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Review Article

A SHORT REPORT ON BIOLOGICAL WEAPONS

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ABSTRACT
Biological weapons are also known as germ weapons, like bacteria, viruses, fungi, toxins, rickettsiae, or any biological toxins used as weapons to kill or harm humans, animals, or plants. Biological weapons are very attractive to the terrorists because of lots of features. The aerosols of biological agents are invisible, silent, tasteless, odourless, and are almost readily scattered. As with the emerging infections, early detection and control of biological attacks depends on a strong and flexible public health management at the all steps of national levels.

Keywords: *Biological Weapons, Microorganism, Toxins, Public Health*

INTRODUCTION
Biological weapons generally cover the microorganisms (Eneh, 2012) or their toxins which are utilized to kill or infect the humans, animals and plants (Suzanne and Etizen, 2000). Biological weapons are also known as germ weapons. These include bacteria, viruses, fungi, toxins, rickettsiae, or any biological toxins that are used to kill or harm humans, animals, or plants (Thavaselvam and Vijayaraghavan, 2010).
Many types of harmful biological agents are present in the environment and the public health framework must be furnished to instantly resolve the disaster that is due to biological attack (Bennett, 2006). Biological weapons are very attractive to the terrorist because of lots of features. The aerosols of biological agents are invisible, silent, tasteless, odorless, and are almost readily scattered (Clarke, 1968).
Biological weapons have been identified nearly 2,500 years ago (Robertson and Robertson, 1995).
These are cheap, can cause mass destruction and are comparably easy to generate (Macfarlane, 2005). These points may attract the terrorist groups. As with the emerging infections, early detection and control of biological attacks depends on a strong and flexible public health management system at the all steps of national and international levels.
The stress associated with a biological attack could create strong psychiatric disorders (Holloyway, 1997). The harmful agents of the biological weapons include bacteria, fungus, virus and the toxins which are produced from these pathogens (Thavaselvam and Vijayaraghavan, 2010). The infectious agents that could likely be used include those which are responsible for causing deadly diseases like anthrax, plague, tularemia, equine encephalitides (e.g. Venezuelan equine encephalitis viruses), small pox and hemorrhagic fevers.
Toxins include botulinum toxin from *Clostridium botulinum*, trichothecene mycotoxins from *Fusarium*, *Myrotecium T richoderma*, *Stachybotrys*, *ricin toxin* from the castor bean *Ricinus communis*;, and other filamentous fungi which includes staphylococcal enterotoxins from *Staphylococcus aureus*; and other toxins produced from marine organisms such as dinoflagellates, blue-green algae and shellfish (Garland and Bailey, 2006).
Bacillus anthracis, which causes anthrax, is among the most dangerous pathogenic bacteria. *Clostridium botulinum* is a pathogenic bacterium that is the causative agent of *botulism.* Tetanus is caused by toxins produced by bacteria *Clostridium tetani,* this toxin acts on the nervous system, resulting in muscle spasm and rigidity.
Although the herbicides are chemicals, but they are generally kept with biological and chemical warfare both because they may work in a same manner as biotoxins or bioregulators. Biological weapons may also be used to target plants for the destruction of crops and agriculture (Darling and Woods, 2005). We have tried to summarize a short report on biological warfare in this article.

History

In 190 BC, Hannibal won a great victory over King Eumenes II of Pergamon by firing venomous snakes into the enemy ships. In 18th century AD, British forces scattered small pox infected blankets to Americans for transmission of infections (Noah *et al.*, 2002).

During First World War, the Germans developed *anthrax, cholera* and a wheat fungus as biological weapons (Mobley, 1995). In November 2001, 23 cases of bio-terrorism found in the US which mostly involved, postal workers, where letters contaminated with anthrax were opened (Thavaselvam and Vijayaraghavan, 2010).

By 1900 the germ theory and advances in bacteriology established practical and refined techniques for use of bio weapons in war. Recently, in 2013 a total of 180 states and Taiwan had signed the Biological Weapons Convention (BWC).

Biological weapons are used in different means to gain a diplomatic advantage over the enemy (Biological Weapons Convention) (Garland and Bailey, 2006).

Way of Delivery

Aerosol sprays are the most effective methods by which the weapons are efficiently delivered to their target site. Other modes of dispersals are food, water contamination and ordinary explosive.

Depending on atmospheric conditions and the agent itself, infectious material could travel up to hundred kilometres in a particle size that after inhalation would be delivered to the target lung tissues (Eitzen, 1997).

Table 1& 2 represents the classification of biological warfare agent (Thavaselvam and Vijayaraghavan, 2010).

Table 1: Classification of Biological Warfare Agents (BWA) Based on Type of Organism

Bacteria	Anthrax (*Bacillus anthracis*), Plague (*Yersinia pestis*), *Brucellosis, Cholera, Clostridium perf* toxin, *Clostridium botulinum* toxin, *Staph enterotoxin B, Melioidosis, Tularemia*
Virus	Congo Crimen Hemorrhagic Fever (arenaviruses, filoviruses, flaviviruses, and bunyaviruses), Ebola Hemorrhagic Fever, Small Pox (variola virus), Rift Valley Fever, Venezuelan Equine Encephalitis
Fungus	Trichothecene Mycotoxin
Rickettsia	Q Fever
Misc	Saxitoxin (derived from paralytic shellfish) Ricin (cytotoxin derived from caster bean mesh)

Preparing Against Biological Attacks

An Enhancement in the activities of epidemiologic efficiency to detect and respond to biological weapons attacks. Preparation of educational materials which aware and reassure the peoples during and after a biological attack.

Government should encourage research on antiviral drugs and vaccines. Supply of diagnostic reagents to state and local public health agencies. Enhance bioterrorism-related education and training for healthcare peoples and officers. Establish communication programs to ensure the delivery of accurate information. The biological weapons could backfire and harm the army and peoples of the nation (Khan *et al.*, 2000).

Table 2: Classification of Biological Warfare into Category A, B, C Based on their Potency*

Category A Easily Transmitted, High Mortality, Require Special Action to Check Them	Category B Cause Moderate Morbidity and Low Mortality	Category C Merging Pathogens that could be Engineered for Mass Dissemination in the Future
Variola major (smallpox)	*Coxiella burnetti* (Q fever)	Nipah virus
Bacillus anthracis (anthrax)	*Brucella* species (brucellosis)	Hantaviruses
Yersinia pestis (plague)	*Burkholderia mallei* (glanders)	Tickborne hemorrhagic fever viruses
Clostridium botulinum toxin (botulism)	Alphaviruses —Venezuelan encephalomyelitis, —Eastern and western equine encephalomyeliti	Tickborne encephalitis viruses
Francisella tularensis (tularaemia)	Ricin toxin from *Ricinus* communis (castor beans)	Yellow fever
Filoviruses —Ebola hemorrhagic fever, —Marburg hemorrhagic fever;	Epsilon toxin of *Clostridium perfringens;*	Multidrug-resistant tuberculosis
Arena viruses, Lassa (Lassa fever), —Junin (Argentine hemorrhagic fever) and related viruses	*Staphylococcus enterotoxin* B	

*CDC. Preventing emerging infectious diseases: a strategy for the 21st century. Atlanta, Georgia: U.S. Department of Health and Human Services, 1998. Centers for Disease Control and Prevention (CDC) Atlanta, GA 30333.

CONCLUSION

Biological weapons have recently got attraction and intensely used against enemies (Eneh, 2012). The terrorist activities will continue to involve bombs and firearms, also include weapons of mass destruction, including biological agents. To prevent the effect of the attack and mass destruction government should enhance and increase the expenditure on research on antiviral drugs and vaccines.

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