



Review Article

The role of a dental surgeon during a bioterrorism attack

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ABSTRACT

The Corona Virus Outbreak has brought the world to a halt. It has caused global panic. Italy, Iran and US happen to be the worst hit countries in addition to China which was the Epicentre. Streets have been talking and the rumour mills are running strenuously. There is a lot of controversy about this corona virus. From it spreading through seafood, or bats or snakes. To it being artificially created and spread through the means. Some netizens said it won't be as dangerous as SARS, some said its unnecessary panic, to some saying that many Shows, Books & Movies had already predicted this & its preplanned. If it is artificially created & spread out globally it is a "BIOTERRORISM ATTACK" Bioterrorism is the intentional use of micro-organisms and toxins to produce disease and death in humans, animals and crops. Terror is derived from a Latin word meaning fright. It is practised and spread by collecting people of different regions, religions and ages with any intention related to politics, society or economy. Terror groups may sometimes stop or pause their activity when their needs are met. These attempts may be done just to spread fear and to gain publicity. In bioterrorism biological agents are used to cause harm. Biological weapons strike in all of a sudden and then linger for a long time. Thus creating a high level of panic, environment contamination and extreme pressures on emergency health services. An accurate and quality information given to the public by credible public health and medical experts can do a lot in controlling fears and encouraging cooperation and participation from masses in a constructive and organized manner. Dental professionals can potentially play a very significant role in the response to the big emergency of a bioterrorism attack.

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1. Introduction

Bioterrorism is the intentional use of biological agents like viruses, bacteria, toxins and other harmful agents to cause illness or death in people, animals or plants. These agents are typically found in nature but they can be mutated to increase their ability to cause disease, to make them act faster. And to make them resistant to current medicines or to increase their ability to spread wider into the environment. These agents are very tough to detect and they don't cause their effects till a few hours or days.

Biological agents are a sharp weapon as they are inexpensive to use, can be easily disseminated and cause panic and tremendous fear among masses.¹ And thus it is

the duty of public health experts and medical professionals, dentists included to help in managing an emergency like it!

2. History

The use of biological weapons for spreading terror has been practised since ancient times:

1. It Dates back to Ancient Rome, when faeces were thrown into the faces of their enemies.²
2. Assyrian politicians got fungus from rye dumped into their opponents' wells, giving them fatal ergot poisoning in 650 BC.³
3. The armies besieging a town depended upon spreading disease among the defending population and so they threw dead animals into the towns water supplies to spread the disease.³

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4. In 14th century the Tartars spread bubonic plague by throwing diseased corpses into towns to spread the disease.³
5. During World War I, United States of America and Germany developed biological weapons to contaminate the animal fodder.³
6. Dr. Anton Dilger worked with cultures of anthrax and glanders, between 1915-1916, with the purpose of biological sabotage on behalf of the German Government.⁴

2.1. Some modern incidences of bioterrorism

1. In 1984, in Oregon to poison civic leaders the Rajneeshee cult spread Salmonella in restaurants and grocery stores.³
2. In 1992, A number of terrorist organizations, including Al-Qaeda, have explored the use of biological agents.
3. Russia had the ability to launch missiles containing biological weapons of small pox.
4. 1994 Pneumonic Plague attack in Surat.
5. In 1995, Sarin gas was released in a subway at Tokyo, by the religious sect Aum Shinrikyo, which immediately killed 12 people and hospitalized 5000.³
6. 1996, Dengue Haemorrhagic fever attack in Delhi took place.
7. In 2001, letters containing anthrax spores were mailed to a television news anchor, US senator, and others, leading to the death of a few people and hospitalization of many more.⁵

How to differentiate between terrorism and bioterrorism?

Though both are for fear but a Terrorist attack and bioterrorist attack differ in the following parameters.⁶

3. Bio Agent Categories

These biological agents have been categorized by the US Centre for Disease Control (CDC) into 3 divisions- A, B & C:

3.1. Category A

These pose the highest risk to national security. They are easily transmitted and are capable of causing high mortality. Thereby causing mass public panic. Requiring immediate attention and action by the professionals! The following are some examples of the agents falling under category A:

1. ANTHRAX: A non-contagious disease caused by the spore-forming bacterium *Bacillus anthracis*. If diagnosed early it can be cured by antibiotics like Ciprofloxacin.⁷

The 1st incident of Anthrax use as a biological weapon was when the Scandinavian freedom fighters as supplied by the German General Staff used anthrax against the Imperial Russian Army in Finland in 1916 with unknown results.⁸

Anthrax in powdered form was mailed and used in a series of attacks on the officers of several United States Senators in late 2001.⁹

Also in 1993, Anthrax was used as an unsuccessful attempt in Tokyo by Aum Shinrikyo.¹⁰

It causes abrupt fever, respiratory distress and chest pain.

2. SMALLPOX: One of the very contagious viruses spread through air route having a high rate of mortality about 20-40%.¹¹ Though eradicated since 1970s all thanks to the world vaccination program¹² but small samples are known to exist in the Russian and American Labs. Which since the collapse of the Soviet Union have been found in other countries as well.

Smallpox is dangerous as a biological weapon because of its highly infectious nature. Also, the infrequency with which vaccines are administered among the general population since the eradication of the disease would leave most people unprotected in the event of an outbreak.¹³

It causes popular rash that begins on the face and extremities and uniformly progresses to vesicles and pustules.

3. BOTULISM: Caused from Bacterium *Clostridium Botulinum*. It a deadly threat as it causes death by respiratory failure and acute bilateral descending flaccid paralysis beginning with cranial nerves palsies. It is readily available globally due to its cosmetic usage.^{14,15}

4. BUBONIC PLAQUE: Caused by bacterium *Yersinia Pestis*. It is transmitted to humans through flea bites and aerosols, rodents are the hosts for it, causing Pneumonic Plaque. It is a threat as it is cultured easily and remains in circulation due to local rodents.¹⁶

5. TULAREMIA: Caused by bacterium *Francisella tularensis*. Also known as rabbit Fever, Has a low fatality but is highly incapacitated. It can be transmitted through contact with the fur, inhalation, and ingestion of contaminated water or insect bites. The bacterium is highly contagious as a very small number e.g. 10-50 organisms are capable of causing the disease. If used for a bioterrorism attack it can be released into the air and people who inhale this infectious aerosol would generally experience severe respiratory illness. Including life-threatening pneumonia and systemic infection, if they are not treated. This bacterium is easily available and can be cultured in labs.^{17,18}

6. HAEMORRHAGIC VIRAL FEVER: Including haemorrhagic fevers caused by the Filoviridae (Marburg and Ebola) and by the Arenaviridae (Lassa fever and the Bolivian haemorrhagic fever).

Ebola fever has fatality rates ranging from 50-90%. Death from Ebola is commonly because of multiple organ failure and hypovolemic shock. Marburg had been first discovered in Marburg, Germany and thus named so. Arenaviruses have a lower fatality rate, but are found largely, mainly in central and South America.¹⁹

Table 1:

Parameters	Bioterrorism	Terrorism
Speed of effects seen after the attack	Takes time/ Prolonged	Immediate
Site of attack	Non Specific	Specific
Knowledge & Familiarity about means of attack	Low	High
Distribution of affected patients	Dispersed Geographically	Concentrated
Decontamination of victims/ environment	Dispersed Geographically	Confined Environment
Quarantine/Isolation	Necessary in cases of Transmissible disease	Not Necessary usually
Medical support	Antibiotics, Vaccines, Traumatic Care	First Aid and Traumatic Care

COVID 19 will fall under this, if Corona Virus has been used as a Biological weapon.

3.2. Category B

They have the second highest priority. Has a low mortality rate, moderate morbidity, and is moderately easy to disseminate. It includes:²⁰

1. Brucellosis (Brucella species).²¹
2. Epsilon toxin of Clostridium perfringens.
3. Threats from Food safety by Salmonella species, E coli O157H7, Shigella & Staphylococcus aureus.
4. Glander (Burkholderia mallei²² Melioidosis (Burkholderia pseudomallei).^{23,24}
5. Psittacosis (Clamidia Psittaci).
6. Fever (Caxiella burnetii).²⁵
7. Ricin toxin from Ricinus communis (castor beans)
8. Abrin toxin from Abrus precatorius (Rosary peas).
9. Staphylococcal enterotoxin B Typhus (Rickettsia prowazekii).
10. Viral encephalitis (alphaviruses, for example,: Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis.

4. Threats from Water supply by Vibrio cholerae,²⁰ Cryptosporidium parvum

4.1. Category C

They are the third highest priority and are considered as emerging threats for a disease. They have high mortality and morbidity rates. They can be engineered for mass dissemination in the future. These include:²⁶

1. NIPAH virus
2. HIV
3. Severe Acute Respiratory Syndrome (SARS)
4. Hantavirus

4.2. Strategy & Response

The planning starts with the development of biological identification system.²⁷

4.2.1. Being prepared

Early detection and rapid response is dependent upon the close cooperation between the Public Health Authorities & Law Enforcements.²⁶

4.2.2. Biosurveillance

Real-Time Outbreak Disease Surveillance[RODS] is developed to collect the data from sources including hospitals, clinics, labs etc. Data over the counter about drug sales is used to perform signal detection, that is, to detect the a possible bioterrorism attack as early as possible. Health related data from Hospitals, SOS call centre computers, and veterinary medical record systems could be of much help. Researchers are also making use of data from school attendance records, drinking water supplies, food processing units, feedlot operations.²⁶ They are working towards the development of devices to detect the existence of a threat by the tiny electronic chips that would contain living nerve cells to warn about the presence of bacterial toxins.²⁸

5. Dental Surgeon's Role

Dental Surgeons can play a very important role towards the preparation of a bioterrorism attack and its immediate response thus working towards a significant outcome. In case of a major bioterrorism attack, the local needs could be immediate & huge. As hospitals become filled, alternate sites for providing health care would be required, and dental offices and hospitals could fill in that need.²⁹

From 1st January 2001, The Dental Practice Act was modified and it's stated that in cases of emergencies, the dentists who were a part of the local emergency response team and were trained as a Dental Emergency Responder (DER) could provide facilities for which they are trained.³⁰

Table 2: Thus a dentist/dental surgeon can work towards

In general	In specific
Preparation for a bioterrorism attack	Treatment of craniofacial injuries
Immediate response towards an attack.	Administration of anaesthesia
Diagnosis and monitoring	Starting Intravenous lines
Referrals	Providing Cardiopulmonary resuscitation &
Triage	Other Basic Life Support measures.
Immunizations	Dentists trained in forensic odontology can work closely with local
	Disaster Mortuary Operational Response Teams(DMORTs)
Infection control	Do Local Surveillance to know about the spread of the disease apart
	from the original site of attack.
Medical care augmentation.	

5.1. Dental practice in relation to COVID 19

Since the Transmission dynamics of COVID 19 in dental practice are high and we all can't stay home until a vaccine is developed. We need to treat the Novel Corona Virus 2019 as a part of our lives and deal with it like any other contagious disease. Be it AIDS/ HIV, Hepatitis etc. The dentist could take the following steps:

1. Taking a proper history of each patient and including travel and symptomatic parameters to it.
2. Reaching out and discussing the Risk & preventive measures with each patient.
3. Sensitizing their staff about it.
4. Performing a Symptomatic assessment of each case.
5. Keeping their precautions strong. From proper hand washing before & after each case to proper usage of mouth masks, face shields, eye protection (PPE Kits).
6. Following proper sterilization & disinfection protocols With all Instruments, operatory and consultation chamber
7. Following proper waste disposal & Management.
8. Limiting rush by doing an appointment based practice with minimum attendants with any patient.
9. Emphasis should be made by each dentist to create some awareness among his patients so that they comply to each new protocol and understand its importance so that they reach out to others as well.
10. He shall also be available to clarify any misconceptions among public and shall guide them better for their safety and the safety of others.

6. Conclusion

Bioterrorism is a threat worldwide, and would remain so until anything is done about it. For long term solutions our Medical fraternity should take charge and educate the public and policy makers about it & how to deal with it. According to the current scenario there are increasing number of countries which are involved in the proliferation of such biological weapons and their acquisition by terrorist organizations. So there is an ardent need to develop biodefense by full international cooperation. And to educate

the likely target population about the precautions, response and protective measures which need to be taken in case of a bioterrorism attack.³¹

We, Dental Surgeons can be very helpful²⁹ at such times to provide our support to our fraternity. Give quality information to the masses about precautions and responses, and with proper training help in the patient management as discussed in my article above during such a catastrophe with all precautions & safety / protective measures taken.

7. Source of Funding

None.

8. Conflict of Interest

None.

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