NEW HORIZONS

Biological Warfare : Who Can Make a Difference

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The use of biological and chemical weapons is considered the most heinous type of warfare. When it was first tried on a large scale in 1915 at Ypres, France against French, Algerian and Canadian troops, the German high command had a hard time finding officers who would participate in the use of poison gas against an enemy.

Biological Warfare involves the use of living organisms for military purposes. They can be viral, fungal, bacterial, rickettsial and protozoan. Biological agents can mutate, reproduce, multiply and spread over a large geographic terrain by wind, water, insect, animal and human transmission. Conventional biological agents include Yersinia pestis (Plague), tularemia, rift valley fever, Coxiella burnetti (Q. Fever), eastern equine encephalitis, anthrax and smallpox. The potential impact of biological weapons is well documented (1) .

The new genomic information being discovered and used for commercial genetic engineering in the fields of agriculture, animal husbandry and medicine is potentially convertible to the development of a wide range of novel pathogens that can attack plant, animal and human populations.

Unlike nuclear bombs, the materials and tools required to create biological warfare agents are easily accessible and cheap, that is why biological weapons are some times referred as poor man's atomic bomb. A state of the art biological laboratory could be built and made operational with as little as $ 10,000 worth of off the shelf equipment and could be housed in a small room. Various research studies government warnings and commentaries have all pointed to a grave terrorism future (2-5).

BIO-TERROR THREATS: Public health authorities need to be alert in looking for signs of biological attack. An unusual disease outbreak could represent the release of biological weapons or the occurrence of emerging and re-emerging disease. In either case, an epidemiological investigation could differentiate between two possibilities since the most populations around the world are susceptible against commonly incriminated biological agents and any such attack could drastically increase the death toll. Ironically least prepared are those countries who are faced with maximum threat.

Bio-terror threats can be: (i) Biological Agents
(ii) Chemical Agents

Among the biological diseases on the watch list are depicted in Table 1:-

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Table 1.

Anthrax	Botulism	Pneumonic Plague	Small Pox
METHOD OF INFECTION, POSSIBILITY OF USE			
Spores released as a colourless, odourless, invisible cloud over a large area; requires technical sophistication to make and spread Weaponised by US in 1950 & 1966	Toxin released into the air or used to poison food; difficult to make into weapons for causing mass causalities Most toxic compound known 15,000 times more toxic than nerve agent VX and 10,000 times more toxic than sarin	Distributed through air; very difficult to acquire germs and process and spread them	Small amount released through the air could be effective; only known sources are US and Russian labs
SYMPTOMS			
Early signs resemble a fever or cough. Malaise and fatigue may lead to severe respiratory distress once symptoms appear	Difficulty speaking, seeing and/or swallowing, nausea, vomiting, paralysis that can inhibit breathing	High fever, chills, headache, malaise, cough, muscle pain, followed by respiratory failure, bleeding and circulatory collapse	High fever, malaise, headache, backache, severe abdominal pain, delirium, followed by a rash that begins in the mouth
INCUBATION PERIOD			
Symptoms can appear as soon as two days or as long as six to eight weeks after exposure	Symptoms typically appear 12 to 72 hours after ingestion; severity of illness depends upon amount of toxin ingested	Estimated to be one to six days, with many patients dying quickly after symptoms appear	Symptoms usually appear within 12 to 14 days
TREATMENT			
Antibiotics must be started before development of symptoms; if not, the mortality rate is estimated to be 90%	Antitoxin should be administered quickly once symptoms appear	Prompt treatment with antibiotics can be effective; almost all untreated patients die	No effective drug treatment; vaccination no longer given; those vaccinated earlier probably no longer have protection

Besides these biological threats other diseases which have potential biological threats include:- Brucellosis, Q. Fever, Tularemia, Viral Encephalitides, Viral Hemorrhagic fevers, Staphyloccal entero toxin B etc.

BIO-TERROR-WHAT IS NEXT - Bacteria viruses and toxins (of microbial, plant and animal origin) can be used as bio agents including bacillus anthracis, botulinum toxins, yersinia pestis, staphylococcal entero toxin B, venezuelean equine encephalitis. Despite being different, they share certain common characteristics:-

(i) Can be dispersed in aerosols that can remain suspended for hours.

(ii) Aerosols can be delivered by simple technology including industrial sprayers with nozzles.

Terrorists with conventional weapons have to be concerned about metal detectors, x-ray machines etc. but terrorists with BW agents don't face those means of detection.

FOOD : A nation's food-supply especially of imports. Only a tiny fraction of the food coming into the US undergoes inspection. Salad bars could be contaminated with dangerous pathogens like salmonella that would make anyone dangerously ill. Terrorists could lace imports with not only botulism toxin but also other pathogens including E.Coli 0157:H7, salmonella, dysentery, cyclospora and hepatitis.

AIR : Shoppers in an enclosed space like the forum shops could be made ill by terrorists contaminated air.

THE THREAT : Small pox, plague, botulism, Tularemia and Hemorrhagic fever. But of these smallpox may be the most worrisome. Killing 30% of those infected and leaving the rest scarred for life, it spreads easily from person to person. A single suicidal terrorist spraying a few drops of smallpox virus or a liquid solution of Ebola or even plague in a crowded mall or into the ventilation system of a large building could cause untold harm.

WATER : A few drops of cholera bacteria could poison the water tank of an apartment house. Or a terrorist

might use pathogens including botulism, to attack a bottler of specialty water or a dairy. But overall these are poor options for bio-warriors. Even bottlers of pure water could be hit by bio-warriors.

CHEMICAL WARFARE AGENTS

These are chemicals that have direct toxic effects in humans, animals or plants. Potential chemical weapons for use in warfare are :–

1. Irritants - Tear gas, Sting gas
2. Vesicants - Mustard, Lewisite
3. Toxins - Cyanide
4. Pulmonary agents - Phosgene
5. Nerve Agents - Sarin, tabun, soman, VX

Protection from Chemical Warfare (CW):-

Primary prevention would include

(i) Education: - recognition of threat and timely response.

(ii) Specific protective measures - which are detailed in the following text.

(iii) Environment modification

(iv) Political will and strong global order that reject biological weapons development and its use.

Secondary prevention

- Early detection and prompt treatment of diseases.
- Epidemiological differentiation of emerging and re-emerging vs. biological threat.

Tertiary prevention

- Limitation of disability arising out of such biological & chemical attack.
- Rehabilitation.

Protection can be divided into three categories namely individual protection, collective protection and medical protection.

(a) Individual Protection

Inhalation of toxic chemicals is through nose, mouth or skin. If these are completely from contamination, individuals can function even in a contaminated environment albeit with reduced mobility and comfort. For individual protection gas mask with canister, protective (breathable/permeable) suits, boots, gloves etc are necessary.

(b) Collective Protection

For protection of large number of persons from the danger of ingress of toxic vapour shelters are used. Each shelter is fitted with filters to provide uncontaminated air for 30-35 personnel. This is also available indigenously.

(c) Medical Protection

In spite of known CW agents and their effect, antidotes (drugs are known only for nerve agents and hydrogen cyanide/cyanogens chloride/*cyanide. For nerve agents the treatment regimen involves injection of atropine (2 mg) with repeated doses at every 15 min in conjunction with PAM chloride injection by IV route (600 - 1000 mg). For hydrogen cyanide/cyanide/cyanogens chloride, the recommended antidote protocol is immediate administration of sodium nitrite (3% solu. 10 ml IV) and sodium thiosulphate (50 ml of 25% solution IV).

In the case of mustards, the eyes are bathed in a sterile physiological salt solution. For skin, the treatment is similar to burn injuries such as administration of saline, antibiotics and antibacterial lotions.

Decontamination

Decontamination is a process by which the toxic chemicals are rendered harmless. Decontamination can be done on body or clothes, environment, contaminated area and vehicles and equipment if any. All methods of decontamination are based on one or more of the following principles.

- Destruction of chemical groups responsible for toxicity or
- Removal of the chemical agent.
- Standard operating procedure in case of chemical attack

DO'S

- Cordon off the area (100 meter diameter)
- Find out the wind direction and clear the down wind side immediately at least upto 500 meter.
- Rescue team comprising of experts (medical doctors, nursing assistant, chemists, police personnel) to put on full protective gear.
- Wear decontamination suit and decontaminate the area using portable apparatus and decontamination solution.
- Simultaneously causalities should be decontaminated with decontamination powder as a first aid.
- Use causality bag to remove affected people for treatment/hospital.
- Drugs to be used if cyanides detected.

DON'T

- Don't crowd near the victim to avoid further contamination.
- Don't go in down wind direction.
- Don't get back into the cordoned off area till final clearance.
- Those who are in the rescue crew should not remove the protective suits until they are declared safe,
- Do not handle contaminated clothing and protective gear with bare hands - put these in sealed polythene cover for safe disposal later.

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