



RISING THREAT OF BIO-TERRORISM IN TRAINS AND METROS& ROLE OF INTEGRATED DENTAL RESOURCES TO STRENGTHEN THE DISASTER RESPONSE CAPACITY

¹*Dr. Monis Raza, ²Dr. Mohit Mangla, ³Dr. Nikita Gulati and ⁴Dr. Shazia Zaidi

¹Senior Lecturer, Department of Orthodontics & Dentofacial Orthopaedics, I.T.S. Center for Dental Studies and Research Muradnagar, Ghaziabad (U.P) - 201206, India.

²Former Post Graduate Student, Department of Oral & Maxillofacial Surgery, I.T.S. Center for Dental Studies and Research Muradnagar, Ghaziabad (U.P) - 201206, India.

³Senior Lecturer, Department of Oral & Maxillofacial Pathology, I.T.S. Center for Dental Studies and Research Muradnagar, Ghaziabad (U.P) - 201206, India.

⁴Consultant, Department of Dermatology, Sumitra Hospital, Noida(U.P.)-201307, India.

***Corresponding Author: Dr. Monis Raza**

Senior Lecturer, Department of Orthodontics & Dentofacial Orthopaedics, I.T.S. Center for Dental Studies and Research Muradnagar, Ghaziabad (U.P) - 201206, India.

Article Received on 10/11/2019

Article Revised on 30/11/2019

Article Accepted on 21/12/2019

ABSTRACT

Over the past few decades, global events indicate that the threat of biological attack is not a myth, but a harsh reality. The threat of biological terrorism in densely populated areas such as metro / train and the consequent outbreaks, triggered by newly identified resurgent pathogens, as well as the possibility that high-consistency pathogens could be used as agents of biological terrorism, amply demonstrate the need to improve the ability of managing extremely infectious diseases in clinical and public health. This review provides a punitive summary of biological terrorism, the agents used, and counteracting measures, the role of a dentist, with a relevant note on India's current state of police investigation systems, laboratory response network, and the potential to counteract such an event.

KEYWORDS: Bioterrorism, Dentist, Awareness.

INTRODUCTION

We live in an era in which billions of people strive to foster interaction, tolerance and understanding about the more destructive forces of war, violence and political chaos that marked the beginning of the 21st century. But terrorism has continued to plague the international security scenario. The issue of international terrorism as part of 'hybrid threats' has been discussed at length in recent security conferences held in the Russian Federation over the past three months, with answers still to be sought. Several countries are seriously concerned about several new forms of security threats that were described in combination as "hybrid threats," i.e. threats using military and non-military methods, including bioterrorism, social media radicalization, cyber attacks, fake news, color revolutions, international regime change efforts, and terrorism.^[1]

Among all these threats to security, the dark horse was bioterrorism. The use of biological agents as weapons has been prevalent throughout history to disrupt established structures, such as governments and particularly large urban populations. Densely populated

areas such as subway trains, local trains and trams are the most sensitive areas for possible bioterrorism attack due to the lack of adequate security measures and awareness of the problem.

In addition, the problem of bioterrorism has become more critical due to the ICT revolution. Researchers have characterized the next hundred years as the "century of biology." Incredibly rapid and significant developments have been made in genetic modifications in bio-molecular technology and improved bio-producing technologies. Nevertheless, being a dual-edged sword, technology will make it easier for sinister actors to resolve obstacles in the past that prevented the development of biological weapons.^[2]

Bioterrorism redefines the reactions of dentists to disasters. Correct and substantial information provided by credible public health and physicians to the general public will do much to alleviate their fears and encourage their cooperation and involvement in constructive, organized community response efforts. Within the emergency response to a major bioterrorism attack, the

dental profession can play a major role. The medical specialty will contribute valuable assets to the preparation for and in the immediate response to a bioterrorist attack and its aftermath, both in personnel and facilities. Within the result, these properties must make a major difference.^[3]

Defining Bioterrorism

A bioterrorism attack is the intentional release in humans, animals, or plants of viruses, bacteria, or other germs (agents) used to cause disease or death. Such agents can normally be found in nature, but genetically modified agents can increase their ability to cause disease, make them immune to current drugs, or increase their ability to spread to the environment.^[4]

What (agents likely to be used)

Bioterrorism agents are classified as categories A, B, and C.^[4]

Category A: High-risk agents/diseases like anthrax (*Bacillus anthracis*), botulism (*Clostridium botulinum* toxin), plague (*Yersinia pestis*), smallpox (*Variola major*), tularemia (*Francisella tularensis*), and viral hemorrhagic fevers [filoviruses (e.g. Ebola, Marburg) and arenaviruses (e.g. Lassa, Machupo)] pose a threat to national security because they can be quickly disseminated or transmitted from person to person, lead to high mortality rates and potentially have a significant impact on public health. They might cause public panic and social disruption, and require special action for public health preparedness.

Category B: The second highest priority agents include those that are moderately easy to spread, result in moderate morbidity rates and low mortality rates, and require specific improvements to the diagnostic capability of CDC and enhanced disease monitoring.

Agents/diseases are brucellosis (*Brucella* species), epsilon toxin of *Clostridium perfringens*, food safety threats (e.g., *Salmonella* species, *Escherichia coli* O157:H7, *Shigella*), glanders (*Burkholderia mallei*), melioidosis (*Burkholderia pseudomallei*), psittacosis (*Chlamydia psittaci*), Q fever (*Coxiella burnetii*), ricin toxin from *Ricinus communis* (castor beans), Staphylococcal enterotoxin B, typhus fever (*Rickettsia prowazekii*), viral encephalitis [alphaviruses (e.g. Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis)], and watersafety threats (e.g. *Vibrio cholerae*, *Cryptosporidium parvum*).

Category C: The third highest priority agents are emerging pathogens that could be produced for mass distribution in the future due to accessibility, ease of development and dissemination, and the potential for high morbidity and mortality rates and major health effects.^[3] New trends are microbe products that can kill or disable targeted hosts, such as hormones,

neuropeptides, cytokines known as "designer substances" to target a particular organ or enemy type. Others are biological weapons of "ethnic bombs" and parasites being tested to affect cash crops.^[4]

History

The use of biological weapons for terror is not new as these devices were used in ancient times to cause terror.

- Assyrian politicians dumped rye fungus into the wells of their opponents, giving them fatal ergot poisoning in 650 BC.
- Town siege armies relied on increased disease among the defending population and threw dead animals into water supplies to spread it.
- Fourteenth-century Tatars spread bubonic plague to towns by catapulting diseased bodies.
- In the First World War, biological weapons were developed by the United States and Germany to contaminate animal feed.
- The U.S. and the Soviet Union developed biological agent arsenals for use in war and against civilian populations during the Cold War.^[5]
- Dr. Anton Dilger experimented on behalf of the German Government with anthrax and glander cultures between 1915 and 1916 for the purpose of biological warfare.^[4]

In 1984, Rajneeshee cult distributed *Salmonella* in restaurants and grocery stores to poison civic leaders and gain control of the local government in Oregon.

- In 1992, Russia was able to launch small pox weapons-grade missiles. A number of terrorist groups have been exploring the use of biological agents, including Al-Qaeda.
- In 2001, letters containing anthrax spores were sent to a television news reporter, U.S. president, and others, leading to a few people's death and a few others' hospitalization.^[5]

Increasing propensity of Bio Terrorism at Metro/Trains and Other Dense Areas

The Tokyo subway sarin attack was an act of domestic terrorism committed by members of the cult movement Aum Shinrikyo in Tokyo, Japan, on March 20, 1995. The attackers unleashed sarin on three lines of the Tokyo Metro (then part of the Tokyo subway) during rush hour in five coordinated attacks, killing 13 people, severely injuring 50 (some of whom died later), and causing temporary vision problems for nearly 1,000 others. The attack was directed against trains passing through Kasumigaseki and Nagatashō, where the Diet (Japanese parliament) is headquartered in Tokyo.^[6]

It sends a blast of air rolling through the huge network of tunnels of the 100-year-old system each time a train races through a subway station. That blast is kicking up and carrying a whole bunch of particles. They are swirling, floating and flying. And then all over they deposit themselves. With the low safety threshold of the subways and the high number of passengers, they are

particularly vulnerable spots for an attack on bioweapons.^[7]

Delhi Metro's ridership alone has already touched 26 lakh, according to a source. According to Indian Railways facts and figures, the number of originating and average distance traveled per passenger for the year 2016-2017 was 8116 million and 141.7 km respectively.^[8] The Delhi Metro Rail Corporation transports 1.5 million passengers on 2,700 trips per day, each covering an average distance of 17 kilometres. While the local rail network of Mumbai is the busiest commuter train system in the world, with 7.5 million people using the trains to ride on a daily basis and these numbers increase exponentially during office hours. This is just about two of our country's major cities, but taking into account the ongoing development of rail transport means in all of India's major cities, estimates will plunge the sky high.^[9]

It is well established that in the face of empirical problems such as rising congestion and pollution, public transport is becoming increasingly important for urban areas to prosper. Metro has emerged in the National Capital Region as the most preferred mode of public transport system. The metro system's inherent features make it an ideal target for terrorists and miscreants. Typically, metro systems are open and dynamic systems carrying thousands of passengers. In addition, the high infrastructure costs, their economic importance, being the city's life line, high news interest, fear & panic, and mass casualties pose a greater threat to their safety. In the sense of public transport, safety is a relatively new issue. It addresses deliberately caused problems. Security issues or risks are caused by people whose acts are aimed at undermining or disrupting the public transport system and/or injuring passengers or employees. Such risks vary from everyday operational security concerns including chaos, vandalism, and attack to the threat of terrorism.

Two gunmen, Ismail Khan and Ajmal Kasab, attacked the Chhatrapati Shivaji Maharaj Terminus (CSMT) on November 26, 2008. By using AK-47, the attackers killed 58 people and wounded 104 others.^[10] Imagine riding in a subway or just switching your train to work, it's a closed space, thousands of people are standing closely and someone is releasing a deadly virus / bacteria. It may not have an immediate effect, but how well it spreads, each person takes it home and exposes their families to the same lethal particle. It could do much greater harm than what a single bullet would have done.

India's Preparedness Against Bioterrorism

The preparedness of India to counter bioterrorism leaves much to be desired. The Home Affairs Ministry (MHA) is the nodal counter-terrorism ministry, while the Ministry of Health and Family Welfare (MoH & FW) is responsible for dealing with epidemics. The Ministry of Agriculture (MoA) is concerned with animal and plant

epidemics. The Defense Ministry (MoD) has naturally appropriate armed forces as first responders. The Indian Council of Medical Research (ICMR) is responsible for the formulation, coordination and promotion of biomedical research with the National Institute of Virology (NIV) at the apex, however, there is no separate central organization per se that addresses different facets of the bioterrorism threat.

The National Institute of Cholera and Enteric Diseases, the National Institute of Epidemiology and the Research Center for Vector Control are other important facilities under the ICMR. Under the Director General of Health Services, the National Center for Disease Control (NCDC) has several advanced labs, but the technical expertise to combat bioterrorism is currently lacking. The Department of Defense Research and Development (DRDO) has a large network of laboratories. Defense Research and Development Establishment (DRDE) is interested in hazardous chemicals, biological agents, biotechnology, microbiology, virology and toxicology research.

Research and Development establishment specializes in the manufacture of individual protective equipment (IPE) for defense supplies and stores. The Laboratory of Defense Food Research is committed to food quality, safety and security. Other research and development (R&D) organizations dealing with biotechnology, drugs and toxicology are the Council for Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT) and are supported by a comprehensive laboratory network. The Agricultural Research Council of India (ICAR) is a top research institution in the fields of agriculture and animal science.

The NDMA is required to plan, prepare and respond to both natural and man-made disasters with State Disaster Management Authorities (SDMAs) to organize and track disaster management (DM) activities down to local and district levels. The National Disaster Response Force (NDRF) is trained as a multidisciplinary force for specialized response to natural and man-made disasters. It consists of 10 battalions, including Border Security Force (BSF), Central Reserve Police Force (CRPF), Central Industrial Security Force (CISF) and two Sashastra Seema Bal (SSB) battalions. Regarding chemical, biological, radiological and nuclear (CBRN) emergencies, four NDRF battalions are trained and equipped. Nevertheless, the main focus of both NDMA and NDRF remained on natural disaster response.^[10]

After 9/11 attacks, letters laced with anthrax bacteria began to appear, delivered through the postal system in the United States. In the attacks, five people died. In response, a 2003 anti-bioterror program called BioWatch was launched by the US government. In the event of terrorism, BioWatch has sensing systems in major cities across the country.^[9] Such a sensing device has the ability to be used in metro stations across the country to

help detect bioterrorism but certainly at a higher cost. It has been plagued with false alarms since its introduction and has never seen an incident of terrorism. Lawmakers have become skeptical of the USD 1 billion project as it risks desensitizing officials who may not respond if a real attack is detected by the device.^[9]

Metro network is evolving day by day, it is constantly expanding, with a growing population, this mode of transportation has increased demand. Delhi Metro Rail Police has eight DMRC & Airport Express Line police stations, has installed police assistant booths at the stations, and CISF has assisted DRMC in disaster management related tasks as they would be the first responders to any natural / manmade disaster.^[12,13] But the question remains, are we adequately aware of and prepared to prevent / counter a Delhi metro bioterrorism attack?

Arguments based on the premise of low doctor-population ratio were used to initiate multiple programs in public health, especially in the areas of human resource development. According to the facts presented in the literature, India has reached a doctor-population ratio of 1:1000 of the WHO standard. The health system has shifted from "not available" to "available but not engaged" status or "available but inefficient and maldistributed."^[14] Nonetheless, the question remains whether this amount is appropriate to combat a bioterrorism event and whether or not alternative health practitioners will increase the number of workers. The native demands can be large and immediate in a major bioterrorist attack. When hospitals are crowded, there may also be a need for alternative sites to provide health care, and dental offices can meet that need.

Role of Dentist in Strengthening the Disaster Response Capacity

Dentistry can contribute valuable assets to plan for and in the immediate response to a bioterrorist attack and its aftermath, both in staff and services. It is important to inform the dental community on the medical and oral manifestations of diseases arising from a bioterrorist attack. Formal plans for associate coordinated response by dental staff should be created, incorporated into the response arrangement of each group, and practiced sporadically just in case of associate attack. Dental offices fitted with certainly valuable instrumentation will be able to act as regional auxiliary hospitals if the need arises. As part of the dental school information, educational programs that provide information on potential biological weapons should be developed along with continuing education courses.^[11]

It is necessary to develop up-to-date sources of knowledge that will be quickly accessed throughout the associated attack and reference materials to be distributed for PRN use. Such simple references should be able to provide dentists with sufficient knowledge of

the specific agent used in associate attack to modify them in order to respond effectively.

Dentists are in daily contact with the general public. Armed with data and connected to science-based sources of information about agents that will be used in a terrorist act, dentists can educate their patients and may affect public knowledge as a whole. There may also be a need for advanced teaching programs for threat communication. Dental offices are located in any given community and have several of the resources available to hospital facilities: sterilization equipment, air and gas lines, suction equipment, radiology capabilities, tools and needles. They will be referred to as "mini-hospitals" when native hospital facilities are inundated or when patient concentration is to be avoided, as in attacks involving contagious agents. For materials to be distributed in the event of an attack, pre-designated dental offices could act as stock pile sites.^[11]

The key to triple-crown planning for a good response to a serious terrorist attack is that it is planned and checked by performing simulated attacks and creating a plan that is incorporated into the disaster response of each city.

Assistance during an attack

The help that dentists and other dental workers can provide during the first few days of a potential bioterrorist attack may vary depending on the community's needs and available resources. These can range from packaging medicines in individual doses to providing a significant portion of primary medical care in a quarantined area if doctors are unavailable because they have become disabled or died.

Surveillance and Notification

Disease surveillance systems are critical not only to detect an outbreak initially, but also to monitor the extent and spread of the outbreak and to determine when it is over. Managing a large outbreak would require gathering information from contact tracing and exposure source investigations, as well as information on critical medicine, medical equipment availability as well as managing corpses.^[12]

Since there is an incubation period before the clinical manifestations of diseases used as weapons in bioterrorist attacks become evident, it may be difficult to recognize the actual perpetration of an attack. Dentists can serve as an excellent surveillance resource as they can detect and report to public health authorities characteristic intraoral or cutaneous lesions when they are present. These may also be able to detect irregular trends of the cancellation or missed appointments of staff or patients that can not be explained by known local circumstances. Such incidents may well be a precursor to serious events that are about to occur.

Diagnosis and Monitoring

In addition to assisting in the early identification of the disease or disease introduced in a bioterrorist attack, dentists can provide an individual patient diagnosis by observing the physical and behavioral signs that people manifest when the nature of the attack is determined. Salivary swabs can provide important information on diagnosis or treatment and can be obtained by dentists for laboratory tests to determine diagnosis when appropriate or to track patient progress.

Referral

Dentists can refer suspicious cases for confirmation, treatment or both to the appropriate specialists. Immunizations, triage facilities, increased medical care, decontamination and control of infections are key arenas to work on.

The Way Forward

Bioterrorism is not a cause of panic, it can be a source of serious discussion. The country should target measures aimed at enhancing public health in various areas of medical specialty, along with microbe identification, police education, generic antimicrobial and medical specialty to beat drug resistance, education can enhance society's power to fight 'regular' infectious disease outbreaks and mitigate the outcome of bioterrorism attacks. The ongoing exposure of the biological coercion risk is an opportunity to evaluate our collective capacities and explicitly identify weaknesses and vulnerabilities in densely populated areas such as trains and metros. New technologies such as Bio-watch systems will require leadership and intervention from responsible federal agencies, promising though overpriced and rising the size of the national state. The government's proactive measures to ensure a wider range of security measures and empower the health sector in such a case of disaster management are crucial. The number of well-equipped emergency units and the number of people with the expertise to handle is still questionable and should be addressed.

A careful analysis of the unpreparedness consequences provides a basis for change. For longer-term solutions, India's medical profession and the railway sector should educate each of the general public and policy makers on biological terrorism and build a global agreement that not only condemns its use, but also similarly encourages preventive and dominant measures. Dentists will provide their patients and communities with valuable service by providing quality information about the potential for attacks, what to look for, and how to effectively respond to an attack.

REFERENCES

1. Sanja De Silva Jayatileka. Growing Global Consensus On Terrorism, Hybrid Threats & National Security. Colombo Telegraph. 26 June, 2019.
2. Bioterrorism- Public health System To Remain Alert. CD Alert, Monthly Newsletter of National Institute of Communicable Diseases, Directorate General of Health Services, Government of India, vol. 5. September-October 2001. p. 1-12.
3. Centers for Disease Control and Prevention. [Internet]. [cited on 15/01/2012] Available from: <http://www.bt.cdc.gov/bioterrorism/>.
4. Bioterrorism. In: Suryakantha AH, editor. Community Medicine (with recent advances). 1st ed. Chap. 58, New Delhi: Jaypee Publishers; 2009. p. 822-4.
5. Bhatt S, Rajesh G, Thakur D. Knowledge, perceived need for education, and willingness to participate in bioterrorism preparedness among students in an Indian dental institute: A questionnaire study. Med J DY Patil Vidyapeeth 2017; 10: 526-31.
6. Wikipedia contributors. "Tokyo subway sarin attack." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 27 Sep. 2019. Web. 14 Oct. 2019.
7. Erin Biba. Meet New York City's Anthrax Detectives. BBC Autos. 21 June, 2016
8. Delhi Metro vulnerable to terror attacks: Parliamentary panel. Economic Times. 13 July, 2018.
9. Hodson H. Detecting a subway bioterror attack. New scientist magazine. Magazine issue 2882, published 15 September 2012.
10. Sumeet Abrol. Countering Bioterrorism Threat to India: Employing Global Best Practices and Technology as Force Multiplier. 72(2): 1-17 © 2016 Indian Council of World Affairs (ICWA) SAGE Publications sagepub.in/home.nav DOI: 10.1177/0974928416637934.
11. Guay AH. Dentistry's response to bioterrorism: A report of a consensus workshop. J Am Dent Assoc 2002; 133: 1181-7.
12. Hoffman RE. Preparing for a bioterrorist attack: legal and administrative strategies. Emerg Infect Dis 2003; 9: 241-5.
13. Prakash N, Sharada P, Pradeep G. Bioterrorism: Challenges and considerations. J Forensic Dent Sci. 2010; 2(2): 59-62. doi:10.4103/0975-1475.81283
14. Kumar R, Pal R. India achieves WHO recommended doctor population ratio: A call for paradigm shift in public health discourse!. J Family Med Prim Care. 2018; 7(5): 841-844.