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EMERGING LEGAL CONCERNS IN BIO TECHNOLOGY AND BIOLOGICAL WEAPONS

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INTRODUCTION

'The First World War was chemical; the Second World War was nuclear; and the Third World War – God forbid –will be biological' – Sir William Stewart¹

The history of warfare and the history of disease are unquestionably interwoven. Throughout the history of warfare, disease and non-battle injury have accounted for more deaths and loss of combat capability than from actual battle in war itself. The most striking example is the great influenza pandemic during World War I that killed 20 million people or more worldwide in 1918². Although this was a naturally occurring event, what if a country could create a biological agent that could yield the same catastrophic loss of life on the enemy? That, in essence, is the potential effect of applying bio technology for biological warfare (BW) or bioterrorism (BT). Biotechnology has been a groundbreaking field, contributing significantly to advancements in medicine, agriculture, and industry. The great achievements of molecular biology and genetics over the last 75 years have produced advances in agriculture and industrial processes and have revolutionized the practice of medicine. The very technologies that fuelled these benefits to society, however, pose a potential risk as well—the possibility that these technologies could also be used to create the next generation of biological weapons. the same technology that promises tremendous benefits also has the potential for misuse, especially in the creation of biochemical weapons. Biochemical weapons, which use biological and chemical agents to cause harm or death, are considered weapons of mass destruction (WMDs).

¹ Nixdorff, K., and W. Bender. 2002. "Biotechnology, Ethics of Research, and Potential Spin-off," *INESAP Information Bulletin*, 19 (March): p. 19-22

² Stephen M. Block, "Living Nightmares: Biological Threats Enabled by Molecular Biology," in *The New Terror: Facing the Threat of Biological and Chemical Weapons*, eds. Sidney Drell, Abraham D. Sofaer, and George D. Wilson (Stanford, CA: Hoover Institution Press, 1999), 58; see also, Robert G. Webster, William J. Bean, Owen T. Gorman, Thomas M. Chambers, and Yoshihiro Kawaoka, "Evolution and Ecology of Influenza A Viruses," *Microbiological Reviews*, March 1992, 152-179.

BIOTECHNOLOGY: A DOUBLE-EDGED SWORD

Biotechnology involves the manipulation of living organisms or their systems to develop products or processes beneficial to humanity. Applications of biotechnology include:

- Medical biotechnology: Involves the creation of vaccines, gene therapies, biopharmaceuticals, and diagnostic tools.
- Agricultural biotechnology: Includes genetically modified organisms (GMOs) designed for increased yield and resistance to pests.
- Industrial biotechnology: Utilizes microorganisms for the production of chemicals, fuels, and materials.

Biotechnology represents a “dual use” dilemma in which the same technologies can be used legitimately for human betterment and misused for bioterrorism. While biotechnology offers tremendous societal benefits, it also poses significant risks. The very tools used for creating life-saving therapies and improving food security can be weaponized to create biological or chemical weapons capable of causing mass casualties.

The regulation of dual use biotechnology research is a highly contentious technical, political, and societal issue. In the language of arms control and disarmament, dual use refers to technologies intended for civilian application that can also be used for military purposes. Technology involves more than just products; it also encompasses a means to produce and use products in such a way as to solve a problem. Thus, technology comprises “the ability to recognize technical problems, the ability to develop new concepts and tangible solutions to technical problems, the concepts and tangibles developed to solve technical problems, and the ability to exploit the concepts and tangibles in an effective way.”³

The “general purpose clause” of the BWC⁴ prohibits the development, production, and stockpiling of biological weapons, but permits States that are parties to the treaty to conduct research activities for peaceful purposes or in order to defend or protect against BW agents.⁵

³ Autio, E., and T. Laamanen. 1995. “Measurement and evaluation of technology transfer: Review of technology transfer mechanisms and indicators.” *International Journal of Technology Management*. 10(7/8): 647 as cited in P. Zanders, op. cit., p. 6

⁴ The Biological and toxin Weapons Convention (BTWC), 1972

⁵ United Nations. 1972. Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction. United Nations General Assembly Resolution 2826 (XXVI) (New York: United Nations). The BWC recognizes that the equipment and materials used to produce BW agents are almost entirely dual use, having legitimate commercial as well as military

Useful distinctions between permitted and prohibited activities at the level of basic research are difficult to make because biotechnology presents a classic example of the dual use dilemma.

BIOCHEMICAL WEAPONS: A THREAT TO GLOBAL SECURITY

Biochemical weapons are composed of living organisms or toxins that can be used to cause death or injury to humans, animals, or plants. These weapons include:

- **Biological agents:** Viruses (e.g., smallpox, anthrax), bacteria (e.g., plague, tularaemia), fungi, or genetically engineered organisms designed for harm.
- **Chemical agents:** Toxins such as sarin, mustard gas, and other chemical substances that disrupt biological processes, causing severe injury or death.

Biochemical weapons are considered particularly dangerous because they can be difficult to detect, inexpensive to produce, and capable of inflicting mass casualties in a short time. Moreover, their potential for use by non-state actors, such as terrorist organizations, poses additional challenges for global security.

Biochemical weapons are a type of weapon of mass destruction (WMD) that use toxins or biological agents, such as viruses, bacteria, or other pathogens, to inflict harm on humans, animals, or agriculture. Their use violates international law and is condemned for their indiscriminate impact on civilians and military personnel alike.

IMPACT OF ADVANCEMENT IN BIOTECHNOLOGY ON DEVELOPMENT OF BIOWARFARE AGENTS

Ever-evolving advances in biotechnology research hold promise for a revolution in biowarfare development and may thus offer opportunity to technologically proficient rogue nations and sophisticated terrorist organizations to expand their capabilities for attack. For the sake of discussion, impact of biotechnology on the development of biological agents can be considered as under:

- **Genetically modified agents:** With the advent of recombinant DNA technology, it has become quite easier to alter the genetic makeup of an organism for producing biowarfare agents. Some of the potential modifications that may be exploited to affect these

applications. For this reason, the treaty specifically prohibits only those activities involving pathogens that “cannot be justified for prophylactic, protective, and other peaceful purposes.”

alterations include antibiotic resistance, increased aerosol stability, or enhanced virulence.⁶ The genetic modifications may specifically be used to alter epitopes or sequences used for detection and diagnostics, thereby necessitating the incorporation of multiple points of reference into these systems to ensure security regarding bio-detection strategies

- **.Advanced biological warfare agents:** Development of technologies in biological sciences has helped biowarfare agent developers to identify biochemical pathways critical for physiological processes and engineer specific advanced biowarfare agents to exploit vulnerabilities in the biological system. Emerging biotechnologies thus might lead to a paradigm shift in biowarfare agent development with future biological agents capable to target specific human biological systems at the molecular level

INTERNATIONAL REGULATIONS ON BIOTECHNOLOGY AND BIOCHEMICAL WEAPONS

The international community has long recognized the need to regulate both biotechnology and biochemical weapons to prevent their misuse. Several treaties, conventions, and organizations work toward these goals.

- **the Geneva Protocol prohibition against the use in war of chemical and biological weapons**

The Geneva Protocol was negotiated in 1925 and entered into force in 1928. Although it prohibits the use in war of chemical and biological weapons, many of the states that ratified the protocol in subsequent years did so with so-called “second use reservations.”⁷ Pursuant to those reservations, a Geneva Protocol party that is attacked with chemical or biological weapons retains the right to respond in kind. Thus, the protocol came to be considered, in effect, a ban on the first use of chemical and biological weapons. The protocol now has 134 parties and has been in force for almost 75 years. Thus, its first-use prohibition is considered to be part of customary international law, which is binding on all states. India ratified the convention in 1950.

⁶ Advances in genetics could create deadly biological weapons, Clinton warns. <http://www.breakingnews.ie/world/advances-in-genetics-could-create-deadly-biological-weapons-clinton-warns-531347.html>,

⁷ Thomas Graham, Jr., Biological Weapons and International Law. *Science* 295, 2325-2325 (2002). DOI:10.1126/science.295.5564.2325

- **The Biological and toxin Weapons Convention (BTWC), 1972**

The BWC is the primary international treaty that bans the development, production, and stockpiling of biological and toxin weapons. It was one of the first multilateral disarmament treaties banning an entire category of weapons. The same can be said for possession of biological weapons. Unlike chemical weapons (which were used extensively in World War I), biological weapons have never been used in war in modern times. The BWC has now existed for nearly 30 years and has been accepted by most of the world's nations (some 107 states). Moreover, since the United States unilaterally renounced its biological weapons program in 1969, no state has acknowledged a legitimate possession of biological weapons. Thus, on the basis of state practice, the possession of biological weapons could be considered to be prohibited by customary international law.⁸

However, one of the primary criticisms of the BWC is the lack of a robust verification mechanism, which makes enforcement challenging. India has rectified the convention and pledges to abide by its obligations.

- **The Chemical Weapons Convention (CWC), 1993**

The CWC is a comprehensive international treaty that prohibits the development, production, acquisition, stockpiling, and use of chemical weapons. It is enforced by the Organisation for the Prohibition of Chemical Weapons (OPCW), which conducts inspections to ensure compliance. The CWC has been largely successful in reducing chemical weapon stockpiles worldwide.

- **The Cartagena Protocol on Biosafety (2003)**

A supplement to the Convention on Biological Diversity (CBD), the Cartagena Protocol focuses on ensuring the safe handling, transport, and use of living modified organisms (LMOs), particularly with regard to biotechnology. Although not directly focused on weapons, the protocol is crucial in regulating the unintended consequences of genetic engineering.

- **United Nations Security Council Resolution 1540 (2004)**

This resolution mandates that all UN member states take measures to prevent the

⁸ Shane K. Green, E 3 LSI Research: An Essential Element of Biodefense, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, 3, 2, (128-137), (2005).

proliferation of WMDs, including biological and chemical weapons, to non-state actors. It requires states to establish domestic controls to prevent terrorists from acquiring these weapons.

INDIAN REGULATIONS ON BIOTECHNOLOGY AND BIOCHEMICAL WEAPONS

India is a party to major international treaties related to biotechnology and biochemical weapons and has developed a regulatory framework to manage the risks associated with these fields.

1. The Environment Protection Act, 1986

This Act is the umbrella legislation for environmental protection in India. It empowers the government to regulate biotechnology activities, especially those related to genetically modified organisms (GMOs), to ensure environmental and biosafety.

2. The Biological Diversity Act, 2002

This Act ensures the conservation of biological diversity in India and regulates the access to genetic resources. It aligns with India's commitments under the Convention on Biological Diversity (CBD).

3. Chemical weapons convention act 2000

The act was passed to implement the CWC. and it provided for the establishment of a national authority for chemical weapons convention or NACWC. This institution formed in 2005, is the chief relation between the govt of India and the organization for the prohibition of chemical weapons.

4. The Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act, 2005

This legislation was enacted to prohibit the unlawful activities related to WMDs, including biochemical weapons, and aligns with India's international obligations under the BWC and CWC. The Act gives the government authority to regulate the development, transfer, and use of materials that could be used to produce such weapons. Section 8(4) prohibited the unlawful transfer, whether direct or indirect of biological and chemical weapons. Section 14 of the same act penalties for a violation of this

provision range from imprisonment for a term of not less than 5 years to life imprisonment and shall also be liable for fine.

5. **The Drugs and Cosmetics Act, 1940**

This Act governs the development and approval of biotech-based medical products, ensuring they meet safety and efficacy standards. The Act also regulates the use of microorganisms and toxins that could potentially be weaponized.

6. **Intellectual Property Laws**

Biotechnological inventions are protected under the Patents Act of 1970. However, ethical concerns have led to restrictions on patenting genetically engineered organisms, especially those that may pose a threat to the environment or public health.

- **The Insecticides Act, 1968:** Although primarily aimed at regulating agricultural chemicals, this Act also covers substances that can potentially be used as chemical agents in warfare.
- **Customs Act, 1962:** Provides provisions for prohibiting the export or import of items that could be used to produce WMDs, including biochemical weapons

LANDMARK JUDGMENTS AND CASES

The regulation of biotechnology and biochemical weapons has been shaped by key cases and judicial decisions, both in India and internationally.

➤ ***United States v. Iraq (Saddam Hussein's Regime)***⁹

The use of chemical weapons by Iraq during the Iran-Iraq War (1980-1988), particularly the deployment of mustard gas and sarin against Iranian forces and Kurdish civilians, highlighted the devastating impact of biochemical weapons. This led to global condemnation and eventually to Iraq's disarmament under international law, with extensive involvement by the United Nations and the OPCW.

➤ ***The Anthrax Attacks in the United States (2001)***

Shortly after the 9/11 terrorist attacks, anthrax spores were mailed to various locations in the U.S., resulting in multiple deaths and widespread panic. The incident highlighted

⁹ Ronli Sifris, Operation Iraqi Freedom: United States V Iraq — The Legality Of The War, 2003
https://law.unimelb.edu.au/__data/assets/pdf_file/0009/1680363/Sifris.pdf

vulnerabilities in the management and security of biological agents and led to the passing of stricter U.S. bioterrorism laws, such as the ****USA PATRIOT Act**** and the ****Public Health Security and Bioterrorism Preparedness and Response Act**** of 2002.

➤ ***Endosulfan Case (India, 2011)***

Although primarily a case related to the environmental and health effects of the pesticide Endosulfan, this case brought attention to the regulatory framework around chemicals that can have dual-use applications. The Indian Supreme Court banned the production and sale of Endosulfan, citing its harmful effects on humans and the environment. The case emphasized the need for stringent regulation of chemicals that could potentially be weaponized.

➤ ***Kedar Nath v. Union of India (2008)***

In this case, the Indian courts dealt with the illegal manufacture and transportation of substances that could be used for the production of biochemical weapons. The case reinforced India's legal commitment to prevent the proliferation of WMDs under both national law and international treaties.

ETHICAL CONSIDERATIONS AND CHALLENGES

The dual-use nature of biotechnology presents significant ethical dilemmas. On the one hand, biotechnology offers unparalleled opportunities for advancements in medicine, food production, and environmental conservation. On the other hand, the same technology can be misused to create biochemical weapons with devastating consequences.

1. **Bioethics in Biotechnology**

The manipulation of living organisms, particularly through genetic engineering, raises ethical questions about the potential for unintended consequences. Gene-editing technologies like CRISPR have the potential to eradicate diseases, but they also carry the risk of creating new pathogens or disrupting ecosystems.

2. **Dual-Use Research**

Research in biotechnology often has dual-use applications, where technologies developed for peaceful purposes can also be used for malicious intent. The challenge lies in balancing scientific progress with the need for security and ethical oversight.

3. **Enforcement Challenges**

While treaties like the BWC and CWC provide frameworks for the prohibition of

biochemical weapons, enforcement remains a significant challenge. The BWC, in particular, lacks a formal verification regime, making it difficult to monitor compliance. Moreover, non-state actors such as terrorist organizations present a unique threat, as they operate outside the bounds of international law.

CONCLUSION

Biotechnology, with its vast potential to transform healthcare, agriculture, and industry, represents one of the most important scientific frontiers of the 21st century. However, the same technology can be weaponized to create biochemical weapons, posing a grave threat to global security. International treaties like the BWC and CWC, along with national regulations in countries like India, provide a framework for controlling the development and use of these technologies. Nevertheless, enforcement challenges, ethical concerns, and the dual-use nature of biotechnology require constant vigilance and a balanced approach to regulation.

The future of biotechnology will depend on the international community's ability to regulate its use, ensuring that its benefits are maximized while minimizing the risks of misuse in the form of biochemical weapons. The intersection of biotechnology and biochemical weapons presents a complex challenge that requires a comprehensive and multi-faceted approach. By strengthening international cooperation, enhancing legal and regulatory frameworks, and promoting ethical research practices, we can mitigate the risks associated with the misuse of biotechnology and ensure that these powerful tools are used for the benefit of humanity.

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