INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]

VOLUME 5 AND ISSUE 14 OF 2025

APIS – 3920 - 0001 *(and)* ISSN - 2583-2344

Published by

Institute of Legal Education

https://iledu.in

MEDICAL ETHICS AND BIOTERRORISM: EMERGING CHALLENGES

AUTHOR - AKSHAYA S, STUDENT AT THE TAMILNADU DR. AMBEDKAR LAW UNIVERSITY

BEST CITATION - AKSHAYA S, MEDICAL ETHICS AND BIOTERRORISM: EMERGING CHALLENGES, *INDIAN JOURNAL OF LEGAL REVIEW (IJLR),* 5 (14) OF 2025, PG. 729-743, APIS – 3920 – 0001 & ISSN - 2583-2344.

ABSTRACT

Bioterrorism—the intentional release of biological agents to cause widespread disease, fear, and societal disruption—has emerged as one of the most complex and ethically challenging threats of the twenty-first century. Unlike conventional terrorism, biological attacks exploit the vulnerability of public health systems, the invisibility of pathogens, and the interconnectedness of global populations. This paper provides a comprehensive examination of the evolving landscape of bioterrorism and its intersection with medical ethics. It traces the historical trajectory of biological weapons from ancient methods of poisoning wells to sophisticated modern techniques involving genetic engineering, laboratory manipulation of viruses, and the misuse of synthetic biology. The study highlights how bioterrorism challenges the traditional pillars of medical ethics—autonomy, beneficence, non-maleficence, and justice—by forcing healthcare professionals to balance individual rights against collective safety. Physicians must confront dilemmas related to mandatory reporting, quarantine, allocation of scarce resources, and personal risk during outbreaks. The paper further analyzes legal and regulatory frameworks, particularly the Biological Weapons Convention (BWC), WHO guidelines, and India's statutory mechanisms such as the Epidemic Diseases Act and Disaster Management Act. It also examines contemporary concerns including dual-use research, cyber-biosecurity, AI-assisted pathogen design, and the ethical oversight of high-risk biological laboratories. The study argues that the rise of emerging pathogens, global travel, and technological democratization has increased the probability of intentional or accidental biological incidents. Therefore, medical ethics must expand into a broader framework of biosecurity ethics, emphasizing preparedness, transparency, public trust, and rights-based public health governance. The paper concludes that an ethically informed biodefense strategy is essential to protect societies while preserving human dignity and civil liberties.

KEYWORDS: Bioterrorism, Medical Ethics, Biosecurity, Biological Weapons Convention, Medical Professionals.

INTRODUCTION

Bioterrorism refers to the deliberate use of biological agents—such as viruses, bacteria, toxins, or genetically engineered organisms—to intimidate, coerce, or cause mass casualties among civilian populations. Its destructive potential surpasses many conventional weapons because biological agents are self-replicating, invisible, and capable of spreading across borders with ease.[1295] As global technology advances, the threat of bioterrorism has expanded from crude historical tactics to sophisticated strategies involving synthetic biology and artificial intelligence. This makes bioterrorism not only a criminal act but also a public health emergency, national security challenge, and ethical dilemma for the medical community.

Medical ethics becomes crucial in responding to bioterrorism because healthcare professionals are expected to function simultaneously as caregivers, first responders,

[1295] World Health Organization, Public Health Response to Biological and Chemical Weapons 5 (2004)

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

disease identifiers, and moral agents. Due to some issues challenge traditional medical ethics principles such as **autonomy, beneficence, non-maleficence, and justice**.[1296] Public health ethics, which prioritizes community welfare, often conflicts with classical clinical ethics, which prioritizes individual patients.

Historically, bioterrorism is not new. Ancient armies used dead animals, poisoned wells, and infected corpses as weapons.[1297] By the 20th century, nation-states developed institutional biological warfare programs, culminating in major violations such as Unit 731 in Japan and biological experiments by colonial powers. The global community recognized the severity of biological weapons and negotiated the **1972 Biological Weapons Convention (BWC)**, which remains the primary international treaty prohibiting biological weapons.[1298] However, despite the BWC, technological advances and geopolitical tensions ensure that the threat persists through state and non-state actors.

India faces bioterrorism vulnerabilities due to dense population, uneven healthcare infrastructure, porous borders, and rapid urbanization. Indian laws such as the Epidemic Diseases Act, Disaster Management Act, and provisions of the Indian Penal Code provide partial frameworks for responding to biological threats, but India lacks a comprehensive national biosecurity law.[1299] This gap raises concerns about preparedness, ethical responsibility, and accountability.

In the contemporary world, bioterrorism threats are amplified by **synthetic biology**, **CRISPR gene editing**, **lab-grown pathogens**, **global travel**, and even **cyber-biosecurity risks**, where digital breaches may allow hackers to manipulate biological data.[1300] These developments pose unprecedented ethical and legal challenges.

This paper aims to provide a comprehensive academic analysis of bioterrorism and medical ethics by examining historical evolution, theoretical concepts, ethical tensions, legal frameworks, and modern technological risks. The expanding threats of biological misuse suggest that medical ethics must evolve into bioethics and global health ethics to remain relevant, ensuring that public safety is protected without undermining fundamental rights.

II. EVOLUTION OF BIOTERRORISM

Bioterrorism has deep historical roots that span thousands of years, evolving from rudimentary attempts to spread disease to sophisticated, scientifically engineered threats. Understanding its historical development is essential for grasping the modern ethical, legal, and medical challenges it presents. Although the term "bioterrorism" is modern, the intentional use of biological agents in conflict and coercion has been observed across civilizations.

A. Early and Ancient Practices

Evidence suggests that as early as the 6th century BCE, biological tactics were used in warfare. Historical accounts reveal that the Assyrians used rye ergot, a toxic fungus, to poison enemy wells.[1301] Similarly, Scythian warriors dipped their arrows into decaying bodies or blood mixed with fecal matter to induce lethal infections in their enemies.[1302] These practices lacked scientific understanding but reflected a clear intent to weaponize disease.

During medieval periods, bioterroristic strategies became more systematic. One of the most infamous examples is the **1346 Siege of**

[1296] Tom L. Beauchamp & James F. Childress, Principles of Biomedical Ethics 13-15 (7th ed. 2009).
[1297] Mark wheelis, Biological warfare Before 1914, 5 J. STRATEGIC STUD. 1, 2-4 (1999)
[1298] Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, Apr. 10, 1972, 1015 U.N.T.S. 163.
[1299] Rakesh Bhaskar, Biosecurity in India: Gaps in Law and Preparedness, 12 INDIA Q. 67,70-72 (2018).
[1300] Flippa Lentzos, Synthetic Biology and the Threat of Bioengineered Weapons, 19 NAT'L SEC.J.45, 47-50 (2021).
[1301] S.E. van der Brugge, Early Uses of Biological Agents in Warfare, 12 J. MIL. HIST. 34, 36 (1998).
[1302] Kelly R. Hughes, Ancient Tactics of Biological Warfare, 8 MIL MED. HIST. REV. 112, 115-18 (2005).

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

Caffa, where the Mongol army catapulted plague-infected corpses over city walls, causing an outbreak of the Black Death among defenders.[1303] This incident is often cited as an early precursor to biological warfare. Contaminating water sources, using diseased animals, and deliberately spreading smallpox—such as through infected blankets given to Native American populations during colonial conflicts—became recurring tactics.[1304]

B. Rise of State-Sponsored Biological Warfare (19th–20th Century)

The modern era marked the transition from crude tactics to scientifically organized biological warfare programs. With the advent of microbiology in the 19th century, states began exploring pathogens as strategic weapons.

Germany's Biological Sabotage Attempts (World War I)

During World War I, Germany attempted to infect horses and livestock used by Allied forces with anthrax and glanders.[1305] These covert operations marked the first modern attempts to use biological agents in war.

Unit 731 and World War II Biological Experiments

Japan's infamous Unit 731 (1936–1945) conducted extensive biological warfare research, releasing plague-infested fleas over Chinese cities and conducting vivisections on prisoners.[1306]These atrocities represent one of the most extreme violations of medical and ethical norms in history.

Cold War Proliferation

Following World War II, both the United States and the Soviet Union developed large-scale biological weapons programs. The accidental 1979 release of anthrax spores in Sverdlovsk, USSR—initially concealed as a natural outbreak—revealed the magnitude of these secret operations.[1307]

C. Emergence of Bioterrorism by Non-State Actors

The latter half of the 20th century saw a significant shift as **non-state actors** began adopting bioterrorism.

Aum Shinrikyo (Japan, 1990s)

The cult attempted multiple biological attacks using anthrax and botulinum toxin before ultimately deploying sarin gas in 1995.[1308] Their failed biological attempts demonstrated the increasing accessibility of scientific tools to extremist groups.

2001 Anthrax Letter Attacks (USA)

In the aftermath of the 9/11 attacks, letters containing weaponised anthrax spores were mailed to media offices and U.S. senators, killing five people and infecting seventeen[1309]. This incident exposed the vulnerabilities of public health systems and highlighted the ethical responsibility of medical professionals during biological threats.

D. Bioterrorism in the 21st Century: Synthetic Biology and New Threats

Advances in genetic engineering, CRISPR technology, and synthetic biology have transformed modern bioterrorism. Today, it is possible to:

- Modify pathogens for higher virulence,
- Engineer antibiotic resistance,
- Recreate extinct viruses using publicly available genomic data,
- Use AI-based models to design harmful biological sequences.[1310]

The democratization of biotechnology—through do-it-yourself (DIY) labs and open-source

[1303] Mark Wheelis, Biological Warfare at the Siege of Caffa, 4 EMERGING INFECTIOUS DISEASES 970, 971 (1998).
[1304] Elizabeth A. Fenn, Biological Warfare in the Age of Smallpox, 16 J. AM. HIST. 1552, 554-57 (2000).
[1305] Erhard Geissler, German Biological Warfare Research, 1918-1945, in Biological and Toxin Weapons Today 20-22 (1991).
[1306] Sheldon H. Harris, Factories of Death: Japanese Biological Warfare, 1932-1945 45-47 (1994).
[1307] Matthew Meselson et al., The Sverdlovsk Anthrax Outbreak, 79 SCIENCE 1202, 1203-06 (1994).
[1308] David E. Kaplan & Andrew Marshall, The Cult at the End of the World 88-93 (1996).
[1309] U.S. Dep't of Justice, Amerithrax Investigative Summary 3-7 (2010).
[1310] Filippa Lentzos, Emerging Synthetic Biology Threats, 9 Nat' L SEC.J. 45, 48-52 (2021).

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

genetic data—means that biological tools once restricted to state laboratories are now accessible to small groups or individuals. This shift radically increases ethical risks and necessitates rethinking medical and scientific responsibilities.

III. CONCEPTUAL FRAMEWORK OF BIO TERRORISM

Understanding bioterrorism requires conceptual clarity, as the term encompasses a broad range of intentional acts involving biological agents. This section explores the definitional framework used in legal, medical, and security contexts and provides a typology of bioterrorist threats.

A. Concept and Definitions of Bioterrorism

The term *bioterrorism* is generally understood as the *deliberate release or dissemination of biological agents—viruses, bacteria, fungi, toxins, or genetically modified organisms—with the intent to cause disease, death, fear, or social disruption*.[1311] These acts may target humans, animals, agriculture, or the environment.

Legal Definitions

Several international and domestic frameworks attempt to define biological threats:

- The **World Health Organization (WHO)** defines biological terrorism as "the intentional release of biological agents or toxins for the purpose of harming or killing humans, animals, or plants."
- The **U.S. Centers for Disease Control and Prevention (CDC)** describes bioterrorism as "a deliberate release of viruses, bacteria, or other agents used to cause illness or death in people, animals, or plants."[1312]
- Although India does not have a specific statutory definition of bioterrorism, it recognizes biological threats under the Disaster Management Act and the National Disaster Management Authority guidelines.[1313]

Important Elements Found in Most Definitions

1. **Intentional act** — distinguishes bioterrorism from natural outbreaks.
2. **Use of biological agents** — living or non-living substances capable of causing disease.
3. **Purpose of harm** — including physical, psychological, economic, or political damage.
4. **Target population** — civilians, animals, crops, or ecosystems.

Together, these elements help identify bioterrorism within public health and criminal justice frameworks.

B. Differences Between Bioterrorism, Biological Warfare, and Natural Outbreaks

Bioterrorism vs. Biological Warfare

Although related, these terms are not interchangeable.

- Biological warfare generally refers to state-sponsored use of biological agents during armed conflict.[1314]
- Bioterrorism, by contrast, may be carried out by non-state actors, extremist groups, individuals, or states acting covertly.

Bioterrorism vs. Natural Outbreaks

Natural pandemics occur without intentional release, whereas bioterroristic incidents involve deliberate human agency. However, distinguishing between the two is often challenging, especially when pathogens resemble naturally occurring diseases.[1315] This ambiguity complicates surveillance, ethics, and legal accountability.

[1311] World Health Organization, Health Aspects of Chemical and Biological Weapons 12 (2004).
[1312] CDC, Bioterrorism Overview (2018).
[1313] Nat'l Disaster Mgmt. Auth. (India), Guidelines on Biological Disasters 8-10 (2008).
[1314] Malcolm Dando, Biological Warfare in the 20th Century 17-20 (1994).
[1315] Jeanne Guillemin, Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism 59-61 (2005).

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

C. Categories and Types of Biological Agents

The CDC's classification of biological agents is widely used in biodefense planning. It categorizes agents based on their ease of transmission, morbidity, mortality, and public health impact.[1316]

Category A Agents (Highest Priority)

These agents pose the greatest risk to national security and public health:

- Anthrax (Bacillus anthracis)
- Smallpox (Variola major)
- Plague (Yersinia pestis)
- Botulinum toxin
- Tularemia
- Viral hemorrhagic fevers (e.g., Ebola, Marburg)

Category A threats are easily disseminated, cause high mortality, and can induce public panic.

Category B Agents (Moderate Priority)

These agents cause moderate illness and are moderately easy to disseminate:

- Salmonella species
- E. coli strains
- Ricin toxin
- Staphylococcal enterotoxin B

Category C Agents (Emerging Threats)

These include novel agents that could be engineered for mass dissemination:

- Nipah virus
- Hantavirus
- Genetically modified pathogens
- Synthetic organisms produced using CRISPR

Category C threats highlight the risks posed by biotechnology and genetic engineering.

D. Methods of Delivery in Bioterrorism

Biological agents can be disseminated through a variety of methods, each with distinct implications for public health preparedness.

1. Aerosol Dissemination

Aerosols enable inhalation-based infections and allow wide geographic spread. Historical incidents, such as anthrax programs, often relied on aerosolization.[1317]

2. Contamination of Food and Water

Foodborne pathogens have been used in several bioterror events, including the 1984 Rajneeshee salmonella attack in Oregon.[1318]

3. Agricultural Bioterrorism

Targeting livestock or crops can devastate a nation's economy and food security. Foot-and-mouth disease and wheat rust are potential targets.

4. Person-to-Person Dissemination

Highly contagious agents like smallpox can spread exponentially once released.

5. Genetic and Cyber-Biological Methods

Modern biotechnology enables:

- Artificial synthesis of viruses
- Release of engineered organisms
- Cyber intrusions into genetic databases or labs[1319]

These emerging methods pose unprecedented ethical and legal challenges.

E. Characteristics of Effective Biological Agents

A biological agent suitable for terroristic use typically exhibits:

- High infectivity
- High morbidity and mortality
- Ease of production
- Environmental stability
- Potential for widespread dissemination
- Difficulty in detection or attribution[1320]

[1316] CDC, Bioterrorism Agents/Disease (2020).

[1317] Erhard Geissler, Aerosolized Biological Weapons, 42 J. BIOSAFETY 133, 1134-36 (1998).

[1318] Seth Varma, The Rajneeshee Bioterror Attack, 72 AM. J. PUB. HEALTH 1691, 1693 (1984).

[1319] Flippa Lentzos, Cyberbiosecurity Risks in Synthetic Biology, 19 NAT'L SEC. J. 45, 52-55 (2021).

[1320] Jonathan Tucker, The Challenge of Biological Terrorism, 5 TERRORISM & POL. VIOLENCE 1, 4-6 (1993).

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

These characteristics make biological agents uniquely dangerous when compared to chemical or radiological threats.

IV. INTERNATIONAL LEGAL FRAMEWORK GOVERNING BIOTERRORISM

Bioterrorism poses a cross-border threat that cannot be addressed by national policies alone. Because biological agents spread rapidly and unpredictably, international collaboration is essential for surveillance, preparedness, and response. The global legal framework consists of treaties, conventions, WHO regulations, UN Security Council resolutions, and guidelines that collectively aim to prevent the development, stockpiling, or misuse of biological agents. This section examines the key international legal instruments that govern bioterrorism and establish ethical and legal obligations for states.

A. The Biological Weapons Convention (BWC), 1972

The Biological Weapons Convention (BWC) is the cornerstone of international law on bioterrorism. Adopted in 1972, the BWC prohibits the development, production, stockpiling, or acquisition of microbial agents or toxins "of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes."[1321]

Key Features of the BWC

- Comprehensive prohibition of biological weapons.
- Mandates destruction or diversion of existing biological stockpiles for peaceful uses.
- Encourages international cooperation for peaceful biological research.
- Requires national implementation measures, such as legislation, biosafety guidelines, and export controls.

Although groundbreaking, the BWC lacks a formal verification mechanism to ensure compliance, making enforcement challenging.[1322] Advances in synthetic biology and gene editing also raise concerns that non-state actors may bypass traditional regulatory structures.

Relevance to Medical Ethics

BWC obligations strengthen ethical responsibilities by:

- Encouraging responsible bioscience research,
- Promoting transparency in pathogen handling,
- Ensuring scientific work does not contribute to weapon development,
- Creating global norms for professional accountability.

B. Geneva Protocol (1925)

The 1925 Geneva Protocol prohibits the use of asphyxiating, poisonous gases and bacteriological methods of warfare.[1323]While primarily aimed at states, it laid the foundation for later treaties like the BWC. Its limitations include:

- Prohibiting *use* but not *research* or *stockpiling*,
- Lack of enforcement mechanisms,
- No applicability to internal conflicts or non-state terrorism.

Despite these shortcomings, it remains symbolically significant as the earliest global condemnation of biological warfare.

C. United Nations Security Council Resolution 1540 (2004)

UNSCR 1540 imposes legally binding obligations on all UN member states to prevent non-state

[1321] Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, Apr. 10, 1972, 1015 U.N.T.S. 163

[1322] Malcolm Dando, Verification Challenges of the BWC, 14 BIOSECURITY & BIOTERRORISM 23, 25-28 (2015).

[1323] Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous Gases, and Bacteriological Methods of Warfare, June 17, 1925, 94 L.N.T.S. 65.

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

actors—including terrorist groups—from acquiring or using biological weapons.[1324]

Obligations Under Resolution 1540

- Criminalization of biological weapons-related activities by non-state actors.
- Implementation of domestic biosafety and biosecurity controls.
- Border controls and export regulations on sensitive biological materials.
- International cooperation in capacity-building.

This resolution is particularly important because it addresses terrorist misuse rather than state warfare, directly filling a gap left by the BWC.

D. WHO's International Health Regulations (IHR), 2005

The International Health Regulations (IHR 2005) form a legally binding instrument requiring countries to build core capacities for detecting, reporting, and responding to public health emergencies, including bioterrorism.[1325]

IHR Requirements Relevant to Bioterrorism

- Early detection of unusual disease patterns.
- Mandatory reporting of public health threats of international concern (PHEIC).
- Strengthening laboratory surveillance systems.
- Transparency in sharing information with WHO.

Ethical Dimensions

The IHR emphasizes:

- Timely communication to protect global populations,
- The principle of least restrictive measures,
- Protection of human rights during public health responses.

Thus, the IHR integrates medical ethics into global legal obligations.

E. United Nations Office for Disarmament Affairs (UNODA)

UNODA assists in implementing the BWC and supports states in:

- Drafting national legislation,
- Conducting confidence-building measures (CBMs),
- Developing biosecurity frameworks,
- Training scientists in responsible conduct of research.[1326]

UNODA plays an essential role in translating international commitments into practical national policies.

F. The Global Health Security Agenda (GHSA)

Launched in 2014, the **GHSA** is a partnership of more than 70 countries seeking to improve global capacity to prevent, detect, and respond to biological threats—whether natural, accidental, or intentional.[8] Although not legally binding, GHSA strengthens international collaboration, biosafety standards, and emergency preparedness.

G. International Criminal Court (ICC) and Bioterrorism

While the **Rome Statute** does not explicitly list biological weapons under "weapons causing superfluous injury," intentional bioterrorism that results in mass harm may fall within crimes against humanity or war crimes.[1327]Thus, individuals—not just states—may be held criminally responsible.

V. INDIAN LEGAL FRAMEWORK

India does not presently have a single, comprehensive statute exclusively addressing bioterrorism; however, a combination of constitutional provisions, criminal law statutes, public health legislation, disaster management

[1324] S.C. Res. 1540, U.N. Doc. S/RES/1540 (Apr. 28, 2004).
[1325] World Health Organization, International Health Regulations (2005).
[1326] United Nations Office for Disarmament Affairs, BWC Implementation Support (2018).
[1327] Rome Statute of the International Criminal Court art. 7-8, July 17, 1998, 2187 U.N.T.S. 3.

laws, counter-terrorism laws, biotechnology regulations, and professional ethical codes together form a broad legal framework capable of addressing bioterrorism. These laws empower the State to prevent, investigate, punish, and respond to biological threats, whether natural, accidental, or intentional.

At the constitutional level, **Article 21** of the Constitution of India imposes a positive obligation on the State to protect the right to life, which includes the right to health and access to medical care during public health emergencies.[1328] Courts have consistently held that reasonable restrictions on individual liberty—such as quarantine, isolation, or compulsory treatment—are constitutionally permissible when imposed to protect public health. **Article 47**, a Directive Principle of State Policy, further mandates the State to improve public health, providing constitutional justification for preventive biosecurity measures.[1329]In extreme cases, a large-scale bioterror attack may also justify the invocation of emergency powers under the Constitution.

Criminal liability for bioterrorism-related conduct is now primarily governed by the **Bharatiya Nyaya Sanhita (BNS), 2023**, which modernizes India's penal framework. Although BNS does not define "bioterrorism" explicitly, it criminalizes acts that are central to biological attacks. **Section 127** penalizes malignant acts likely to spread infectious diseases dangerous to life, while **Section 128** punishes disobedience of quarantine rules, both of which are directly applicable during biological incidents.[1330] Acts involving contamination of water, food, or air with harmful substances fall under **Section 124**, and the use of biological toxins to cause bodily harm may attract liability under **Section 61**. Large-scale bioterror attacks threatening national security may also be prosecuted as offences of waging war or conspiracy against the State under **Sections 106 to 108**, and coordinated planning of biological attacks is punishable under the conspiracy provisions of the BNS.

Bioterrorism is further addressed under India's counter-terrorism framework through the **Unlawful Activities (Prevention) Act, 1967 (UAPA)**. Section 15 of the Act defines terrorist acts broadly to include the use of hazardous substances capable of causing death, injuries, or widespread panic.[1331] When biological agents are used with terrorist intent, UAPA provisions relating to terrorist acts, conspiracy, funding, and preparation become applicable, allowing stringent penalties and special investigative powers.

From a public health and emergency response perspective, the **Disaster Management Act, 2005** serves as the most important operational statute. The Act defines "disaster" broadly enough to include biological disasters and empowers the central and state governments to impose restrictions, mobilize resources, coordinate agencies, and issue binding directions.[1332] Its nationwide use during the COVID-19 pandemic demonstrates its applicability to bioterrorism scenarios. Complementing this is the **Epidemic Diseases Act, 1897**, which authorises governments to impose quarantine, travel restrictions, inspections, and special health measures. The 2020 amendment strengthened protections for healthcare workers and penalised violence and obstruction during epidemic responses.[1333]

Institutional preparedness for bioterrorism is further strengthened by the **National Disaster Management Authority (NDMA)**, which issued detailed **Guidelines on the Management of Biological Disasters (2008)**. These guidelines address surveillance, laboratory safety, biosafety and biosecurity measures, mass-casualty management, ethical risk communication, and inter-agency

[1328]Francis Coralie Mullin v. Adm'r, Union Territory of Delhi, (1981) 1 SCC 608.
[1329] INDIA CONST. art. 47.
[1330] Bharatiya Nyaya Sanhita, No. 45 of 2023, Sec 127-128.
[1331] Unlawful Activities (Preevntion) Act, No. 37 of 1967, Sec 15.
[1332] Disaster Management Act, No. 53 of 2005, Sec 2(d).
[1333] Epidemic Diseases (Amendment) Act, No. 34 of 2020

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

coordination.[1334] The **National Centre for Disease Control (NCDC)** and the Integrated Disease Surveillance Program (IDSP) play a crucial role in early detection of unusual disease patterns that may indicate deliberate biological release.[1335]

India also regulates bioterrorism risks through **biotechnology and biosafety laws**. The **1989 Rules under the Environment (Protection) Act, 1986** regulate the manufacture, handling, storage, transport, and disposal of hazardous microorganisms and genetically engineered organisms.[1336] These rules establish regulatory bodies such as the **Genetic Engineering Appraisal Committee (GEAC)** and the **Review Committee on Genetic Manipulation (RCGM)**. In addition, the **ICMR and DBT Biosafety Guidelines** prescribe containment standards, laboratory classifications, and ethical oversight of dual-use research involving dangerous pathogens.[1337]

Food and agricultural biosecurity is addressed through the **Food Safety and Standards Act, 2006**, which criminalises contamination of food and water supplies, and through plant quarantine and livestock import regulations that protect crops and animals from biological threats.[1338] Professional accountability during biological emergencies is ensured through the **National Medical Commission (NMC) Code of Professional Conduct**, which obligates doctors to treat emergencies, report communicable diseases, and balance confidentiality with public health duties.[1339]

Despite this extensive framework, India faces significant gaps, including the absence of a unified **National Biosecurity or Bioterrorism Act**, fragmented institutional responsibilities, limited cyber-biosecurity regulation, and inadequate oversight of high-risk laboratories.[1340] These gaps highlight the need for an integrated legal regime that combines criminal law, public health law, biotechnology regulation, and medical ethics to address evolving bioterrorism threats effectively.

Major Global and Indian Case Studies of Bioterrorism**

Bioterrorism incidents—both confirmed and attempted—provide critical insights into the methods, motivations, and impacts of biological threats. Case studies illustrate how governments, health systems, and medical professionals respond, and they reveal gaps in preparedness and ethical decision-making.

VI. CASE STUDIES (GLOBAL AND INDIA)

A. Siege of Caffa (1346): Early Large-Scale Biological Attack

The Mongol army, during its siege of the Genoese-controlled city of Caffa, catapulted plague-infected corpses over the city walls to provoke an outbreak of the Black Death.[1341] This event is historically significant as one of the earliest recorded uses of disease as a weapon. While the epidemic likely spread naturally as well, the intentional introduction of infected bodies represented a primitive but deliberate biological attack.

B. Smallpox Blankets: North American Colonial Warfare (18th Century)

During the French and Indian Wars, British officers discussed and supported attempts to spread smallpox among Native American tribes by distributing infected blankets.[1342] This tactic exploited Indigenous populations' lack of immunity, causing mass casualties. The incident is cited in ethical debates as an early example of biowarfare targeting civilians.

[1334] Nat'l Disaster Mgmt. Auth., Guidelines on Management of Biological Disasters (2008).
[1335] Nat'l Ctr. For Disease Control, IDSP Annual Report (2021).
[1336] Environment (Protection) Act, No. 29 of 1986; Hazardous Microorganisms Rules, 1989.
[1337] Indian council of Med. Research, Biosafety Guidelines for Biomedical Laboratories (2017).
[1338] Food Safety and Standards Act, No. 34 of 2006.
[1339] Nat'l Med. Comm'n, Code of Professional Conduct (2023).
[1340] Rakesh Bhaskar, Biosecurity Preparedness in India, 12 INDIA Q. 67, 70-75 (2018).
[1341] Mark Wheelis, Biological Warfare at the Siege of Caffa, 4 EMERGING INFECTIOUS DISEASES 970, 97172 (1998).
[1342] Elizabeth A. Fenn, Biological Warfare in the Age of Smallpox, 16 J. AM. HIST. 1552,1554-57 (2000).

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

C. World War II – Japan's Unit 731

Between 1936 and 1945, Japan's Unit 731 conducted human experimentation and released pathogens—including plague, cholera, and anthrax—resulting in tens of thousands of deaths in China.[1343]
Victims included civilians and prisoners of war. These atrocities highlight the deepest ethical violations in medical and scientific practice, where physicians themselves became perpetrators.

D. The 1984 Rajneeshee Salmonella Attack (Oregon, USA)

One of the first bioterrorism attacks on U.S. soil occurred when followers of the Rajneeshee cult deliberately contaminated salad bars with *Salmonella typhimurium* in Oregon, infecting 751 people.[1344]
The purpose was to incapacitate voters during a local election, demonstrating how bioterrorism can be deployed for political manipulation.

E. Aum Shinrikyo's Failed Biological Attacks (Japan)

Before carrying out the 1995 Tokyo sarin gas attack, the Aum Shinrikyo cult attempted multiple biological releases using anthrax and botulinum toxin.[1345] Though unsuccessful due to technical failures, these attempts showed how extremist groups could exploit scientific tools, foreshadowing future risks of rogue non-state actors.

F. The 2001 Anthrax Letters (USA)

Shortly after the September 11 attacks, letters containing highly refined anthrax spores were mailed to U.S. senators and media offices.[1346]
The attack killed 5 people and infected 17 other. The U.S. government mobilised an unprecedented investigation (Amerithrax) and strengthened its public health surveillance systems.

This case exposed several key vulnerabilities:

- Lack of laboratory biosafety regulation
- Slow communication between public health and security agencies
- Ethical dilemmas in risk communication to the public

It remains one of the most analysed bioterror events in modern history.

G. Sverdlovsk Anthrax Leak (1979, USSR)

Although initially presented as a natural outbreak, independent researchers later confirmed that anthrax spores originated from a Soviet military laboratory accident.[1347] The incident underscored:

- The dangers of secretive biological warfare programs
- Ethical failures in suppressing public health information
- Potential consequences of accidental releases

H. Emerging Case: Attempts to Weaponize CRISPR and Synthetic Biology

Reports from global biosecurity agencies indicate rising attempts by extremist groups to acquire gene-editing tools, DNA synthesizers, and viral genome sequences from open-source repositories.[1348]
While no confirmed CRISPR-based attack has occurred, the risk is unprecedented and forms a major focus of 21st century biodefense ethics.

Indian Cases

India has not experienced a large-scale confirmed bioterrorism attack, but several incidents and vulnerabilities illustrate the country's risk profile.

A. 1994 Plague Outbreak in Surat

[1343] Sheldon H. Harris, Factories of Death 45-47 (1994).
[1344] Seth Varma, The Rajneeshee Bioterror Attack, 72 AM.J. PUB. HEALTH 1691, 1693 (1984).
[1345] David E. Kaplan & Andrew Marshall, The Cult at the End of the World 88-93 (1996).
[1346] U.S. Dep't of Justice, Amerithrax Investigative Summary 3-7 (2010).
[1347] Matthew Meselson et al., The Sverdlovsk Anthrax Outbreak, 79 SCIENCE 1202, 1203-06 (1994).
[1348] Filppa Lentzos, Emerging Synthetic Biology Threats, 19 NAT'L SEC. J. 45, 52-55 (2021).

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

Although not conclusively proven to be bioterrorism, the unusually rapid spread of pneumonic plague in Surat led Indian intelligence agencies to consider the possibility of an accidental or deliberate introduction.[1349] More importantly, the outbreak exposed:

- Major public health gaps
- Poor disease surveillance
- Panic-driven mass migration of over 300,000 people

From an ethical perspective, the event highlights the need for preparedness and transparent communication.

B. Threats to India's Livestock and Agriculture

Biological agents targeting animals and crops—such as foot-and-mouth disease or wheat rust—pose risks to India's agricultural economy. Strategic agencies have warned that hostile actors may target food security as a form of bioterrorism.[1350]

C. Concerns Over Cross-Border Biological Threats

India's geographical proximity to regions with unstable security landscapes raises concerns about:

- Potential use of biological agents by state or non-state actors
- Infiltration through porous borders
- Cross-border movement of infected hosts or vectors

Although speculative, these concerns inform India's biodefense strategies.

D. Laboratory Biosafety Incidents and Dual-Use Risks

India hosts numerous BSL-3 and BSL-4 laboratories engaged in pathogen research. While essential for scientific advancement, such labs pose dual-use concerns if biosafety lapses occur.

Past reports of containment breaches, though minor, underscore the need for stronger regulation and ethical oversight.

E. Cyber biosecurity Risks to Indian Genetic Databases

With rising digital infrastructure, Indian health systems face risks from cyberattacks targeting:

- Genomic data
- Biorepositories
- Laboratory information systems

These emerging threats blend biological and digital risks, forming a new domain of "cyber-bioterrorism."

VII. ETHICAL DUTIES OF MEDICAL PROFESSIONALS IN BIOTERRORISM

The ethical duties of medical professionals during bioterrorism are not merely moral expectations but are firmly grounded in the **Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002**.[1351] These Regulations provide a binding ethical framework governing the conduct of registered medical practitioners in India and are particularly relevant during public health emergencies involving infectious diseases and mass casualties. The duties articulated under the IMC Regulations closely align with the principles of medical ethics—beneficence, non-maleficence, autonomy, justice, and professional responsibility—thereby reinforcing the role of doctors as protectors of both individual patients and public health.

The **duty to provide medical care in emergencies**, which becomes critical during bioterrorism incidents, is expressly recognised under **Regulation 2.1.1**, which mandates that a physician shall not refuse treatment in emergencies and must render medical aid to the best of their ability. In a bioterrorism scenario, where victims may be exposed to dangerous pathogens, this regulation

[1349] R. Ramachandran, The Surat Plague: Lessons for Urban Health Policy, 30 ECON. & POL. WKLY. 2263, 2264-66 (1995).
[1350] Indian Council of Agricultural Research, Biosecurity Concerns in Indian Agriculture 12-14 (2017).
[1351] Indian Med. Council, Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002

INDIAN JOURNAL OF LEGAL REVIEW [IJLR – IF SCORE – 7.58]
VOLUME 5 AND ISSUE 14 OF 2025
APIS – 3920 - 0001 *(and)* ISSN - 2583-2344
Published by
Institute of Legal Education
https://iledu.in

establishes a clear professional obligation to provide care, subject to reasonable safeguards. While the regulation does not compel reckless self-endangerment, it implies that doctors cannot abandon patients solely due to fear, thereby ethically reinforcing the duty to treat during biological crises.

The **duty of disease reporting and public health cooperation**, essential for early detection of bioterrorist attacks, is reflected in **Regulation 2.4**, which obligates physicians to observe and report cases of communicable diseases to relevant authorities. This duty directly supports public health surveillance and aligns with the ethical responsibility to prevent harm to the wider community. In bioterrorism cases, timely reporting by medical professionals may be the first signal of a deliberate biological release.

At the same time, the IMC Regulations emphasize the **duty of confidentiality**, a cornerstone of medical ethics. **Regulation 7.14** requires physicians to maintain patient confidentiality, except where disclosure is necessary to protect public health or required by law. This exception is particularly relevant in bioterrorism situations, where limited disclosure of patient information may be ethically and legally justified to prevent further spread of disease. Thus, the Regulations provide a balanced approach, allowing confidentiality to be overridden only in exceptional circumstances and in the interest of public safety.

The ethical responsibility of **fair treatment and non-discrimination**, which becomes vital during mass casualty events, is also embedded in the IMC framework. The Regulations prohibit discrimination in the treatment of patients on any grounds, including disease status or social background. During bioterrorism, this ensures that infected individuals are not stigmatized or denied care, reinforcing ethical principles of justice and human dignity.

Further, the IMC Regulations implicitly support the ethical duty of **professional competence and preparedness**. Physicians are required to maintain professional knowledge and skills, which extends to understanding infectious disease management, biosafety practices, and emergency response protocols. In the context of bioterrorism, this duty acquires heightened significance, as lack of preparedness may exacerbate harm.

The Regulations also impose ethical constraints on **research and scientific conduct**, discouraging practices that could harm society. Although not explicitly addressing bioterrorism, the emphasis on responsible medical conduct complements broader biosecurity ethics by discouraging misuse of medical knowledge.

The ethical duties of medical professionals during bioterrorism—duty to treat, duty to report, confidentiality with public health exceptions, non-discrimination, competence, and social responsibility—are firmly anchored in the **IMC Regulations, 2002**. These Regulations transform ethical principles into enforceable professional obligations, thereby integrating medical ethics with India's legal and public health response to bioterrorism.

VIII. CURRENT CHALLENGES

- Bioterrorism remains difficult to detect in its early stages because symptoms often resemble naturally occurring infectious diseases, leading to delayed identification and response.
- Distinguishing between a natural outbreak, laboratory accident, and deliberate biological attack continues to be a major challenge for public health authorities and medical professionals. Weak disease surveillance systems and limited laboratory capacity, especially in developing countries, reduce the ability to respond quickly to unusual disease patterns.
- Shortage of trained healthcare professionals, protective equipment, vaccines, and critical care facilities

hampers effective response during biological emergencies.

- Rapid spread of pathogens through global travel and urbanisation increases the scale and speed of potential bioterrorism impacts.
- Public panic, misinformation, and rumours—especially through social media—can worsen the effects of a biological incident and undermine trust in health authorities.
- Ethical dilemmas arise in enforcing quarantine, isolation, compulsory vaccination, and movement restrictions, which may conflict with individual rights and civil liberties.
- Allocation of scarce medical resources during large-scale biological incidents poses serious ethical challenges related to fairness, justice, and transparency.
- Coordination gaps between public health agencies, law enforcement, intelligence agencies, and disaster management authorities weaken preparedness and response mechanisms.
- Lack of a comprehensive and unified biosecurity or bioterrorism law in many countries creates legal ambiguity and fragmented accountability.
- Dual-use research in microbiology and biotechnology poses ongoing risks, as scientific advancements intended for public benefit can be misused for harmful purposes.
- Artificial intelligence, while improving disease modelling and drug discovery, also raises concerns because it can be misused to design or modify pathogens and reduce technical barriers for malicious actors.
- Increased dependence on digital systems in laboratories and healthcare institutions has introduced cyberbiosecurity risks, including hacking of genomic databases and manipulation of biological data.
- Cyber attacks on health infrastructure and disease surveillance systems can delay detection of bioterror incidents and compromise national biosecurity.
- Open access to genetic data and scientific publications creates tension between scientific transparency and prevention of misuse by hostile actors.
- Developing countries face additional challenges due to rapid digitalisation of healthcare without adequate cybersecurity safeguards or trained personnel.
- Stigmatization and discrimination against infected individuals or communities remain a serious social challenge during biological emergencies.
- Ensuring ethical conduct of medical professionals while managing fear, risk, and public expectations is increasingly complex during bioterrorism threats.
- Overall, the evolving nature of bioterrorism demands integrated legal, ethical, technological, and public health responses rather than isolated solutions.

IX. SUGGESTIONS

- Enact a comprehensive national law on biosecurity and bioterrorism to clearly define offences and response mechanisms.
- Strengthen disease surveillance and laboratory capacity for early detection of biological threats.
- Provide regular training and protection for medical professionals and healthcare workers handling biological emergencies.

- Establish clear ethical guidelines for triage, quarantine, and resource allocation during biological incidents.
- Regulate dual-use biological research and AI-based tools through strict ethical oversight.
- Implement strong cyber biosecurity measures to protect health data, genomic databases, and laboratory systems.
- Promote public awareness and inter-agency coordination to prevent panic, misinformation, and delayed response.

X. CONCLUSION

Bioterrorism represents one of the most complex and dangerous challenges to modern public health, national security, and medical ethics. Unlike natural disease outbreaks, bioterrorism involves deliberate human intent, which intensifies ethical dilemmas for medical professionals and places extraordinary pressure on legal and health systems. The study has shown that while international and Indian legal frameworks provide partial mechanisms to address biological threats, significant gaps remain in preparedness, coordination, and ethical governance. Medical professionals play a crucial role in detection, treatment, surveillance, and risk communication, and their duties are firmly rooted in ethical principles and professional regulations such as the IMC Regulations, 2002.

The rapid advancement of biotechnology, artificial intelligence, and digital health systems has further transformed the nature of bioterrorism, introducing new risks such as dual-use research misuse and cyber biosecurity threats. These developments demand a reorientation of medical ethics towards a broader biosecurity perspective that balances individual rights with collective safety. Effective response to bioterrorism requires an integrated approach that combines strong legal frameworks, ethical medical practice, technological safeguards, and public trust. Ultimately, safeguarding society against bioterrorism depends not only on scientific and legal preparedness but also on the ethical commitment of medical professionals to protect human life, dignity, and public health even in the face of unprecedented threats.

REFERENCES

1. Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, Apr. 10, 1972, 1015 U.N.T.S. 163.
2. Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous Gases, and of Bacteriological Methods of Warfare, June 17, 1925, 94 L.N.T.S. 65.
3. World Health Organization, *International Health Regulations* (2005).
4. World Health Organization, *Public Health Response to Biological and Chemical Weapons* (2004).
5. World Health Organization, *Ethical Considerations in Developing a Public Health Response to Pandemic Influenza* (2016).
6. United Nations Security Council Resolution 1540, U.N. Doc. S/RES/1540 (Apr. 28, 2004).
7. United Nations Office for Disarmament Affairs, *Biological Weapons Convention Implementation Support Unit* (2018).
8. Tom L. Beauchamp & James F. Childress, *Principles of Biomedical Ethics* (7th ed. 2009).
9. Lawrence O. Gostin, *Public Health Law and Ethics: A Reader* (2d ed. 2010).
10. Sheldon H. Harris, *Factories of Death: Japanese Biological Warfare, 1932–1945* (1994).

11. Mark Wheelis, Biological Warfare at the Siege of Caffa, 4 EMERGING INFECTIOUS DISEASES 970 (1998).
12. David E. Kaplan & Andrew Marshall, *The Cult at the End of the World* (1996).
13. U.S. Department of Justice, *Amerithrax Investigative Summary* (2010).
14. Filippa Lentzos, Synthetic Biology and the Future of Biological Weapons, 19 NAT'L SEC. J. 45 (2021).
15. Sam Weiss Evans & Daniel M. Gerstein, Cyberbiosecurity: An Emerging New Discipline, 16 HEALTH SECURITY 8 (2018).
16. National Academies of Sciences, *Biodefense in the Age of Synthetic Biology* (2018).
17. Indian Medical Council, *Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002*.
18. National Medical Commission, *Code of Professional Conduct for Registered Medical Practitioners* (2023).
19. Disaster Management Act, No. 53 of 2005 (India).
20. Epidemic Diseases (Amendment) Act, No. 34 of 2020 (India).
21. Bharatiya Nyaya Sanhita, No. 45 of 2023 (India).
22. Unlawful Activities (Prevention) Act, No. 37 of 1967 (India).
23. National Disaster Management Authority, *Guidelines on the Management of Biological Disasters* (2008).
24. Indian Council of Medical Research, *Biosafety Guidelines for Biomedical Laboratories* (2017).
25. Rakesh Bhaskar, Biosecurity Preparedness in India, 12 INDIA Q. 67 (2018).