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| **BIOMEDICAL TERRORISM: A COLD WEAPON** |
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**Abstract:**

In this modern age, to achieve an ideological, financial, religious or political aim, humans have begun conducting the intentional use of indiscriminate violence to create fear and terror which is commonly known as ‘Terrorism’. Terrorism is often used against non-combatant targets. There are many terror tactics such as biological, chemical, nuclear, or explosive events. The word ‘Terrorism’ connotes the use of force or violence outside the law to create fear among citizens with the intent to coerce some sort of action.

Considering the riotous advances in biotechnology, the threat of bioterrorism is the most plausible when compared to other weapons of mass destruction (WMDs). In the recent epidemic of H1N1 which claimed over 2,300 lives, it becomes a threat which India is not well prepared for as highlighted through this epidemic.[[1]](#footnote-1) The rapid rise in fundamentalism and extremism position of Pakistan, the precarious security environment in South Asia, the cloud of civil war in Afghanistan, the emergence of the Islamic State of Iraq and Syria (ISIS) and the Chinese intellectuals capturing the map of India further accentuate this threat.

Due to the increased threat of terrorism, the risk that is created by various microorganisms as biological weapons are required to be evaluated and the historical development with the use of biological agents should be better understood.

The addition of genetic engineering holds the most dangerous potential. In this paper, the historical perceptive of BIOMEDICAL TERRORISM is described in detail which was the basis of introducing this critical situation in this modernized period. The paper seeks to fill the lacuna from the dearth of literature regarding this field of biology.

While shedding light on the current state of the art, the research looks into exactly how these techniques can be used to create artificial viruses and bacteria that can be used as a disease-carrying mechanism. The paper deals with how biotechnology can also be used to defend against the impending threat of biological weapons.

The revolution in biotechnology has brought forth several cutting-edge technologies, which can potentially provide an actual advantage against the threat of biological weapons. There has been support for the idea of using this science to combat biological warfare or reduce the impact of the same. Perhaps, the ease of production and the broad capability of biological agents with technical knowledge led to a further spread of biological weapons. This paper evaluates the types, evaluation, and treatment of biological terrorism and discusses the role of the inter-professional team in evaluating and treating catastrophic events associated with this terrorism.

**Keywords: Bioterrorism, India, history, technology, biological weapons**

**Introduction**

Biology uses the experimental method to gain information, being a part of a triumvirate of fundamental natural sciences and, similar to its corresponding sciences of chemistry and physics. Unlike the corresponding sciences, the study of biology involves living things, which includes human beings. When humans are involved as subjects, the contrast of science affects both human rights and the Hippocratic Oath, the experimental method becomes legally and ethically unfeasible. The lethal weapons can be produced easily and inexpensively into the global market of scientific beings.

The global release of pathogens or toxins by non-state actors which inflicts harm or damage on a wide population by infecting humans, crops or livestock can be termed as **‘Bioterrorism’**. This terrorism is also referred to as ‘germ warfare’. Several military kinds of research have also been carried out on the potential of microorganisms to attack specific physical infrastructure, for example, by degrading plastics and rubber.[[2]](#footnote-2)

The terms Biological terrorism and bioterrorism came into global use in the United States during the 1990s. They refer to the use of biological agents by non-state actors to injure, frighten or kill persons (including attacks on crops or livestock). The distinction of Biological terrorism from bioterrorism is by who terrorists are, what sort of agents they use, and why they use those agents.[[3]](#footnote-3)

Designer diseases and stealth viruses are a growing notion, which makes it extremely troublesome to live in peace, considering how nuclear power has been modified. The fact about the use of biotechnology as a weapon either an offensive or retaliatory measure, is difficult to reconcile with the idea of misuse. With the rapid developments, another aspect of biotechnology has gained immense importance known as ‘ethics’. **Bioethics** includes medical and environmental ethics.[[4]](#footnote-4) The ethical issues raised in biology and medicine, especially those raised by human activity in society and the use of biotechnology is considered as ‘Bioethics’.

**Biological agents**

The biological agents include pathogens (living microorganisms that cause diseases) and toxins (non-living poisons extracted from living microorganisms, plants, or animals).[[5]](#footnote-5) The suitable pathogens for bioterrorism include bacteria, such as those causing anthrax and plague, or viruses including those which leads to smallpox and Ebola virus disease, and toxins, including botulinum toxin manufactured from a bacterium, ricin taken from castor bean plants, trichothecene made from fungi and saxitoxin derived from marine animals.[[6]](#footnote-6)

Several diseases like smallpox, have been eradicated, naturally become potent biological disaster as group immunity wanes **(National Disaster Management Authority [NDMA], 2008)**. The effects of bioterrorism can be extremely damaging to the economy and result in large-scale loss of life and disruption to society **(National Research Council [NRC], 2002)**.[[7]](#footnote-7)

Bacteria that cause anthrax, tularemia and the plague have been developed through pathogens as a biological weapon (BW). Viruses such as small-pox, Marburg and rickettsiae such as

Coxiella Burnett, which causes Q fever is considered as a havoc in bioterrorism. Theoretically, every pathogen could be used as a biological weapon posing several challenges.

There are two ways in which biological agents can be used. The first way, an individual might get infected with a pathogen such as smallpox that can be transferred from person to person, in the hope that this would spark a wider outbreak of the disease. This process can work on a small scale, it would be difficult to differentiate from a naturally occurring epidemic, and would almost certainly result in the death of the person originally infected. As the most naturally occurring pathogens are not virulent, they are selected, bred, or genetically modified to increase their virulence.[[8]](#footnote-8)

There must be a stable biological agent that allows their survival to be stored, transported and delivered to its target. The pathogens are fragile and unstable, so they are manipulated in a laboratory to improve their stability. These terrorists have a large number of agents to produce a weapon that can affect a larger population. The naturally occurring pathogens are difficult to collect in quantity which is why they are cultivated and mass-produced in a laboratory.

In a natural state, pathogens infect humans through breaks in the skin or by being ingested or inhaled. The exposure of these pathogens to a large number of people, through ingestion, will require contamination of food or drinking water, which is difficult. Due to the dilution effects, contaminating large water sources such as reservoirs is unfeasible. Thus, the most likely route for a biological weapon is inhalation. The creation of **aerosol** (a cloud of infectious droplets or particles that remains suspended in the air long enough to be inhaled) requires the manipulation of pathogens. Most of the pathogens break down quickly in sunlight, and any wind can rapidly disperse an aerosol cloud rendering it harmless, so effective delivery is difficult.[[9]](#footnote-9)

Biological weapons from these agents can be manufactured at an expensive rate and require considerable scientific expertise, and until recently only big nations have the financial resources, technological sophistication and laboratory infrastructure to do so.

**Historical view**

The intentional infliction of casualties on civilians is considered inappropriate in the history of humanity. In the areas of tactical or strategic value civilians are attacked unless for the sake of attackers. Unfortunately, bioterrorism weapons are difficult to control and it damages military personnel as well as citizens. The United States and the international community have experienced multiple acts of terrorism targeting civilians through the last decade.

The concept of biological warfare in the primitive forms of bacteriological warfare is traced back into prehistory. Before 2001, the use of biological weapons by non-state actors was inconceivable like anthrax attacks using weapon-grade Bacillus anthracis. In the last 100 years, the scrutiny of professionals shows that there have been approximately 200 incidents involving toxic biological materials. The incidents include the air dropping of plague contaminated fleas against the Chinese by the famous Japanese Army Trust in 1940 and the unpopular incidents like the contamination of mercury into Israeli oranges by the Palestinian terrorists in 1979.

* World War I: Through infecting horses and mules with glanders, a virulent disease, Germany launched a biological sabotage campaign in France, Russia and the United States.
* 1972: The Chicago water supply was planned to be poisoned with typhoid bacteria by two college students namely Allen Schwander and Stephen Pera.
* 1984: Salmonella typhimurium bacteria were infected in doorknobs and salad bars in restaurants by the Bhagwan Shree Rajneesh followers in Oregon by some local election groups.
* 1993: Anthrax in Tokyo was released by Aum Shinrikyo religious groups.
* 1995: in Oklahoma City, the bombings of Murrah Federal Building.
* 2001: The World Trade Center airline attacks.
* 2001: Delivery of anthrax-laced infectious anthrax to news media offices and the US Congress.
* 2009: Medical Center attacks at Fort Hood, Texas.
* 2014: The Boston Marathon bombings.
* Present: Multiple bombings worldwide.

Ranging from tactical to strategic, biological weapons can be tailored to suit a wide number of terrorist options. Biological diseases like these can be communicable infectious agents like Ebola and foot-and-mouth disease (FMD), or non-communicable pathogens that cause disease but are not transmitted from one human to another like anthrax and all other toxins.[[10]](#footnote-10)

Estimates of casualties produced by a hypothetical biological attack\*

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| Agent | Downwind reach (km) | Number killed | Number incapacitated |
| Rift Valley fever | 1 | 400 | 35,000 |
| Tick Borne encephalitis | 1 | 9500 | 35,000 |
| Typhus | 5 | 19,000 | 85,000 |
| Brucellosis | 10 | 500 | 125,000 |
| Q-fever | >20 | 150 | 125,000 |
| Tularemia | >20 | 30,000 | 125,000 |
| Anthrax | >20 | 95,000 | 125,000 |

\*Release of 50 kg of agent (aerosolized) by aircraft along a 2-km line upwind of a population center of   500,000 (23).\*

**(Report issued by World Health Organization in November 1969)**[[11]](#footnote-11)

The historical events of using diseases depict that it is difficult to differentiate between a naturally occurring epidemic and an alleged or attempted biological warfare attack which is the problem that has continued into present times.

**Measures against Bioterrorism: India**

The preparedness of India to deal with bioterrorism leaves much to be desired. The nodal ministry for countering terrorism is the Ministry of Home Affairs (MHA), while for handling epidemics, the **Ministry of Health and Family Welfare (MoH &FW)** is responsible. The **Ministry of Defence (MoD)** has armed forces inherently suitable as responders.

**National Institute of Virology (NIV),** is responsible for the formulation, coordination and promotion of biomedical research with the **Indian Council of Medical Research (ICMR)**. The other important facilities under the ICMR include the **National Institute of Cholera and Enteric Diseases**, **National Institute of Epidemiology and Vector Control Research Centre**. The research on hazardous chemicals, biological agents, biotechnology, microbiology, virology and toxicology is done by an extensive network of laboratories such as the **Defence Research and** **Development Organization (DRDO) and Defence Research and Development Establishment (DRDE)**.

A decentralized, start based surveillance programme known as **Integrated Disease Surveillance Programme (IDSP)** was launched in 2004, with an integrated communication backbone for early warning and timely response to impending disease outbreaks.[[12]](#footnote-12) On grass-root levels, IDSP has failed to reach satisfactory results in the recent epidemics.

**Threat Assessment**

India lacks the benign security environments in South Asia. The unsettled boundary with neighbour nations and its extremely weak relations with state institutions adversely affected the security of India. The democratic state is battling serious terrorist threats. More than 800 terrorist modules are operating in India.[[13]](#footnote-13) Nuclear proliferation and the linkages of many terrorist organizations with Pakistani scientists highlighted the threat through the case of A Q Khan.

The security of India is more reactive than proactive i.e. incident-based. The expansion of the pharmaceuticals and biotech industry depicts that bioterrorism is a threat for which India is not well prepared. The possibility of infiltrating sites and facilities containing dangerous material is a concern as doctors, engineers, academicians and information technology (IT) personnel were arrested in the past involved in bioterrorism.[[14]](#footnote-14)

It was suspected through epidemiological studies that the disease might have been genetically engineered in both places due to the ‘unique’ unknown strain. The plague of Surat and the way the crisis panned out some important lessons for India which the country was not ready for:

* Around 400,000-600,000 residents migrated which was the biggest migration post Independence. This migration was the reason for the spread of the disease to the whole country.
* Stocks of tetracycline and other broad-spectrum antibiotics were exhausted within hours of the severe outbreak due to panic buying of medicines.
* The **MoH & FW** was a mute spectator declaring the plague pneumonic and not bubonic i.e., pneumonic plague was more lethal.
* The exaggerated figure of deaths was reported by the media nationally and internationally, which triggered unprecedented panic all over the nation.
* International flights were suspended and some countries also put restrictions on imports from India. There was export restriction too, which cost the Indian economy Rs 13 billion, besides loss of investor confidence.

In India, the prevalent internal security challenges and the absence of major biological disasters so far are in danger of generating complacency. The vulnerability of India to biological threats such as bioterrorism and biological havoc shows the urgent need to strengthen the public health system and surveillance measures.

**Aspects of Biotechnology**

The ‘brave new world’ of genetically engineered plants and animals have everything from plant-based edible vaccines to sheep and goats that produce pharmaceutical drugs in their milk, to pigs whose organs can be transplanted into people, to yellow rice designed to save millions in the developing world from serious nutritional deficiency.

The meaning of biotechnology is different to different people and things. The term refers to the modification or exploitation of naturally occurring biological processes to meet determined human needs.[[15]](#footnote-15)

The notions on biotechnology are quite varied with the regional scope with some commonalities. The people are optimistic about the ability of biotechnology to improve national security conditions.[[16]](#footnote-16)

Since 1999, most of the EU 15 member states have seen a rise in national public optimism about biotechnology. There is a growth of this sector in India too. The distinction between conventional biotechnologies and applications of biotechnology in military fields is very fundamental.[[17]](#footnote-17) The question of awareness comes down in the picture. Through the introduction of biotechnology, the application of bioterrorism episodes is minimal in the world.

Under obligations of the **International Biological Weapons Convention, 1972, the Biological weapons andante-Terrorism Act, 1989** was passed instead of the United States. The **Public Health Security and Bioterrorism Preparedness and Response Act of 2002** is the most recent statute which moves towards closing loopholes in the previous statutes.[[18]](#footnote-18)

In the context of India, potential risks are with regards to the use of genetically modified organisms in agriculture, healthcare, human wellness, environment and biological diversity. In 2000, the Cartagena Protocol on Biosafety was negotiated and adopted under the umbrella of **CBD(Convention on Biological diversity)**. India is a party to the **Convention on Biological Diversity (CBD) and signatory to the Cartagena Protocol on Biosafety**.[[19]](#footnote-19)

**Conclusion:**

In their delayed and invisible effects, biological weapons are unique. The factors which make it unique can allow several groups to inculcate fear and cause confusion among their victims. By a biowarfare attack, not only sickness and death in a large number of victim results but also it would aim to create fear, panic and paralyzing uncertainty to the future generations.

Bioterrorism is a low-probability and high impact event in the world. The term can mitigate threat calls for a robust public health system.[[20]](#footnote-20) The essential component of this threat mitigation is political awareness and public participation. The security forces have lacked the know-how about bioterrorism and it will require both capacity and capability building to manage these situations.[[21]](#footnote-21)

To build a seamless system inclusive and holistic efforts are needed that have preparedness and response to counter this biologically developed terror. The transformation of India into a resilient society will require the preparation of India against biological attacks that have dual-use benefits of combating natural diseases.[[22]](#footnote-22)

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**About the Author**

The author of this research work is Yukta Singh. She is a fourth-year law student, graduating from Lloyd Law College of Greater Noida. She was fascinated with the law at a young age, and this interest led to some early exposure to legal pieces of literature since she was drawn to the legal field. She is an enthusiast and a learner with a dream to be a successful Corporate Lawyer in future. Apart from corporate laws, she is interested in Criminal and Constitutional Laws. She is also a bit of a snob for Cyber Law literature. Ms Singh has written several research papers and articles in her student phase with publishing rights. In this paper, the author has developed and presented a passion for ideas.

Note: Yukta Singh describes the trajectory of Bioterrorism around the globe, culminating the necessary research. She piques the curiosity of the reader as to how exactly this terror can manipulate the lives of human beings.

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