

Barasat Government College

M.Sc Thesis

A Review on

**Biological Warfare
From Historical Past to Present**

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1 Introduction

Every country, mainly the developing countries, of our modern world is under threatened by the bio-terrorism or the biological warfare, accomplishing with miscellaneous biological agents. Our point of view for this article is to gather knowledge about the biological warfare and its historical review and also about some recent attacks. Biological warfare is also known as the germ warfare, is a threat by using the biological agents to create disease in human, animals and plants. It is considered that the biological weapons are more powerful and effective on the target. It is done by either by an individual or by a group or by any political, religious or criminal motivation. The system of biological weapon composed of 4 vital components – payload (the biological agents), munitions (containers keep the payload), delivery system (missiles, artillery shells, aircraft) and dispersal mechanism (an explosive force or the spray device) [34].

2 Historical Aspects:

From the last two century, microbiology becomes to emerge and now it reaches to it's one of the maximum peak. During this time the biotechnology and the biochemistry plays a dominant role in the human welfare. But these advantages of the science become the cause of adverse effect by the help of many heinous people as well as many countries who become the constant support of those terrorist groups. This support and those planes are not very new for our world. Many evident showed that from the approximately 600 BC [1], this type of odious ruse was taken to ensure their rule against neighbouring areas, countries. The events can be classified into three groups according to the time or the era –

- a. Before World War-I
- b. During World War
- c. After World War-II

2.1 Before World War I

The biological weapon had been proved as a potential weapon [1] for any war and also could able to cause massive destruction. In the early time the biological agents such as bacteria, virus, and protozoa were delivered by the affected cadavers, filth and also by their contagious materials which they used often [2]. Due to only brutality, two severe pandemic were caused by most of the military leaders, termed as protectors of common human being, magically.

In 1346, during the siege of Caffa, a seaport of Ukraine was attacked by the Tartar force, a dangerous vagabond group. Genoese force, the controller of that seaport, used a biological weapon, the perilous plague, for protecting their seaport [2, 3]. But another dirty idea came from the Tartar force, as expected, that they distributed their diseased corpses to the Genoese force as well as into the city, and the pandemic of the Black Death flooded throughout the Europe to all over the world. Gabriel de Mussis, a notary of the north Genoa, Claimed mainly two important points about the incident happened in the Siege of Caffa, that he first one was the epidemic of plague took place by contaminating city by the infected soldiers as well as the peoples and the second point was that the plague affected refugees along with the rats from the Constantinople, Genoa, Venice and other areas were shipped to another place and the vice-versa which led to the starting of the second wave of the plague epidemic [2,25]. Even it was said about the epidemiology of the plague with very complicated format but we can understand simply that one biological attack was sufficient to start a epidemic or even pandemic as we can observe in the Siege of Caffa [3]. During the 14th and the 15th centuries the Europe was witnessed the tragedy of the plague and more than 25 millions of people were died but at that time and after that time many war was happened where disease or the poisons were used as the weapons.

Another example of misleading construction of vision arose in the British force and caused another dangerous pandemic, smallpox. During the French-Indian War in 1754 to 1767, the commander general of the British force, Sir Jeffrey Amherst, provided the smallpox infected utensils, clothes etc. to the Indian people, since an epidemic of smallpox had been spread out in the European and North American countries. As a result for the use of contaminated blankets or clothes, that viral disease became a major curse for the native Indian population [2, 4].

2.2 During World War

During the 19th century the starting of the golden era of microbiology became the cause of adopting the advance methodology in the bioterrorism. In this time the bio-weapons were not the crude infected materials, but they were able to isolate many bacteria and virus in their laboratory and simply inoculated into the target.

During the World War –I, Germany was accused for spreading the anthrax and glanders producing bacteria by inoculating those into the horse and cattle of the USA and its nearby countries' ship. Not only that they also infected many Romanian, Russian sheep. Many evident proved that Germany spread vital disease like cholera and plague in the Italy and Russia respectively [5, 6]. But in 1924, The League of Nations fully supported the Germany and commenced that they were unable to find any strong evidence against Germany [2]. But the whole world was shaken due to the horrible effects of the biological weapons, as their own population was being affected by their brutality, and aimed to put limitations for those types of weapons. On June 17, 1925 a protocol had been announced and signed by around 108 nations. It stated that, "Protocol for to prohibition of the use of war of asphyxiating, poisonous or other gases and of the bacteriological methods of warfare", and this was named as Geneva Protocol [7, 2].

During the World War –II the peak of the Japan was high for using the biological weapons. They developed a center known as 'Unit 731' for researching about the biological agents. They almost cross the level of brutality as they infected the prisoners by *Bacillus anthracis*, *Vibrio cholera*, *Neisseria meningitidis*, *Yersinia pestis* and also by the terodotoxin, an extremely poisonous fungal toxins, for their research and at about 10000 prisoners were died due to their illegal experiments [8,9]. Beside the Japan many countries continued their experiments and research on the biological weapons like Soviet Union, Germany, Britain, and USA etc [9].

2.3 After World War II

The experiments of brutality with the biological agents were continued after the World War-II and still now. USA was accused to use of the biological weapons during the Korean War (1950-1953) by North Korea, Soviet Union, China and also many more disease were out broken at that time as written in many newspaper [2,19,20]. After that event USA avoided the collaboration with the Unit 731 scientist and soon after that they planned a program to establish a new defensive protection against any terrorist attack by developing proper vaccination, treatment and therapy of their own army members. This program was a step out to become ready and then jumped ahead towards the target areas as well as countries without any massive destruction of their own troops. Approximately from 1942, but mainly after 1951, at the Fort Detrick in USA a hollow metallic sphere was constructed with a million liter volume, known as "Eight Ball" [2], where many pathogens were exploded within it into aerosol condition. After that many volunteers were exposed inside the ball and were infected them with such pathogens. This heinous procedure was fulfilled with the aim for observing the vaccination, prophylaxis etc. In New York, San Francisco and many other cities some organisms like *Aspergillus fumigates*, *Bacillus subtilis* and *Serratia marcescens* were released over a large geographic area for studying the solar irradiation and climate condition on the viability of the organisms. After that a severe outbreak of urinary tract infection raised among the common people by *Serratia marcescens* and they admitted to the Stanford University Hospital [4, 22].

Many countries also resumed their biological weapons research, mainly Canada, Britain, France and Soviet Union. The allegation reported after World War –II were as follows [6] –

1. The Great Britain applied biological agents against the Oman in 1957 as it published in the Eastern European Press.
2. USA spread cholera in the Hong Kong in 1961 as stated by China.
3. US military Commission in Columbia and their troops used the biological weapons against the peasant of Columbia and Bolivia which was published in the Soviet newspaper Pravda in 1964.
4. In 1966 Egypt used massive attack of the bio-weapons against the Middle East mainly the Iraq and the target site was witnessed by cholera.
5. In 1984, a different religious schism was infected restaurant salads with *Salmonella typhimurium*, in USA to destroy the public health [23].
6. In 1993, a biological attack by using the anthrax spores was occurred in a ritual of the Japan [24].

YEAR	INCIDENTS
1346	Tartar force hurled the cadavers of plague victims to the Genoese controlled seaport
1710	The body of plague victims were used during the war between Russia and Sweden
1763	British army provided the smallpox infected blankets to the native Indians
1914-1918	German used the glanders and the anthrax to infect the USA and Romanian sheep and cattle of various ships
1942-1945	Japan established “Unit 731” and continued the deadliest experiments of the bio-weapons upon the prisoners of China, Mongolia, and Soviet, America etc.
1941	1700 Japanese troops were died due to hazards of their own weapon
1949	600 Japanese prisoner were killed by the Soviet military due to only the experiments of the bio-weapon
1942-1969	USA produced the “eight ball” where the volunteers were deliberately infected inside the ball to determine the effectiveness of the bio-weapon and the vaccines
1964	Viral encephalitis along with death was reported from the Fort Detrick eight ball experiments
1951-1954	<i>Serratia marcescens</i> and the other pathogens were distributed over a large area and many people were diagnosed by urinary tract infection
1954	According to the European Press the Great Britain used some bio-weapon against Oman
1961	USA infected cholera to the Hong Kong city
1964	US military used bio-weapon against peasants of Columbia and Bolivia
1969	Egypt used cholera against Iraq
1984	Salad bars of restaurant were infected by the Salmonella typhimurium in USA
1993	Anthrax spores were distributed into Japan in a ritual

Table 1: Different events occurred after World war –II

3 Biological Agents

According to the World Health Organization (WHO), the the biological agents can be defined as an agent which is able to produce adverse effect through multiplication within the host cells or the host body causing death for accomplishing the motivation of war against animal, human, plants etc. the agents would be virus, bacteria, protozoa, any proteinous substances derived by plants which had potent cytotoxic, neurotoxic, cardiotoxic, myotoxic properties [10]. The attackers or the terrorists always select such an agent or biological agents which fulfill the following criteria –

1. It has to be new in morphology or in cellular content to identify,
2. It has to be severely virulent,
3. The disease has not been endemic in the target area,
4. It must be difficult to diagnose simply,
5. No vaccine should be made up against it and the treatment must be complicated

The Center of Disease Control and Prevention (CDC), situated in USA, classified the biological agents into three major groups, based on their potency, virulence, severity and also complication for treatments – 1. Category A, 2. Category B and 3. Category C. category A consists of smallpox, anthrax, plague; category B consists of many bacteria, virus and protozoa but mainly the toxins; category C consists of the new borne pathogens which have insufficient information about the host- parasite interaction and also about its managements. Those categories are tabulated here in the table – II

As per rules of CDC the category A agents are those that can be easily transmitted within community, having high mortality rate and will be enough to create trauma in common people and also required a high effective control measure for fighting against it. Category B agents are belonging to those group which have relatively low mortality rate but the diagnostic criterion’s are under development. Finally the last category C has those agents which are newly emerged in the world and have high mortality rate and very little knowledge about the diagnosis, treatment and the control measure [CDC]. Now we draw our attention on some agents and their characteristic features, potency etc in briefly –

	Category A	Category B	Category C
Agents	Anthrax (<i>Bacillus anthracis</i>) Botulism (<i>Clostridium botulinum</i>) Smallpox (<i>Variola major</i>) Plague (<i>Yersinia pestis</i>) Tularemia (<i>Francisella tularensis</i>) Viral hemorrhagic fever by Ebola virus, Marburg virus	Brucellosis (<i>Brucella sp.</i>) Epsilon toxin (<i>Clostridium perfringens</i>) Glanders (<i>Burkholderia nallei</i>) Q fever (<i>Coxiella burnetii</i>) Typhus fever (<i>Rickettsia prowazekii</i>)	Nipah Virus Hantavirus Tick-borne hemorrhagic fever virus Yellow fever virus Corona virus (SARS, MERS)

Table 2: Different category of the biological agents with proper examples

3.1 Anthrax

Anthrax is a zoonotic disease spread from horse, cattle, and sheep to human. The causative agent is a bacterium named *Bacillus anthracis*, a Gram positive aerobic and endospore forming microorganism. Human being can be infected by three form of anthrax – a) cutaneous anthrax, b) gastrointestinal anthrax and c) pulmonary anthrax. The endospore enters through the skin and form a lesion, which occurs in the cutaneous anthrax. The endospore reaches into the gastrointestinal tract, known as gastrointestinal anthrax. The main symptoms of this type are – nausea, vomiting, abdominal pain, bloody diarrhea etc. in case of cutaneous anthrax the mortality rate is 1% and in the later case the mortality rate increases to 50%. But the dangerous form of anthrax is the pulmonary anthrax, the solely target for the terrorist, with approximately 100% mortality rate. The pathogen is being inhaled by human and thus it enters into the lung, causing mild fever, coughing and chest pain, but due to mild symptoms the negligence arises and it reaches to the blood stream and within 2-3 days it develops the septic shock that becomes the cause of collapse the patient within 24-36 hours [12, 13].

3.2 Smallpox

The causative agent of smallpox is an orthopoxvirus named Variola virus, mainly two types – a) variola major and b) variola minor. It is a highly potent biological agent, highly contagious and also deadly because of very short incubation period (maximum 12 days). It was announced that this virus had been eradicated totally but some of their strains have been securely preserved in USA and Russian laboratory [14]. At the initiation of the infection it would cause mild fever and headache, but after some days it cause the skin lesion, multiple organ failure and ultimately death. There are no antiviral drugs against the smallpox, only the vaccination will effective if it was taken before the infection, but the vaccines had some side effects. The main aim of the bioterrorists would be the release of this fatal virus into population and making a disastrous massacre, because according to WHO the vaccines which are stocked are not enough to protect a mass attack [12].

3.3 Botulism

Botulism is a special type of food poisoning which is caused by the bacteria *Clostridium botulinum*, a endospore forming gram positive microorganism. They become dangerous when their environment become anaerobic, influence to produce endotoxin the botulinum toxin, a highly effective neurotoxin which has ability to block the acetylcholine receptors of the synaptic end. The victims developed a progressive flaccid paralysis and ultimately demised by the pulmonary and cardiac failure. It is transferred to the body by food sources which are not sufficiently cooked or by the fresh vegetables which are being eaten as non-cooked [12]. Like others botulinum toxin has three types – type A toxin, type B toxin and type E toxin. The type A toxin

are mainly found in the USA, Canada, Colorado, Mexico region, a most virulent toxin with 60-70% mortality. Death will come by only touching the toxin on tongue, even not need to swallow. Type B is found in the European region and has 25% mortality rate and type E is found in the sea-foods and considerably mild than others. Considering its potency of killing human being this could be a great weapon for the international goons, as they could supply the bacteria in the food materials mainly in the street foods, more charming for common people.

3.4 Nipah Virus

Nipah virus is a negative stranded RNA virus of Henipavirus, genus and the bats are the main reservoir for that virus. It is a newly emerged fatal virus causing a severe condition for a country and a new remote for the bioterrorists. It causes neurological and respiratory problems within 4-21 days, incubation periods, and also transmissible within the population by the usual method of zoonotic transmission as well as by human to human direct transmission [15]. It makes outbreaks in many countries since 1998 like Malaysia (first diagnosed), Bangladesh, India and Philippines and out of these the mortality rate of India and Bangladesh were high nearly 70% than that of the others two (nearly 40% suffers from the acute encephalitis and also with pulmonary troubles, starting with high fever and finally they develop the altered mental condition, hypotonia, segmental myoclonus, limb weakness and then rapidly coma and death within few days [17].

3.5 Hanta Virus

Hantavirus, the genus, belongs to the family Bunyaviridae, including more than 300 viruses which make host like the animals, plants. This virus contains three single stranded negative RNAs, interestingly these are named as small (S), medium (M) and large (L) and they produce the nucleoprotein, envelop glycoprotein and the viral RNA dependent RNA polymerase respectively [18]. The main target sites of Hantavirus are the epithelial, endothelial macrophage, follicular dendrite and also the lymphocyte cells and the virus complete their entry by the attachment via viral surface protein, as usual [19]. The symptoms of this viral infection are very severe, as the mortality rate is not very high as we observe in the former pathogens, but the post infection effects are very dangerous because the patients suffer from multiple organ failure problems and those remain after recovering from the disease. So as a biological weapon it is enough to produce a severe panic in the target area as well as to collapse the socio-economic balance in any country. The incubation period of the Hantavirus is approximately 6 weeks [20] and the first symptoms are hypertensive, oligouric, polyuric, pulmonary edema, restlessness, nausea, vomiting etc. along with those a large amount of patients develop vascular leakage, abdominal pain, conjunctival, cerebral and gastrointestinal hemorrhages lead to death of 1/3 of all patients [21].

Agents	Disease	Features	Symptoms
<i>Bacillus anthracis</i>	Anthrax	Gram +ve, endospore forming	Fever, cough, respiratory distress, shock
<i>Francisella tularensis</i>	Tularemia	Gram -ve, endospore forming	Fever, chills, headache, depression, nausea
<i>Burkholderia mallei</i>	Glander	Gram -ve	Cough, chest pain, fever, shock
<i>Yersinia pestis</i>	Plague	Gram -ve, without spore	High fever, malaise, cough, haemophysis, cyanosis, stridor
<i>Shigella dysenteriae</i>	Shigellosis	Gram -ve, without spore	Fever, abdominal cramp, diarrhea with blood, kidney failure
<i>Clostridium botulinum</i>	Botulism	Gram +ve, endospore forming	Acute afebrile, flaccid paralysis and death by only one
(toxin) Variola major	Smallpox	DNA virus	Fever, headache, skin lesion, multiple organ failure, death
Ebola virus	Ebola virus hemorrhagic fever	-ve strand RNA virus	Fever, headache, chill and later internal bleeding
Marburg virus	Marburg virus hemorrhagic fever	-ve strand RNA virus	Nausea, vomiting, chest-pain, jaundice, liver failure, massive hemorrhage
Nipah virus	Nipah viral infection	-ve strand RNA virus	Encephalitis, pulmonary trouble, altered mental condition, hypotonia
Hantavirus	Hantavirus pulmonary syndrome	-ve strand RNA virus	Hypersensitivity, poly-uric, pulmonary edema, vascular leakage, cerebral and gastrointestinal hemorrhage
Corona virus	Severe acute respiratory syndrome COVID-19	+ strand RNA virus	Fever, dry cough, tiredness, sore throat, loss of smell or taste

Table 3: Different bio-agents with their features and symptoms

4 Mode of Delivery

The bio-agents could be delivered by the air medium through the ventilation and air conditioning machine or system which is a very popular mode of delivery by the terrorists. As earlier about 100 kg anthrax spores was distributed over the Washington, DC, which led to about 1.3-3 millions deaths as we can say the weapon was act as the hydrogen bomb. The another route of delivery could be the food and water, as the terrorist can contaminated the drinking water or the useful water resources like pond, lake, well etc. and also contaminate the foods. The contaminated food can be the cause of death of millions people, because the food cycle is not easy to break immediately, as it is very difficult to find the food material which is infected and also where those foods are distributed. So, when the prevention measure would be taken many common people will die the main target for the terrorism, and also a panic will appear among the people which would enough to

destroy the mental and economical health. Another effective way of spreading the biological agents would be the dissemination of the vectors of the vector-borne disease. As an earlier example, Japan was spread a huge amount of *Anopheles* sp. mosquito to China, which led to a malaria epidemic in the China during the World War –II. But the terrorist always accepted the air medium for disease transmission because the evidence against them will be very less than the others and the transmission rate will very high as the air pass from one area to other [10].

5 Target

The target for the bioterrorism can be classified into two main streams like one is direct which the biological is and the other one is the indirect which is either political or economical. So the biological attack can be the cause of two type of epidemic – the epidemic of the disease by the causative agent and the epidemic or even the pandemic of fear and panic because of this disease. The panic is very strong weapon to destroy the economic balance as well as the mental balance of a country as that country or the affected area loss their tourism, export and the investments. The vital aim of the bioterrorism to proliferate the fear, anxiety, uncertainty, depression and finally the mistrust for the government and these are enough to collapse the commerce and the tourism. The second advantage for the bioterrorism is the physical disease which is caused to finish the man-power of an affected area. A small scale biological attack on the “soft” target, like airport, railway stations, food productive factories etc., is enough to destroy the total economical and the social dimensions. Some examples can clear our vision; the airline industry lost about 10 billion US dollar in 2003 due to SARS epidemic. In case of US anthrax attack in 2001, the estimated cost for sanitizing the containment part of the Hart Senate building in Washington DC was 26.2 billion US dollar per 100000 affected persons. The Western countries unlike the Eastern they produce food at a large scale in centralized food industry. That information may be very interesting for the bioterrorists as only one attack at those factories can lead to destroy the thousands of people who depend on it [10].

6 Impacts on Physical and Mental health

Biological warfare is very scary for common people and it has ability to break down the total physical and mental health along with the economy. First, the terrorist use the weapons which are invisible for the naked eye, like the pathogens and the poisons. So it is impossible to determine that the individual is exposed or not. For this reason, the people are unable to say if they injured or not [26, 27].

Second, the biological agents are contagious which spread person to person contact. This fact create a situation of fear helplessness when the family, friends, lover, neighbors may be the main source of disease. At that time the safe health and social support is needed but not available. We already know that every biological warfare agents have a feature to distress the mind which is enough to destroy the mental health and the social safe measures like isolation, social distancing, quarantine as well as the separation of children from their parents create a depression, anxiety among the local people [27, 28, 29].

Third, biological agents enhances the fear because many pathogens are newly borne and the pathogenesis, clinical features, symptoms, treatments are rarely known and the health professionals have the lack of knowledge about who is at risk, what health concerns might be taken and how to fight against it [30].

Fourth, the signs of autonomic arousal may be misattributed in many persons who act as the evidence of the infection or the contamination, involves various symptoms like muscle tension, palpitation, hyperventilation, vomiting, sweating, tremors and a sense of foreboding. For this, the physically healthy but frightened person can show like autonomic arousal which leads to deal with them as an affected one and may overwhelm the health service [31, 33].

Fifth, persons have to wear mask, gloves, and clothes which can protect them from contagious disease, but but this make the people more distress because of wearing those for long time which produce claustrophobia, breathing problems. These effects are more common in the doctors, nurse, and health workers as they wear those kits for several hours to several days constantly [32].

As it is showed by the historical account that the public panic is very rare and only occur in the closed area where the exists are a few in number, like stadium, cinema hall, but a disease become prolonged and no proper treatments are available then a public panic also arise in such areas [30].

7 Role of Iraq in Bio-war Preparation - An Example of Brutality

The scientist had discovered many potent biological agents, planned to use by Iraq in the Operation Desert Storm, like 5 bacteria, 1 fungus, 5 virus and four toxins along with those they also developed two bacterial strains for stimulant purpose (non-pathogenic bacteria) like *Bacillus thuringiensis* and *Bacillus subtilis*. Iraq continued their experiments and production of these agents on several plants and laboratories like Salman Park, Al Hakam Single cell Protein Production Plant, Al Manal, Muthana State Establishment etc. First, amounts of some anthrax spore were imported from USA and France to the Salman Park, where the media, storage, knowledge about the pathogenecity were recovered. Then the Al Hakam supplied a huge amount of anthrax in 1989 approximately 8000 L of solution. As same as anthrax, *Clostridium perfringens* were imported from USA and then studied and produced at a large scale in the Al Hakam in 1990 and they produced nearly 340 L solution containing the *C. perfringens*. Another agent was a fungus, wheat cover smut, which was disclosed by the scientist in 1985 that it would be fatal for the young wheat plants. In 1988 a large production of the wheat plants took place in Mosul town and infected rapidly by this fungus and harvested those carefully then transferred to the Agriculture and Water Resource Research Center, Fudaliyah for storing and making weapons. In Al Manal 5 viruses were recognized as bio-weapons like Congo- Crimean hemorrhagic virus, Yellow fever virus, enterovirus, human rotavirus and camel pox virus and this had high potency to destroy the civilization. The Iraqi terrorist researched on organisms that produced Aflatoxin, like *Aspergillus flavus* and *A. parasiticus* on the wet rice. This toxin was produced in the Salmon Park in 1989 and approximately 2000 L of solution was manufactured for the war. By *Clostridium botulinum* Iraqis were able to produce about 20000 L solution of botulinum toxin at Al Hakam and Al Manal plant. In 1989 *Ricinus communis*, the caster bean plants were cultivated widely which produces ricin and about 10 L of ricin solution was produced at Salman Park and used as payload in artillery shells. The fungus, *Fusarium oxysporium* and *F. granarium* were grown in the dump, supplemented rice, have ability to produce a mycotoxin called tricothecene. This fungus was cultivated in the several center and their toxins were extracted by using the organic solvents (This tricothecene caused “yellow rain” around the H’mong and other native people of Indochina peninsula). These all type of microbes and toxins were manufactured at Al Hakam, Al Manal and Salman Park and then transferred to the Muthana State Establishment to prepare the payloads by using those materials. For proper dispersions of those materials Iraqis accepted many modern techniques. They installed Italian made pesticide dispersal system with sprayer nozzles, generating aerosols of 1-5 μm and appropriate holding tank in many aircraft and vehicles. In 1990, they were able to modify a MIG -21 fighter plane to equip a 2200 L belly tank which was taken from Mirage-F1 fighter plane, and a sprayer mechanism. The United Nation Security Council Resolution 687 in April 1991 ordered their personnel to destroy all of biological agents of Iraq, after accepting the cease-fire. Then all stored biological agents were treated with formaldehyde and KMnO_4 and finally those mixtures were poured on a bare land in the Al Hakam campus. All munitions were crushed and burned entirely into pits and finally the remains were sealed and simply thrown into the Tigris River [34].

8 Conclusion

Every country should collaborate to identify the main cause of bioterrorism and should accept the appropriate measures as a strong preparedness is a good deterrent for the bioterrorism. The national and regional infrastructure will be needed, which is capable for recognizing and dealing with the various biological agents. Some specific population such as the pregnant woman, elderly people, immunologically suppressed peoples must be provided extra safety. A proper funding scheme will be needed for fighting against the warfare [11]. Vaccines and the antimicrobial drugs may be stored immediately after the attack so that the death of the common people can be reduced. The primary prevention lies on creating a strong global oath and rejects the development of bio-weapons. Secondary prevention will be the early detection and proper medication [2]. Many of social and mental health involvement will not require f a highly specialized skill can be developed. Contingency planning is required for communities and the health professionals to respond properly [33].

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