toxic chemicals. These include nerve agents, blister agents, choking agents and irritants if used in excessive quantities.

The last ten years have put the Chemical Weapons Convention under severe strain, as the Syrian war has shown the fragility of upholding the norm against toxic chemical weapons. The international community has established investigative bodies to uncover the facts about chemical weapons use against civilians in Syria, yet attribution is contested and until now, no person or entities have been brought to justice. Isolated attacks against individuals – most recently against Russian opposition figure Alexander Navalny – have occurred, at times with deadly results, yet without accountability. The inability to bring perpetrators to justice could encourage additional actors to acquire a full capability to use chemical weapons.

Another concern is the fact that in conflict, it is often difficult to confirm the veracity of reports of poisonous substances being dropped on armed forces and civilians. Chemical substances can be riot control agents – such as tear gas mixed with chemical agents to cause stronger symptoms and thus incapacitate fighters and civilians – or using chlorine gas which is not prohibited except if used maliciously and with intent to harm. Chemical weapons are weapons of mass destruction, yet they are also weapons spreading mass terror.

In recent years, we have witnessed the difficulty of upholding the common understanding regarding red lines on the use of chemical weapons. The current geopolitical climate has undermined global solidarity on this issue, and a weakening consensus could lead to the devastating use of more advanced chemical weapons in any large-scale conflict. It could also cause long-term changes in how states understand the development, evaluation and use of ‘nonstandard chemical substances’ (other than deadly substances like sarin) for domestic riot control and counter-terrorism operations. This shows that even with very few countries outside the Chemical Weapons Convention, we cannot be confident that chemical weapons are a relic of the past.