

Apocalypse Now! Anthrax Bioterrorism & The Public Health Challenge

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Abstract:

Governments, scientists, even terrorists - all understand just how easy it is to develop and release severely dangerous pathogens like anthrax.

The anthrax agent, developed from *Bacillus anthracis* bacteria, can truly be considered the terrorist's agent. Made solely for the convenience of the aggressor, it is easy to disperse, near impossible to detect, and difficult to diagnose and treat. The possibility of an anthrax attack is considered one of the most dangerous threats for any civilian population, with an un-paralleled risk of exponential growth in the number of infected people and high mortality rates. Therefore this research paper attempts to gain an understanding of anthrax pathogenesis and the challenges it presents for an effective response. Two key components of the threat are covered. Firstly the September 2001 U.S. anthrax attacks, are analyzed. The attacks are used then, as a case-study to examine the challenges of mitigating any potential outbreak, and discuss future objectives meant to be achieved, like managing insufficient surge and decontamination capacity of healthcare settings. The importance of establishing effective quarantine and communications systems is emphasized as is sustaining ongoing bioterrorism research and education.



Bacillus anthracis - anthrax causing bacteria

Difficult to Diagnose Anthrax: The incubation period ranges from a few hours to 3 weeks, most often 2 to 6 days.

Victims of an anthrax attack can present a wide array of symptoms (Fever, Pneumonia) – with so many possibilities, how to quickly and accurately confirm anthrax? Only once an unusual pattern among patients in emergency rooms is observed, doctors might suspect anthrax and order lab tests to diagnose anthrax, taking several days to get lab results from PH lab.

Objective:

To explore the lethality of the Anthrax agent and examine its background and the challenges of an effective public health response to a bioterrorist attack.

Methodology:

A wide variety of academic and non-academic sources were studied while conducting research for this paper, including peer-reviewed journal articles, books, and documentary and lecture videos presented by leading researchers in public health. Literature published by the World Health Organization (WHO) and Centers for Disease (CDC) was also examined to retrieve relevant data pertaining to anthrax and policies related to a public health response.



Letters laced with anthrax spores were sent to news media offices and two U.S. Senators. Anthrax is not specific to any particular demographic: practically anyone is at risk.



B. Lethality of Anthrax:

Among the few agents/toxins that have been designated as **Tier 1** by the CDC. able to survive for a long time in the environment.

An excellent weapon of choice: Stealth
Many forms of a possible attack: Powder dispersed through food or water supplies, released into the air from a truck, building, or plane.

Rapid spread of spores: Easily blown around by the wind, transmitted from people via clothes, shoes, and other objects (fomites).

Small amount of anthrax = Large number of people infected

Results:

A. Case Study: 2001 US terrorist attacks.

- 22 cases of cutaneous and inhalational infections, 5 deaths.
- Ultimately still a source of controversy: Nobody knows till date real mastermind (FBI- \$2.5 Million reward still unclaimed), motive, origin, relation to 9/11, why attacks stopped and never happened again?
- Sept 2001 attacks most recent example of bioterrorist attack on civilian population (16 years)
- A catalyst for getting the public to become serious about the issue of bioterrorism

C. Research Trends:

2001 Attacks Led to a rapid increase in research immediately following 2001 in bioterrorism Medline citations followed by a constant decline.

Year 2000: 62
Year 2001: 452
Year 2002: 854
Year 2003: 773
Year 2004: 501
Year 2005: 441
Year 2006: 305
Year 2010: 118
Year 2014: 67
Year 2016: 6

Difficult to sustain interest, investments and research when the last attack that occurred was 16 years ago.

D. Anthrax Pathogenesis

If spores were released into the air, people inhaling spores are at highest risk if not immediately treated.

Symptoms can worsen and lead to death if treatment delayed:

- Toxaemia
- Change in mental status, high fever, hypotension,
- The patient is unable to eat or drink especially if the cutaneous reaction is more severe, or located on the face, neck or chest leading to compression on the trachea. and other dangerous clinical manifestations.



> 95% of human cases are cutaneous. Patients develop painful lesions (eschars) which are generally found on exposed regions of the body. Treatable with antibiotics if diagnosed early.



Public Health Challenges in preparedness & response for an anthrax attack:

1. Insufficient surge and decontamination capacity - ability of any healthcare system/institute to manage a sudden influx of patients
2. Dealing with mass hysteria and fears (post 9/11 newspapers, projected anthrax attacks as a possible doomsday event)
3. Although disease does not spread person-person (non-contagious) - Controlling spread in high density areas
4. Associated logistical hurdles.

Proper quarantine, infection control and personal protective equipment (PPE) are an integral part of a public health response to any form of a bio-attack.

Conclusion:

Challenges to meet for the future:

1. Accurate risk assessment.
2. Reliable communications system.
3. How promptly can an infected person capable of communication be quarantined.
4. Proper Personal Protective Equipment readily available
5. Enhanced lab capacity (to quickly ID anthrax)
6. Level of expertise required is relatively low for terrorists, high for responders. Practitioners must reach a certain "specialist level" to deal with attacks or outbreaks."
7. Continued and sustained research in bioterrorism and public health response.

