

# Bioterrorism as a Threat to Humanity

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## Abstract

Bioterrorism instrument of biological weapon of mass destruction. The simple definition of bioterrorism is the utilization of pathogenic micro-organism as an instrument of war and terror. Various notorious microbe has been applied as biological weapons, such as *Bacillus anthracis*, *Bubonic plague*, *Cholera*, *Botulinum*, and others. As the weaponizing germs would eventually require sophisticated microbiology laboratory, not many nations can build it. History has shown that this kind of weapon is much easier to prepare than nuclear and chemical ones. Notorious dictators, such as Josef Stalin and Hideki Tojo, have issued policies to develop biological weapons. During World War II, Soviet Union has utilized them as an instrument to repel the invading German army, while the Japan Empire was about to utilized it in the Pacific War. According to the ordination of United Nations, the application of biological weapon during conventional war is strictly forbidden. Any nations that deploy bioterrorism as instrument of war will face certain sanction from United Nations. In one hand, by law, United States has suspended its biological weapon program at 1972. In the other hand, the dissolution of Soviet Union at 1991 has struck a fatal blow to the development of its biological weapon. However, although some random events in the world, such as the outbreak of avian influenza and Mers-Cov virus, are sometimes associated with bioterrorism by the conspiracy theorist, until today, the scientific community still found no evidence of biological weapon at the current outbreak. This lecture will discuss about the definition of bioterrorism, its utilization, and prevention (biosafety). It is expected that this lecture will eventually increase the public awareness toward the biological weapon.

## I. INTRODUCTION

**B**ioterrorism comes from Greek and Latin words, *bios* (life) and *terrere* (terror), respectively. Bioterrorism emphasizes on creating terror on life and defined as the use by non-state actors of microorganisms (pathogens) or the products of living organisms (toxins) to inflict harm on a wider population [1].

Perpetrator (criminals, insurgent, violent non-state actors) can utilize technology as tools for doing terror. Bioterrorism can be used as strategy or tactic for certain purposes. They

are not only targetting human, but crops and livestock can also be their target [2].

Advanced technologies in biological section can be either advantage or threat for humanity. If they use it as a biological mass destruction weapons which are most feared because of the infection and the psychological consequences, it would be harder to stop it.

## II. MOTIVATIONS IN BIOTERRORISM

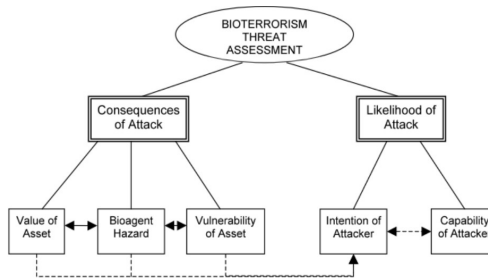
Why do they do the terrorism? Terror is about sending a message, like The Joker said "It's

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\*A thank you or further information

not about money... its about sending a message." [3] This action emphasize mainly about political/ideological. However, technically it depends on the scope of the message, whether to just the faction or to the whole population. Perpetrator terrorize community for another reason and some factors that affect the terrorism can be [4]:

- Ideological (political, social, cultural or religious beliefs which terrorist group hold). There are doctrines, set of values, and behavioral preceptions in their national, cultural and extremist associations).
- Strategic (concerning particular political, social, or religious goals and objectives in the group, seeking achievement and how to accomplish that).
- Tactical (method and techniques to achieve objectives).



**Figure 1:** *Bioterrorism threat assessment*

Biological threat assessment contain two aspects; consequences of the attack and the likelihood of the attack. For the consequences of the attack, it depends on the value of the asset, bioagent hazard, and vulnerability of the asset. The likelihood of the attack depends on intention of attack and the capability of the attacker [4].

### III. ATTACKING REQUIREMENTS

To conduct bioterrorism, one should have several points:

- Organizational Capabilities

- Financial Resources
- Logistical Resources
- Knowledge/Skill Acquisition
- Materials and Technology Acquisition
  - the natural environment
  - purchasing seed stocks from a culture collection
  - theft of seed stocks
  - transfer of seed stocks from a state-level biological weapons program
  - creation of pathogen from genetic building blocks
- Production
- Weaponization and Delivery
  - Aerosol
  - Liquid slurry (thick mud-like slurry)
- The Issue of State Sponsorship

### IV. DISTINCTIONS BETWEEN CHEMICAL AND BIOLOGICAL TERRORISM

Figure which contain a table below, show the differences between chemical and biological terrorism. The distinctions are really clear, so we can know what is the different [5].

**Table 1.** Important distinctions between chemical and biological terrorism.

Chemical terrorism	Biological terrorism
	<i>Speed at which attack results in illness</i>
Rapid—usually minutes to hours after attack	Delayed—usually days to weeks after attack
	<i>Distribution of affected patients</i>
Downwind area near point of release	Widely spread through city or region; major international epidemic in worst-case scenario
	<i>First responders</i>
Paramedics, firefighters, police, emergency rescue workers, and law enforcement	Emergency department physicians and nurses, infectious disease physicians, infection control practitioners, epidemiologists, public health officials, hospital administrators, and laboratory experts
	<i>Release site of weapon</i>
Quickly discovered; possible and useful to cordon off area of attack	Difficult to identify; probably not possible or useful to cordon off area of attack
	<i>Decontamination of patients and environment</i>
Critically important in most cases	Not necessary in most cases
	<i>Medical interventions</i>
Chemical antidotes	Vaccines and/or antibiotics
	<i>Patient isolation/quarantine</i>
After decontamination there is no need	Crucial if easily communicable disease is involved (such as smallpox); advance hospital planning for isolating large numbers of patients is critical

**Figure 2:** *Distinctions of Chemical and Biological Weapon*

## V. U.S. BIOTERRORISM AGENTS CATEGORIES

United States divide the categories into priority level [6].

1. Category A (Highest priority agents)
  - Can be easily disseminated or transmitted from person-to-person
  - Cause high mortality with greatest potential for major public health impact
  - May cause public panic and social disruption
  - Require special action for public health preparedness
  - Examples: Anthrax (*Bacillus anthracis*), Botulism (*Clostridium botulinum* toxin), Plague (*Yersinia pestis*), Smallpox (*Variola major*), Tularemia (*Francisella tularensis*), Viral hemorrhagic fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses [e.g., Lassa, Machupo])
2. Category B (Second highest priority agents)
  - Are moderately easy to disseminate
  - Cause moderate morbidity and low mortality
  - Require specific laboratory diagnostic enhancements and enhanced disease surveillance
  - Examples: Brucellosis (*Brucella* species), Epsilon toxin of *Clostridium perfringens*, Food safety threats (e.g., *Salmonella* species, *Escherichia coli*, *Shigella*), Glanders (*Burkholderia mallei*), Melioidosis (*Burkholderia pseudomallei*), Psittacosis (*Chlamydia psittaci*), Q fever (*Coxiella burnetii*), Ricin toxin from *Ricinus communis* (castor beans), Staphylococcal

enterotoxin B, Typhus fever (*Rickettsia prowazekii*), Viral encephalitis (alphaviruses [e.g., Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis]), Water safety threats (e.g., *Vibrio cholerae*, *Cryptosporidium parvum*)

3. Category C (Third highest priority agents) include emerging pathogens that could be engineered for mass dissemination because of:
  - Availability
  - Ease of production and dissemination
  - Potential for high morbidity and mortality rates and major health
  - Examples: Nipah virus, Hantavirus

## VI. UTILIZATION

This is the history of bioterrorism. It was already utilized since 600 BC, although it was much more simpler [7]. Old times:

- 600 BC - Assyrians' fungus poison in enemy's well
- 1346 - Bubonic plague (Tartar Army)
- 1485 - Naples The Spanish supplied their French enemies with wine laced with leprosy patients' blood.
- 1797 - Napoleon attempted to infect inhabitants in Mantua

Modern times:

- 1937 - The Japan's Unit 731
- 1984 - Rajneeshee Religious Cult used *Salmonella typhimurium*
- 1995 - Aum Shinrikyo Cult used sarin gas in Tokyo subway
- 2001 - Anthrax in a mail was sent to US Senate
- 2014 - MERS? Ebola Virus?

Nevertheless, in modern times, the technology are even much more developed and advanced, with higher impact as well. In the war time, Japan developed Unit 731 for producing biological weapon. One of the latest case is the sending of Anthrax mail to the US senate. Still, the current outbreak of MERS and Ebola are still considered as naturally occurring by WHO, despite the potential to be biological weapon.

### I. The Japan's Unit 731

Japan's Unit 731 is one of the most advanced biological weapon installation at its time [8]. In the war time, Japan built the Unit 731, in order to make an advancement in bioweapons. Japanese army used human experiments (Codename: Maruta) for developing effective bioweapons. Maruta means log, the wood log. It was merely a joke to cover the amount of bodies they have used for the experiments [9]. Located on Pingfang, China, and commanded by Lt. Gen. Ishii Shirou, they used the prisoners and tested them with bacteria and virus such as Anthrax, Glanders, and Bubonic plague [9]. The research were about how effective the bioweapon and the duration in engaging death. They could even developed a bio-bomb that will be applied at the pacific wall, although it never happens due to the capitulation of Japan armed forces.

### II. Rajneeshee Religious Cult

In early 1980, Bhagwan Shree Rajneesh established this cult in Oregon. Then the local council dislike the idea for them to take a place. Nearly that time, they planned to influence the outcome of next local council elections [2]. They used *Salmonella typhimurium* in the salad bars of ten local restaurants. 751 cases of salmonellosis, at least 45 had to be hospitalised. This happened because the lack of hygiene security and inspection in that town.

### III. Aum Shinrikyo Cult

In 1995, they had 60000 members and billion US dollars They believed about the apocalyp-

tic Armageddon and only a few will survive that time [2]. The notorious attack was using sarin gas in Tokyo subway. Not only they had sarin gas, but they also had many chemical and biological agent, such as:

- Chemical weapon : sarin, VX, tabun, soman, mustard gas and sodium cyanide.
- Biological agents : anthrax, Q fever, botulinum toxin, and sample of Ebola fever outbreak in 1995.

But they failed to infect people with their biological agents : They attempted to disseminate botulinum toxin on seven occasions and anthrax twice, using sprayers on rooftops and the back of trucks, which was also a failure. They had also found it too difficult to get their anthrax to form spores and had instead tried to spray anthrax slurry which did not aerosolize correctly.

### IV. Letters with Anthrax

Soon after the terrorist attacks of 9/11, letters laced with anthrax began appearing in the U.S. mail. Five Americans were killed and 17 were sickened in what became the worst biological attacks in U.S. history.

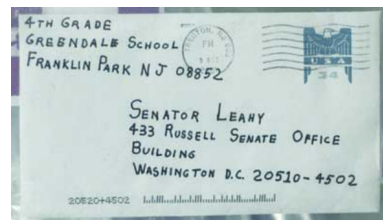


Figure 3: Letter to The Senator

### V. Middle East Respiratory Syndrome (MERS)

Viral respiratory illness first reported in Saudi Arabia in 2012. It is caused by a coronavirus called MERS-CoV which is the newest biosafety threat is definitely MERS-CoV. This virus could poses potential hazards to the Islamic world, because it occurred in the vicinity of the Islamic

holy sites of Mecca and Medina. Most people who have been confirmed to have MERS-CoV infection developed severe acute respiratory illness. They had fever, cough, and shortness of breath. About 30% of people confirmed to have MERS-CoV infection have died.

There are still no vaccine, nor drugs that available to tackle with the infection [13].

## VI. Ebola Virus Disease (EVD)

Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans. EVD outbreaks have a case fatality rate of up to 90% and occur primarily in remote villages in Central and West Africa, near tropical rainforests. The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission. Fruit bats of the Pteropodidae family are considered to be the natural host of the Ebola virus. Severely ill patients require intensive supportive care. No licensed specific treatment or vaccine is available for use in people or animals [10].

One of numerous Viral Hemorrhagic Fevers. It is a severe, often fatal disease in humans and nonhuman primates (such as monkeys, gorillas, and chimpanzees). July 27, 2014, the Guinea Ministry of Health announced a total of 460 suspect and confirmed cases of Ebola virus disease (EVD), including 339 fatal cases. Though it has been almost 40 years since Ebola was first discovered in 1976, there are currently no cures or effective treatments[12] [14]. Is this bioterrorism?

## VII. PREVENTION (BIOSAFETY)

Prevention or biosafety must be ensured to enhance the public awareness of those bioweapon agents, although the utilization of bioweapons need an expert skill level [15]. In America, Biological Integrated Detection System (BIDS) : a mobile detector, using antibodies to detect the engaging bioweapon [2]. Conducting preparation and planning in each specific agents, is a need. If possible, biosecurity would

make vaccines for the high priority agents [15]. As preventive medicine : we can use the advantageous speed of bioinformatics and computational drug design to search for new drug candidates.

## VIII. SUMMARY

Biotechnology can be used to for humanity or -in the wrong hands- as tools to threaten others. Bioterrorism do need certain skills and expertises. It is a need to prevent the bioterrorism, we can't just stand idle and let them terrorized us. Increasing public awareness about bioterrorism will be necessary.

## IX. ACKNOWLEDGEMENT

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