# Smallpox as Biological Weapon

## Introduction

Biological warfare or germ war history is as old as the existence of war itself. The warring parties in earliest times poisoned wells or utilized toxins in arrowheads (Aken & Hammond, 2003). In the 19th century, the insights by Pasteur and Koch into the infectious nature of diseases presented a breakthrough in the utilization of transmittable agents as biological weapons. Some diseases such as anthrax and smallpox were already deadly in their natural states (Koplow, 2009). However, the development of biotechnology has made it possible to isolate and store causing agents of smallpox increasing the risk of bio-conflict.

Smallpox originated from ancient India and China thousands of years ago. It killed the Egyptian pharaoh named Ramses V around 1145 BC and more than 320 million people in the twentieth century (Dudley & Woodford, 2013). The introduction to the article by Dudley and Woodword provides a better idea of what was mentioned in the abstract. According to the WHO, smallpox is a severe infectious disease caused by the variola virus belonging to the group orthopoxvirus (WHO, 1980). It is caused by either *Variola major* or *Variola minor*. Smallpox is a highly contagious disease that causes death to about 20% of the population that contracts it (Dudley & Woodford, 2013). Most people fled to avoid contamination since smallpox was a devastating disease. Epidemiological studies have evidenced that the disease is transmitted from one person to another via infective droplets during close contact with the infected symptomatic persons, often within a distance of 1.8 meters (Koplow, 2009). The WHO reaffirmed eradicating smallpox completely with the last case reported in 1977. However, some nations are still harboring the virus in their biological warfare laboratories. It creates the need for the public health personnel to be aware of the possibility of using smallpox as a bio-weapon.

## Discussion

### Origin of smallpox

Smallpox is an old and familiar enemy that is known as long as written documents have been maintained. Epidemiologists have speculated that the disease might have originated somewhere in the eastern Africa and then spread to the cities of the Nile Valley (Ajayi, 2006). Preserved literature evidences that smallpox first appeared among Hittites in 1346 BCE, Indians in 100 BCE, and in Persia in 430BCE. The ravages of smallpox followed the Nile Valley through to the urban regions of Asia, the Middle East, reaching China in 48 CE and Europe in 700 CE (Hopkins, 2002; Riedel, 2005)). The disease reached the European continent in the 7th century (Fenn, 2010). It persisted to be a problem until the 9th century. However, the introduction of a vaccine for the disease reduced its threat as a biological weapon. In 1977, the World Health Organization succeeded in eradicating smallpox (WHO, 1988).



Figure 1: Smallpox victims (WHO, 1980).

### Forms of smallpox

Small pox is caused by two major viral forms: *Variola major* and *Variola minor* (Riedel, 2005). The two viruses are epidemiologically distinct according to the mortality rates. Generally, the illness caused by *v. minor* is milder causing a sparse rash. On the other hand, v. major is associated with a large quantity of lesions (Inglesby et al., 1999). However, another study by Marr and Cathey (2010) agrees with Inglessby et al.’s opinion that both viruses caused death after 6 or 7 days of complete lesion formation. If the patient survived, the lesions would disappear and large amounts of skin would peel away.

### Epidemiology

Smallpox is among the most feared infectious diseases across the globe in spite of its eradication. According to the WHO, smallpox has killed approximately 500 million people by the 20th century. The *Variola major* was considered as the major form of smallpox (Aken & Hammond, 2003). The two researchers can be justified for using a convenience sample because the collected data was for future studies. Smallpox is believed to have affected more than 800,000 people in America, Europe, Asia, and Africa killing more than 200,000 annually in Europe alone (Harris, 1915). The validity instrument is consistent with the study’s outcome. The conducted survey found that case fatality of *V. major* was between 20 and 45% and 1% for the *V. minor.* In 1986, the WHO proposed the destruction of all variola stocks to be transferred to WHO reference labs in Russia and the U.S.

### History and potential as a biological weapon

Initially, the British soldiers utilized smallpox as a biological weapon during the Indian War between 1754 and 1767. Troops distributed used blankets of smallpox patients with the intention to initiate attacks on the America-Indian population killing more than 50% of the affected population. In 1967, a global campaign by the WHO resulted in smallpox eradication in the global scene (Inglesby et al., 1999). However, CDE summoned an expert meeting in June 1999, and among the potential biological weapons smallpox was collectively identified to have a higher probability of posing a greater threat (Dudley & Woodford, 2013). There are recent allegations made by some Western nations of the likelihood of smallpox to be used as a bio-weapon (Henderson, et al., 1999). This study is consistent with Leitenberg (2000) findings that nations presumed having active bio-warfare research programs in the recent past comprise of Russia, the U.S., Norway, Cuba, North Korea, Pakistan, China, Israel, Libya, Iran, Sweden, Iraq, Romania, and Bulgaria. On the contrary, there is limited information on the active countries engaged in this research. The study fills this information gap by creating awareness on the potential of using smallpox in biological warfare and medical personnel’s knowledge in dealing with the epidemic.

### Pathophysiology

The viral infection belongs to orthopoxviridae genus and poxviridae family. The species variola viruses are specifically human viruses. A recent review of literature reported that other types of othorpoxvirues including cowpox and vaccinia are infected from a rodent reservoir host (Bennet et al., 1990). The human variola virus causes a systematic disease with generalized rash. The skin lesions are a result of capillaries’ dilation in the corium papillae. It was accompanied by swelling of the endothelium lining together with an infiltration by lymphocytes (Riedel, 2005). The process spreads to other regions resulting in the cell membranes’ rapture. The victims exhibited signs such as epistaxis, headache, jaundice, and high fever.

### Transmission

Smallpox transmission often occurs via inhalation of airborne variola virus from the oral, nasal, or mucus droplets of an infected individual (Riedel, 2005). The transmission occurs if there is an extended face-to-face contact with the infected person within a distance of 1.8 m. Besides, direct contact with the infected bodily fluids usually results in infection. A study by the CDC reported that the virus can also be spread in an enclosed area. However, a study by the Armed Forces Institute of Pathology found that infection in an enclosed setting is lower compared to other infection modes.

### Clinical manifestations

After the transmission, infection occurs and then clinical signs and symptoms are manifested. On the 4th day after infection, the patient develops asymptomatic viremia. On the 8th day, the patients exhibit signs of fever and toxemia. After two weeks, the patients often experience high fever, headache, malaise, and backache (Rosengard et al., 2002). A study by Inglesby et al. (1999) also affirmed this claim. However, it specifies the range of days (7-17days) when these symptoms are manifested. Rashes then appear on the face and forearms spreading to the trunk and legs. The rashes are distributed centrifugally and are denser at the face.

### Treatment

Smallpox has no cure if it attacks. The major treatment for smallpox is vaccination after four days of exposure (Ajayi, 2006). Unlike other studies, Lvey-Bruhl and Guerin (2001) identify different vaccination strategies. However, the study does not mention the sample size among the French population. Other treatment methods for a large civilian population include supportive therapy together with the use of antibiotics, post-exposure separation and infection control, and admission of patients in confined hospital rooms fitted with high-efficiency particulate air filtration (Inglesby et al., 1999). The articles title provides an immediate insight into the research’s intent.

## Conclusion

In summary, there appears to be minimal likelihood of preventing biological weapon attacks against humans. The use of smallpox as a biological weapon can be detrimental to the ecosystem balance, as it is the ultimate biological weapon of mass destruction. It has killed more people throughout history compared to any other infectious disease. Smallpox is a communicable viral disease caused by the variola virus. In spite of the promise of eradication of variola virus as a biological agent, the weaponization of smallpox remains bothersome. The disease causes mass deaths and it makes it a potential biological weapon.

Smallpox can be controlled and its spread curtailed through vaccination, quarantine, therapy, post-exposure separation and infection control, and admission of patients in decontaminated areas in confined hospital rooms. Also, the environment has often been the unpublicized and unnoticed war victim. The United Nations together with environmental activists should urge nations to stop using destruction of the ecosystem as a biological weapon of war.

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