

Bioterrorism: Historical Prospective

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Abstract

Biological weapons have been a threat to human being for many centuries. Many different modes and techniques have been used since ancient times to use the biological warfare agents to kill or harm the enemy and to fulfill their evil intentions. The earliest report has been found before the birth of Christ. At those times very crude methods such as faecal matter and animal carcasses etc. were used but now the concentrated forms of biological agents such as dried spores and genetically modified organisms are available which are fatal even in minute quantity. After the two world wars there had been a race to develop deadlier biological weapons which resulted in death of millions of people and live stocks. Taking into account the potential of these biological weapons to cause mass destruction, a Convention was signed to check the production storage and use of biological weapons. For this full international cooperation is needed. The use of RaPiD-T (R-recognition, P-protection, D-detection, and T-treatment) course can help in reducing morbidity and mortality. The Patriot act and Public Health Security and Bioterrorism Preparedness act have been passed in this regard.

INTRODUCTION

Biological warfare is the intentional use of microorganisms, and toxins (microbial, plant or animal origin), to produce disease and/or death in humans, livestock and crops.

Biological Weapons (BW_s)/ Weapons of mass destruction (WMD) are usually clubbed with the Nuclear and Chemical weapons in the acronym NBC.^{1, 2}

The threat of BW_s is still looming large as can be seen by the fact that it has now become an easy weapon of terrorization by the militants amply illustrated by the 2001 anthrax outbreak in the United States. For the financial Year (FY) 2007, the President's Budget proposes a total of \$1.9 billion for National Institute of Health (NIH) biodefense efforts, a net increase of \$110 million, or 6.2 percent, over FY 2006.³

BEFORE FIRST WORLD WAR

The earliest event reported for the possible use of biological warfare dates back to 400 BC when Scythian archers would tip their arrows in a mixture of manure and blood from decomposing bodies. Enemy soldiers would develop bacterial infection from non-lethal arrow wounds.⁴ This technology is still used by some South American Indians and Africans to slay game and to down a human enemy or two.^{5, 6}

The ancient empire of Assyria poisoned the water supply of

their enemies with the use of rye ergot, a fungus (genus *Claviceps*), and during the siege of Krissa, Salon, an Athenian lawgiver, repeated the same act using skunk cabbage instead.⁷ In 300 BC Roman soldiers would foul a city's water supply by throwing dead animals into wells.⁸

In 183 B.C. live snakes were filled in earthen pots and used in a naval battle between Hannibal, the great Carthaginian leader and King Eumenes of Pergamum. It is said that, king Eumenes soldiers were just merely amused with Hannibal's action to hurl earthen pots aboard the ship, until they realized that their ship was crawling with serpents.⁹ The next documented event occurred in 1346 A.D., when the Tartars flung their soldiers' dead bodies who were suffering from bubonic plague in the Genoan city of Caffé (present Ukraine). The plague ended up running unchecked throughout the city killing thousands and forcing the Genoans to abandon the city.^{10, 11, 12} Similar tactics were used in the battle of Carolstein in 1422 and Russia's war with Sweden in 1710.¹³

Smallpox, at least in the Americas, was seen to be a particularly useful weapon from soon after its inadvertent introduction by Cortez in 1520. During the French and Indian Wars in 1763 the British used smallpox as a biological weapon.¹⁴ The British Commander, Sir Jeffrey Amherst gave the Indians loyal to the French, blankets infested with smallpox virus.^{11, 15}

During the years of American Revolution there were a number of reports of civilians afflicted with smallpox being sent or transported by British army officers to infect Revolutionary troops and citizens. The first deliberate attempt on the part of British forces to spread smallpox was reported during the 1775 to 1776.¹⁴

Nepolean in 1797, infected citizens of Mantua Italy with leptospirosis or swamp fever.^{13,16}

Apart from the military and war usage there has been reports for usage in personal revenge, as in 1860 a professional robber for the medical college of Ohio in Cincinnati became incensed at tricks played on him by medical students. He delivered the corpse of a smallpox victim recently buried to the dissecting lab and intentionally infected many medical students.¹⁷

FIRST WORLD WAR

The advent of world war provided the stimulus for the development of special weapons system, but most efforts were directed to the development and applications of chemical weapons. However in 1917, the German government inoculated American horses and cattle bound for France from South America with glanders disease causing agent (*Burkholderia mallei*).¹¹

At a diplomatic function in the Syrian Embassy in France, a man approached a Syrian high official. He asked if the official knew another member of the government. When the Syrian said yes he gave him a copy of the Koran to give to this person. Since he was very cautious about security he had the book tested. What they found was a deadly poison had been dusted on the Koran. If the high official had used it, he would have died as a result of a chemical assassination.¹⁵

The Japanese conducted extensive biological experiments in Manchuria and in vivo studies on Chinese prisoners. The secret Japanese organization known as Unit 731 conducted extensive biological experiments. At the same time, at least 11 Chinese cities were attacked with plague infested fleas dropped.¹¹

SECOND WORLD WAR

During World War II, biological weapons are known to have been used by Japan and possibly by the Soviet Union. There were plenty of research and development programmes conducted by the Germany, United States and United Kingdom. Japan's

Biological weapons program was huge one which can be gauged from the number of

Centers involved and the number of scientists working. Major ones were centers in Pingfan, Manchria (Unit 731), with more than 3000 thousands scientists working. More than 10,000 prisoners died as a result of experimental infections. At least 11 cities in China were attacked using anthrax, cholera, shigella, salmonella and plague organisms to contaminate food and water supplies. Fleas were infected with plague bacillus and released by aircraft over cities.¹⁴

By 1941, British had learnt about the Japanese development of biological weapons and took more interest in bioweapons and experimenting with anthrax off the north-west coast of Scotland. The grenade used to assassinate German Reinhard Heydrich, chief of the Nazi security service is suspected to have been contaminated with botulinum toxin.¹⁸ Information about possible use of Biological weapons by Soviet Union was provided by Alibek, who believes that tularemia was used at Stalingrad in 1942 against Germans Panzers and Q fever in 1943 among German troops on leave in the Crimea.¹⁴ The Nazis forced the Jews in the concentration camps to live under conditions that they knew would lead to the outbreak and spread of virulent diseases among a cold, starving and stressed population.¹⁰ Biological warfare was at its peak with the Colorado beetles destroying crops in Germans (1944), rice blast in Japan (1945), mysterious outbreaks of dysentery in Bohemia (1945), and cholera in Egypt (1947).¹⁸

AFTER SECOND WORLD WAR

With the passage of World War II the allies came to know about the extent of the research and development made by Japan in the biological weapons. This gave the feedback and impetus to the expansion of biological weapons programs in a number of countries like United States, United Kingdom, Canada, Australia etc. The development in this field grew tremendously until the Biological Weapons Convention which came into effect in 1972.¹⁴

At the time the US BWs program was terminated by President Nixon in 1969, five biological agents: *Bacillus anthracis*, *Francisella tularensis*, *Brucella suis*, *Coxiella burnetii* and Venezuelan equine encephalitis, and two toxins: staphylococcal enterotoxin B and botulinum toxin, had been standardized and weaponized.¹⁰ A biological weapons convention was eventually agreed on in 1972 and went into effect 1973. The agreement reached by 103 nations "never to develop, produce, stockpile or otherwise acquire or retain

microbial or other biological agents or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective, or other peaceful purpose and weapons, equipments, or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.”¹⁹

After this convention there has been no reports of the use of the BW's by any county except for the two signatories, Iraq and the former Soviet Union, who have since ‘admitted publicly and officially that they have been engaged in biological weapons

Research, development and production, but then there had been surge in its use by the militants and criminals. The mid 70s to early 80s brought documented testimony that the countries, Laos, Kampuchea, and even Afghanistan were victimized with the clouds of

Yellow rain'. It was observed that after planes and helicopters dispersed a certain aerosol which contained toxins primarily T-2 mycotoxin, people and animals became sick and disoriented and some even died.²⁰In 1978, there were two attempted assassinations of Bulgarian defectors using ricin agent in umbrella. In September in London, Markov was assassinated. In October in Paris, Kostov's assassination was attempted but the pellet lodged in his subcutaneous fat layer where the body heat was not enough to melt the wax. As a result, Kostov survived the attack. It is suspected that at least six assassinations have been conducted using this tactic.¹⁵

In 1979 in the city of Sverdlovsk, USSR, an explosion from military compound results in a toxic release. Over the next several days, citizens downwind were stricken with high fevers, difficulty breathing, and death. There were over 40 fatalities. Some believed the estimated death toll approached 1000. While local doctors announced an outbreak of inhalation anthrax, the government blamed the situation on anthrax-contaminated beef. The official cause is made known by President Boris Yeltsin in 1992 when he states that it was an accidental release of anthrax spores in a BW program^{21, 22} and in 1981, a Townsen Professor was arrested while trying to rob and kidnap a clerk from a convenience store with a hair spray can. When the can was searched, the authorities found a propane tank with a timed release containing HCN.¹⁵

In 1984, salad bars in Oregon restaurants in Dalles were intentionally contaminated with Salmonella Typhimurium

by Rajneesh Cult, a microbiologist that resulted in 751 cases, of which 45 were hospitalized.^{10, 11} Punjie sticks were used in Vietnam to the same result of infecting soldiers with disease and infection. Soldiers would fall into pits with punjie sticks and the coating of the sticks would puncture skin and cause infection.¹⁵

In 1988 Russian scientist in the city of Sverdlovsk transferred hundreds of tons of anthrax bacteria large enough to destroy the world many times over. They put it into the giant stainless steel containers, poured bleach into them to decontaminate the deadly pink powder. Soldiers dug huge pots and poured the sludge into the ground burying the germs in the Renaissance Island. Then tests showed that although the anthrax bacteria were soaked in bleach twice, some of the spores were still alive and potentially deadly. The stockpile had to be destroyed when US and Britain demanded an inspection and this was done in great haste and total secrecy.^{23, 24} Dr. Kenneth Alibek, the former Deputy Director of Biopreparat in Russia disclosed before the US Joint Economic Committee, the extent of Russian program related to BWs. In 1992, there were 32,000 employees and 40 researches and production units.¹¹Over a 5 year's period, Iraq initiated and aggressively developed a BW program which resulted in the filling of BW agents into over 160 aircraft bombs and 25 Al Hussein missiles warheads and their deployment to four locations.¹¹

According to the Office of Technology Assessment and the US Senate, in 1995, there were 17 countries that were suspected of manufacturing biological weapons.^{16, 25} Though there has been no proof of biological warfare in India, there are a few suspicious outbreaks that may have a terrorist attacks. In 1965 during the Indo-Pakistan war, an outbreak of scrub typhus was observed in the northeastern region of India. An outbreak of pneumonic plague in Surat and bubonic plague in Beed in 1994.²⁶ There has been suspicion that the Surat strain might have been genetically engineered ever since the Government received the test reports from the United States describing it as “Unique” and unrelated to any known strain in the world.²⁷

The threat of Biological terrorism resurfaced following Aum Shinrikyo sarin attack of the Tokyo subway in 1995. The cult's arsenal seized by the police allegedly contained botulinum toxin and drone aircraft equipped with spray tanks.⁸ This incident shattered Japan's cherished self-image as one of the world's safest nation. It is the first example of WMD use against civilians by a religious cult. On 27

February 2004, Shoko Asahara, the former leader of religious cult Aum Shinrikyo has been sentenced to death. Lawyers for Asahara immediately filed an appeal and the process could drag on in court for years, experts' say.²⁸ New methods for bioterrorism were sprouted in the late 1990s. In 1997 a package claiming to contain anthrax was allegedly sent by Counter Holocaust Lobbyists of Zion. Two years later in 1999 a man attempted to rob a currency exchange office in Croatia with a syringe that allegedly contained HIV.^{16, 29}

London Sunday Times, March, 1998: Israeli warplanes equipped to carry chemical, biological weapons. Israeli F-16 fighters have been equipped to carry chemical and biological weapons manufactured at a secret biological institute in a Tel Aviv suburb. Israeli air force crews are now trained to fit active chemical or biological weapons to F-16s within minutes of receiving a command to attack.¹⁰

In the fall of 1998 there was a report that White SA government had ordered a program to develop a genetically engineered BW that would specifically kill blacks. Recently, a rumor surfaced (in the English Press) that Israel was working on a BW that would specifically harm Arabs carrying certain genes.¹⁰

There had been incidences from the infections by the use of infected letters. Morris, 55 and Joseph Curseen Jr., 47 were the two postal workers at Brentwood, Washington who died from inhalation anthrax in October-November 2001. Two other employees were hospitalized with the same disease.³⁰

Ottolie Lundgren, 94, became the nation's fifth anthrax fatality since letters laced with the deadly bacteria began turning up in the mail (23 November 2001. Oxford, Connecticut).³¹ In April 2004 Palestinian militants planned to detonate a bomb laced with HIV infected blood which could prove fatal to survivors with injuries, during Passover holiday but was foiled by the authority.³²

Figure 1

Figure 1: Sandia decontamination foam (reproduced with permission)



Biological weapons can strike suddenly without any warning and inflict considerable mortality and morbidity that can continue for a long period. Atypical clinical manifestations and short time distribution of cases should give rise to suspicion of outbreak due to biological weapon. Attacks by such weapons shall create high level of panic, environment contamination and extreme pressures on emergency health services. Current concerns regarding the use of bioweapons result from the increasing number of countries that are engaged in the proliferation of such weapons; and the acquisition of these cheaper weapons by terrorist organizations. Just as certain illegal drugs are maintained in mobile van labs, so it is possible to grow most bioweapons under similar hidden and or mobile conditions. Recently, Russian researchers have reported that they have genetically engineered a novel anthrax organism. It is suggested by

some that the current vaccine administered to US troops would be ineffective against this genetically engineered strain.³³ By tweaking bacterial gene and viral DNA, a gene terrorist could create an agent far more devastating than the bugs featuring in the anthrax attacks. Two documented cases in which biologists have accidentally created a doomsday bug. One was a strain of the common intestinal bug *Escherichia coli* that was 32,000 times more resistant to the antibiotic cefotaxime than conventional strains. In another case, a pair of Australian scientists created a vicious strain of smallpox, among laboratory mice. They, too destroyed the virus.³⁴ Newer diagnostic techniques, like a biodefense Microarray, that can detect hundreds of top-priority bacterial and viral biologic threats such as anthrax and plague is being developed.³⁵ A new biosensor system called TIGER (triangulation identification for genetic evaluation of risks) has been developed. It can simultaneously identify thousands of infectious organisms in a sample without needing to know beforehand what might be in the sample.³⁶ The need of the hour is to develop full international cooperation; and to educate the likely target populations as to what precautions and protective actions to take in case of a BW attack.

The threat of bioterrorism is now a reality this calls for larger participation by physician to build an emergency medicine infrastructure in their nation.

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References

1. Atlas RM (1998) Biological weapons pose challenge for microbiological community. *Am. Society Microbiol. News* 64: 383-88.
2. Raghunath D (2000) Biological warfare: Bioterrorism," XXIV National Congress of Indian Association of Medical Microbiologists, Patil CS (ed) (Department of Microbiology, JNMC, Belgaum).
3. <http://www.hhs.gov/budget/07budget/nih.html>
4. <http://www.cas.muohio.edu/%7Embi-ws/biologicalwarfare/historyofbw.html>
5. Atlas RM (1998) The Medical threat of biological weapons. *Critical Reviews Microbiol* 24(3): 157-168.
6. Prasad A. S (December 2001) History of Bioterrorism. *The Indian Practitioner .J* 54, 12: pp. 858.
7. Prasad A. S (December 2001) History of Bioterrorism. *The Indian Practitioner .J* 54, 12: pp.857.
8. <http://www.cas.muohio.edu/%7Embi-ws/biologicalwarfare/historyofbw.html>
9. Rothschild JH (1964) *Tomorrow's weapons*. New York, NY:McGraw-Hill; 1964. URL available at <http://72.14.203.104/search?q=cache:o7O-5mg2c0gJ:www.globalsecurity.org/cgi-bin/texis.cgi/webinator/search/%3Fquery%3Dbiological%2Bchemical%2Bweapon%2Bdefense%26pr%3Ddefault%26order%3Dr%26cmd%3Dcontext%26id%3D42b635e9f+Rothschild+JH,+%E2%80%9CTomorrow%E2%80%99s+weapons%E2%80%9D+New+York,+NY:McGraw-Hill%3B+1964&hl=en&gl=in&ct=clnk&cd=310>
10. <http://www.slic2.wsu.edu:82/hurlbert/micro101/pages/101biologicalweapons.html>
11. Batra HV(2000) International response to BW threat and the global scenario. XXIV National Congress of Indian Association of Medical Microbiologists, Patil CS (ed) (Department of Microbiology, JNMC, Belgaum).
12. <http://www.calpoly.edu/~drjones/types.html>
13. Prasad A .S (December 2001) History of Bioterrorism. *The Indian Practitioner. J*, 54:12: pp. 858
14. Gerald L. Mandell, John E. Bennett, and Raphael Dolin (2004) *Principles and Practice of Infectious Diseases*, 6th ed, ed., Gerald L. Mandell, John E. Bennett, and Raphael Dolin (Churchill Livingstone), pp. 3594.
15. Harris R, Paxman. J(1982) *A higher form of killing* (Noonday Press, New York), 74.
16. http://www.bioterry.com/history_of_biological_terrorism.asp ; 2001
17. Ambrose CT (may 2005)Osler and the infected letter *Emerg Infect Dis*, 11(5): 689-93. Erratum in: *Emerg Infect Dis*, June 2005, 11(6): pp. 976. PMID: 15890120 [PubMed - indexed for MEDLINE] URL available at: <http://www.cdc.gov/eid>
18. Prasad A. S (December 2001)History of Bioterrorism *The Indian Practitioner. J*, 54:12: pp. 859
19. Gerald L. Mandell, John E. Bennett, and Raphael Dolin (2004) *Principles and Practice of Infectious Diseases*, 6th ed, ed., Gerald L. Mandell, John E. Bennett, and Raphael Dolin (Churchill Livingstone), pp. 3595
20. Prasad A. S (December 2001) History of Bioterrorism *The Indian Practitioner. J*, 54:12: pp. 860
21. Prasad A. S (December 2001) History of Bioterrorism *The Indian practitioner. J*, , 54:12: pp 860
22. <http://www.aps-pub.com/proceedings/1461/102.pdf>
23. Prasad A. S(December 2001) History of Bioterrorism *The Indian practitioner. J*, 54:12: pp861
24. Sharma R (2001) India Wakes up to threat of bioterrorism," *British Medical. J*, 323: pp 714.
25. A conversation with Richard Preston(1999) *Lab. Med.* 30: pp517.
26. http://www.defenselink.mil/other_info/agent.html
27. http://www.hindunet.org/alt_hindu/1995_Aug_1/msg00015.html
28. *Hindustan Times India*, 29 February 2004, pp. 16, col. 1
29. Prasad A. S (December 2001) History of Bioterrorism *The Indian practitioner. J*, 54, 12: pp. 862
30. <http://archives.cnn.com/2001/HEALTH/conditions/11/07/911.anthrax/index.html>
31. <http://archives.cnn.com/2001/HEALTH/conditions/11/22/anthrax.death/index.html>
32. *The Tribune*, 14 April 2004, pp. 9.
33. D. R. Arora (2003) *Biological Warfare: Bioweapons: Bioterrorism in Textbook of Microbiology 2nd ed.*, ed. Arora. D. R, (CBS, New Delhi): pp. 663
34. *Times of India*, 24 October 2001, pp. 14, col. 1
35. *Lab Medica International*, 2005(2/3), 22, 1, pp. 1-2, URL <http://www.medinews.com>
- 36.

<http://www.medinews.com/GMEDTS32olcgi/ts.cgi?tsurl=0>. 57.17666.0.0

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