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Bio Terrorism and Future - A Review

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Abstract

Biological warfare or biowarfare is the use of biological toxins or infectious agents such as bacteria, viruses, and fungi with the intent to kill or incapacitate humans as an act of war. It is a criminal act against unsuspecting civilians using pathogenic biological agents. Bioterror and Biological Warfare agents are most often colorless, by-and-large odorless microorganisms (bacteria, viruses, fungi) or toxins (usually protein toxins) derived from microorganisms that can be spread in air as aerosols or in food or drink to infect as many people as possible. They are easily concealed, and thus difficult to detect before an attack. Their main advantages to terrorists are allowing easy escape and causing panic and chaos within a civilian population. Their aim is to overwhelm emergency medical departments at local hospitals and clinics. However, there are ways to help protect yourself against bioterror agents and by extrapolating biological warfare agents and to help identify an attack when it occurs.

Keywords: *bioterrorism, Biological Warfare, combat bioterrorism, impact, biothreat organisms.*

Introduction

Bioterrorism, bioweapons, or biowarfare is a term used to portray the purposeful or intentional use, spread/ discharge, scattering or creation of living life forms, poisons, and synthetic concoctions of creature or plant inception to deliver such ailments that can mischief or cause passing of people, creatures, plants, and even the general environment[1]. The psychological militant can spread it through air, water, soil, and food, and they can take scarcely any hours to a few days to cause the impact. More up to date pathogens are developing step by step which lose a significant danger in rewarding hospitalized patients. It is an expansive subject that incorporates different scope of living beings and compound poisons which are utilized to spread fear, peril, hazard, and threat[2].This can be performed by an individual having personal stakes or for counter, however it can likewise be supported by some legislature as a major aspect of a political agenda[3] . In prior days, Bacillus anthracis and little pox infections were utilized as a wellspring of bioterrorism in the West and even as of late, Bacillus anthracis is a normally utilized operator for bioterrorism[4]. This type of psychological oppression is the least demanding on the grounds that the specialists are accessible effectively, don't cause sound or impact, can cause hurt across the outskirts, and are far reaching for the most part as it can clear out the whole populace[5]. There are three general classifications which indicate the term bioterrorism The classes depend on the danger running from most noteworthy to direct and in the long run to gradual[6]. Bioterrorism is genuine, clear, and steady in the cutting edge time. Thusly reinforcing of commonplace Environmental Protection Agencies (EPA), usage of self-observing projects by the

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enterprises, and enactments, for example, the "polluter pays'' standard can assist with securing our natural resources[7] .Research is the foundation of arrangements. Accordingly, the private party ought to be urged to put resources into investigating this field[8].

A bioterrorist assault might be hard to recognize from a normally happening infection [9] sickness flare-up. Agents should initially look at the etiology and the study of disease transmission of an episode to distinguish its source, method of transmission, and people in danger. Certain intimations may show whether a flare-up is the consequence of deliberate arrival of microorganisms. Normally happening ailments are endemic to specific zones and include conventional patterns of transmission; a few infections happen occasionally, and sentinel cases are not uncommon[10]. Conversely, an ailment flare-up because of bioterrorism could happen in an endemic-illness region, whenever of year, all of a sudden, and relying upon the etiologic operator and method of transmission, in enormous numbers—a huge number of cases may happen unexpectedly[11]. Public wellbeing authorities must be suitably sharpened to the chance of bioterrorism when examining sickness flare-ups.

Bioterrorism

Bioterrorism includes the deliberate discharge or scattering of organic agents[12]. These specialists are microscopic organisms, infections, creepy crawlies, parasites, or poisons, and might be in a normally happening or a human-changed structure, similarly in natural fighting. Further, present day agribusiness is defenseless against hostile to farming assaults by fear based oppressors, and such assaults can genuinely harm economy just as buyer confidence[13].The later damaging movement is called agrobioterrorism and is subtype of agro-terrorism.Bioterrorism is the purposeful arrival of infections, microscopic organisms, poisons or other hurtful operators to cause ailment or demise in individuals, animals, or plants[14]. These specialists are normally found in nature, however could be transformed or changed to expand their capacity to cause malady, make them impervious to ebb and flow drugs, or to build their capacity to be spread into the environment[15] .Biological operators can be spread through the air, water, or in food. Organic specialists are alluring to fear mongers since they are amazingly hard to distinguish and don't make disease for a few hours a few days. Some bioterrorism operators, similar to the smallpox infection, can be spread from individual to individual and a few, similar to Bacillus anthracis, cannot[16]. Hepatitis B is an irresistible malady brought about by hepatitis B infection which influences the liver.It can be transmitted through a few different ways through immediate or aberrant contact with blood , oral liquid , mist concentrates and so forth

Bioterrorism might be supported in light of the fact that organic specialists are moderately simple and reasonable to get, can be handily spread, and can cause across the board dread and frenzy past the real physical damage[17].Military pioneers, in any case, have discovered that, as a military resource, bioterrorism has some significant impediments; it is hard to utilize a bioweapon such that lone influences the foe and not well disposed forces [18].A natural weapon is helpful to psychological oppressors primarily as a technique for making mass frenzy and disturbance to a state or a country[19].

History

Contagious diseases and other biological weapons were recognized for their potential impact on armies or people as early as the 14th century BC . The Hittites might have produced the first documented example of BW by sending diseased rams (possibly infected with tularaemia) to their enemies to weaken them [20]. In the fourth century BC, the Greek historian Herodotus relates that Scythian archers used to infect their arrows by dipping them in a mixture of decomposing cadavers of adders and human blood. According to our modern interpretation, this mixture might have contained Clostridium perfringens and Clostridium tetani, as well as the snakes' venom [21] In the third century BC, the military commander Hannibal of Cartagena set fire to the enemy's fleet (belonging to King Eumenes II of Pergamon) with pots full of venomous snakes. Similar examples are reported by historians or, for cases closer to our epoch, by anthropologists of the use of arrows or other vessels infected with different products extracted from animal parts or plants in order to attack the human enemy [22]. Similarly, the use of arrows for the transmission of plague is suggested by some allegorical documents, such as the drawing painted in 1437 by an anonymous artist on a wood cover used by the

government of Siena to protect official documents (Fig. 1). In the Middle Ages, a famous although controversial example is offered by the siege of Caffa (now Feodosia in Ukraine/Crimea), a Genovese outpost on the Black Sea coast, by the Mongols. In 1346, the attacking army experienced an epidemic of bubonic plague. The Italian chronicler Gabriele de' Mussi, in his Istoria de Morbo sive Mortalitate quae fuit Anno Domini 1348, describes quite plausibly how the plague was transmitted by the Mongols by throwing diseased cadavers with catapults into the besieged city, and how ships transporting Genovese soldiers, fleas and rats fleeing from there brought it to the Mediterranean ports[23] Given the highly complex epidemiology of plague, this interpretation of the Black Death (which might have killed >25 million people in the following years throughout Europe) as stemming from a specific and localized origin of the Black Death remains controversial. Similarly, it remains doubtful whether the effect of throwing infected cadavers could have been the sole cause of the outburst of an epidemic in the besieged city. However, this episode of the use of cadavers in order to infect a population remains a landmark in the history of BW [24]. Similar examples of the use of the technique of catapulting infected cadavers can be found throughout the modern period, from the siege of the Bohemian city of Carolstein by Lithuanian troops in 1422 to the siege of the Swedish army in Reval (Estonia) in 1710 by the Russians

Laboratory detection and surveillance for bioterrorism:

Globally, there are laboratories established to address bioterrorism. According to the Centers for Disease Control and Prevention (CDC), there should be a laboratory response network which should include clinical microbiology laboratories that are responsible for identifying, detecting, and reporting bioterrorism[25]. In addition, they must suggest the measures that can be adopted to remedy the effects .Development of resistance in pathogens to antimicrobials is threatening mankind. Intrinsic and mechanisms act together to make the pathogen more and more potent against most of the available therapeutic drugs**.**The laboratory response network can be grouped category wise, dealing with the issue, like a category A laboratory can be a primary laboratory that can help detect such agents which can likely cause bioterrorism effects and so they should be equipped to conduct primary analysis.[26]The B category laboratories can help to isolate and identify the exact agent responsible for bioterrorism and work for its remedial measures and design such strategies. Similarly, the category C laboratories should work to identify those agents that can cause potential damage as a bioterrorism agent in future; they all must act as public health laboratories [27]Mostly, microbiologists are capable enough to work out the effects and remedies for bioterrorism and the population suffering or at risk to suffer from its impacts.[28] However, toxicologists also have a significant role to offer in this regard, as they are the ones who can identify the toxins from food, air, water, and even soil sources that can have an impact on the entire population and pose a risk to the overall public health.

Impacts

Bioterrorism and its potential for mass destruction have been subjects of increasing international concern. Approximately 17 countries (including five implicated as sponsors of international terrorism) may have active research and development programs for biologic weapons [29]. Moreover, groups and individuals with grievances against the government or society have been known to use or plan to use biological weapons to further personal causes.[30] Only modest microbiologic skills are needed to produce and effectively use biologic weapons. The greatest, but not insurmountable, hurdle in such an endeavor may be gaining access to a virulent strain of the desired agent[31]. Production costs are low, and aerosol dispersal equipment from commercial sources can be adapted for biologic weapon dissemination. Bioterrorists operating in a civilian environment have relative freedom of movement, which could allow them to use freshly grown microbial suspensions (storage reduces viability and virulence.[32] Moreover, bioterrorists may not be constrained by the need for precise targeting or predictable results.

The impact of a bioterrorist attack depends on the specific agent or toxin used, the method and efficiency of dispersal, the population exposed, the level of immunity in the population, the availability of effective postexposure and/or therapeutic regimens, and the potential for secondary transmission[33]. Understanding and quantifying the impact of a bioterrorist attack are

essential to developing an effective response.

Biothreat organisms

The biothreat organisms are classified into 3 categories. They are Category A that can be can be easily disseminated or transmitted from person to person;result in high mortality rates and have the potential for major public health impact;might cause public panic and social disruption; and require special action for public health preparedness.[34] The organisms are Anthrax (Bacillus anthracis)Botulism (Clostridium botulinum toxin)Plague (Yersinia pestis)Smallpox (variola major) Tularemia (Francisella tularensis) Viral hemorrhagic fevers, includingFiloviruses (Ebola, Marburg)Arenaviruses (Lassa, Machupo).[35] Category B that are are moderately easy to disseminate;result in moderate morbidity rates and low mortality rates; andrequire specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance[36]. Among the bacteria that colonises the mouth, treponemes dominate because they proliferate rapidly in devitalised tissue with the availability of a simple source of nutrient The organisms are Brucellosis (Brucella species) Epsilon toxin of Clostridium perfringens. Food safety threats (Salmonella species, Escherichia coli O157:H7, Shigella)Glanders (Burkholderia mallei)Melioidosis (Burkholderia pseudomallei)Psittacosis (Chlamydia psittaci)Q fever (Coxiella burnetii)[37].Category C that are available ;ease of production and dissemination; and potential for high morbidity and mortality rates and major health impact. The organisms are Nipah virus and hantavirus and now coronavirus too.[38]

1.6 Preventive measures

The prevention of use of biological weapons should endure to be a top priority for the nation. In the production of bioweapons, which deliver a highly infectious, contagious and lethal pathogen, relatively smaller investment of money, time and effort are required. Recent advances in biotechnology, bioinformatics and molecular genetics has great benefits for human health, but state proliferators and sophisticated terrorists misuse the results of such research to develop more effective biological weapons[39] .The knowledge, materials, and technologies needed to make and use a biological weapon are readily accessible around the world. Pathogens are pervasive in nature and can be found everywhere. The possibility of synthesizing pathogens particularly viruses, using technologies are inexpensive and globally available. Public health, medical, military, and law enforcement experts have met in a number of settings in efforts to identify the most threatening of the biological weapons, specifically those weapons that merit priority concern in the development of public health and medical preparedness measures.

During an event of biological warfare, it is not the muscle power or the powerful ammunition that will come to the rescue, it is the efficiency of an applied science methodology from microbiological scientists that will protect the soldiers and citizens. During an emergency, an immediate intervention will be the need of the hour to reduce the mortality and morbidity rate. Antibiotics, active and passive immunizations, and antiviral agents can be used for this purpose. Since diseases resulting from biological warfare agents and disasters have an incubation period of days, there is a short time period in which proper post exposure prophylaxis may be given.

Conclusion

Bioterrorism is real and evident and persistent in the modern era. During an emergency, an immediate intervention will be the need of the hour to reduce the mortality and morbidity rate. Antibiotics, active and passive immunizations, and antiviral agents can be used for this purpose. Since diseases resulting from biological warfare agents have an incubation period of days, there is a short time period in which proper post exposure prophylaxis may be given. Detection of the pathogenic agent and intervention with appropriate drugs with proper knowledge and awareness of the public is essential to control the spread of the disease.

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