

CHAPTER 2

RECOGNITION

SECTION I - INTRODUCTION

201. Overview.

With current technology, it is likely that a BW attack will be completed before the local commander, or his or her medical advisor, is aware that it has taken place. The medical officer must attempt to distinguish between an epidemic of natural origin and a BW attack. Specific considerations include:

- a. Biological agents are likely to be delivered covertly.
- b. Sick individuals may be the initial indication that an attack has occurred. Distinguishing a BW attack from background endemic disease may be difficult under some circumstances. Mixed infections or intoxications may occur thereby complicating or delaying diagnosis.
- c. A large number of casualties may occur during a short period of time.
- d. In a given geographic area, both military and civilian casualties will occur.
- e. Targets may be large geographical areas or smaller, tactically important, objectives. The size of an area in which casualties occur can help narrow the list of likely agents. For example, certain biological agents, like toxins, can be used most effectively on smaller targets, while others can be disseminated efficiently over extremely large areas (for example, anthrax spores).
- f. Rapid detection and definitive identification of suspected BW agents are essential for tactical and political as well as medical purposes.
- g. Atmospheric conditions are critical to the effective use of biological agents. In general, the optimal time for use of BW weapons is during the late night and early morning. It is during these hours that inactivation of biological aerosols by ultra-violet radiation is minimal. In addition, neutral or inversion conditions are most likely to be present at these times. The phenomenon of atmospheric inversion best allows an agent cloud to travel along the land surface.

SECTION II - EPIDEMIOLOGY

202. Difficulties in Detection.

Human beings are a sensitive, and in some cases the only, biodetector. Early clinical findings may be nonspecific or atypical of the natural disease. Medical personnel maybe unable to differentiate natural disease from BW attacks. Considerable time may elapse following a BW attack before the extent of the exposure is appreciated.

203. Attack Indicators.

Following a BW attack, the disease pattern is likely to have characteristics that differ from those of a naturally-occurring epidemic.

- a. In contrast to naturally-occurring epidemics (excluding foodborne outbreaks) in which disease incidence increases over a period of weeks or months, the epidemic curve for most artificially-induced outbreaks is compressed, peaking within a few hours or days.
- b. In contrast to the peaks and troughs evident in most natural disease outbreaks, a steady and increasing stream of patients will be seen (comparable to that during a natural food poisoning outbreak).
- c. An understanding of disease ecology and epidemiology can be extremely useful in distinguishing natural outbreaks from those induced by biological weapons. For example, diseases which are naturally vector-borne will have environmental parameters which predispose to naturally occurring outbreaks. Appearance of disease in the absence of these parameters would be highly suggestive of a BW attack.
- d. Medical officers must maintain routine disease surveillance; emergence of an atypical pattern mandates immediate notification of higher authority. The simultaneous appearance of outbreaks in different geographical locations should alert commanders to the possibility of a biological agent attack. In addition, multiple agents may be used simultaneously in a BW attack, or chemical and biological agents may be combined in a single attack to confuse diagnosis.

204. Additional Attack Indicators.

Additional indicators of a BW attack include:

- a. A large number of casualties within the first 48-72 hours after the attack (suggesting an attack with a microorganism), or within minutes to hours (suggesting an attack with a toxin). The epidemiology would be that of a massive single source.
- b. A large number of clinical cases among exposed individuals (that is, a high attack rate).
- c. An illness type highly unusual for the geographic area (for example, Venezuelan equine encephalitis in Europe).
- d. An illness occurring in an unnatural epidemiological setting, where environmental parameters are not conducive to natural transmission (such as human Venezuelan equine encephalitis in the absence of antecedent disease in horses or in the absence of vector mosquitoes).
- e. An unusually high prevalence of respiratory involvement in diseases that, when acquired in nature, generally cause a non-pulmonary syndrome: the signature of aerosol exposure (for example, inhalation versus cutaneous anthrax; pneumonic versus bubonic plague; or, a primarily pneumonic versus enteric illness with staphylococcal enterotoxin (SEB)).
- f. Casualty distribution aligned with wind direction.
- g. Lower attack rates among those working indoors, especially in areas with filtered air

- or closed ventilation systems, than in those exposed outdoors.
- h. Increased numbers of sick or dead animals, often of different species. Most BW agents are capable of infecting/intoxicating a wide range of hosts.
 - i. Witness to an attack, or discovery of an appropriate delivery system (such as finding a contaminated bomblet or rocket from which an infectious agent is subsequently isolated and identified).
 - j. Large numbers of rapidly fatal cases, with few recognizable signs and symptoms, resulting from exposure to multiple lethal doses near the dissemination source.

SECTION III - SAMPLE COLLECTION

205. Diagnosis.

The accurate reporting of clinical findings may be critical in alerting other units to both the possibility and nature of a BW attack. Unfortunately, attempts to reach a firm diagnosis on clinical grounds alone may not be productive. Emerging technology will likely provide provisional diagnostic capabilities locally. However, establishing a definitive diagnosis will often require specialized laboratory facilities.

206. Environmental Sampling.

General policies for collecting samples in order to facilitate identification of biological agents are essential. Medical responsibilities normally are limited to collection and submission of diagnostic materials from patients; environmental sampling is an important element in corroborating the occurrence of a BW attack, but is the responsibility of other agencies. Success or failure in providing a timely medical response will depend upon the rapidity and accuracy of the diagnostic effort, together with the transmittal of timely information from those organizations involved in environmental sampling.

207. Sampling Principles.

General principles of the collection and processing of medical samples include the following:

a. *Specimen Collection.*

- (1) Blood culture with routine media will readily detect many bacterial agents, although specialized media may be required for some. Both aerobic and anaerobic cultures should be obtained routinely. Cultures and impression smears should be taken from involved lymph nodes, sputum, pleural fluid, cerebrospinal fluid (CSF), and spleen when possible.
- (2) Acute serum (at least 3 ml for suspected infectious agents, and at least 20 ml serum for suspected intoxications) should be collected as early as possible after onset of symptoms and shipped frozen to a reference laboratory. Blood samples also should be obtained from exposed persons who are not yet symptomatic. Convalescent sera from survivors and nonaffected unit members should be obtained 3-4 weeks later.

- (3) Samples for isolation of suspected viral agents should be obtained from organs and tissues as described above, and placed in specialized transport media and frozen for shipment to specified reference laboratories.
- (4) Tissue samples obtained at autopsy should be collected in multiple aliquots: minimally, one (25-50 gms) to freeze for microbiology or toxicology and one in formalin for histopathology should be obtained. Where possible additional specimens for specialized procedures such as immunofluorescence or polymerase chain reaction studies should be obtained. Organs sampled should include lung, mediastinal lymph nodes, spleen, and liver. Obvious lesions and adjacent normal tissue should be taken from affected areas in any organ. Postmortem blood (up to 20 ml) should be obtained and submitted as serum and clot or cells.

b. Specimen Labelling.

- (1) Each container should be labelled with name, numerical identities, type of specimen, and date of collection. Included should be a brief description of the illness and gross autopsy findings; place, date, and time of death; place, date, and time of collection; pathologists; and unit. Samples for microbiological or toxicological analysis should be kept as cold as possible, preferably frozen. Formalin-fixed material must not be frozen.
- (2) All serum samples should be completely labelled with patient's name, numerical identifier, unit, date, originating medical facility, and medical facility to receive results (if different from submitting facility). Routine laboratory slips should be included with each sample. Data on laboratory slips should include number of days since onset of symptoms and the reason that samples were obtained.
- (3) Clinical and operational data should be included for all samples, together with a form to establish chain of custody. This requirement must be strongly and clearly delineated since evidence may well be politically or militarily disputed.

c. Specimen Handling and Shipment.

- (1) All specimens from suspected BW casualties should be submitted through the routine diagnostic laboratory chain for processing. Samples must be clearly marked for special diagnostic testing, and chain-of-custody procedures maintained.
- (2) Serum should be contained in plastic screw-cap vials, which are securely sealed. If possible, each serum sample should be individually placed in a second plastic vial or zip-top bag to prevent leakage. All specimens should be contained in a metal shipping can or other secondary container. Sufficient absorbent material should be packed to prevent leakage outside the container. The entire contents should be placed in an insulated shipping container with cold packs or dry ice.
- (3) It is the responsibility of the laboratory officer, in concert with the physician, to ensure that suspect specimens are submitted correctly and expeditiously to an appropriate diagnostic laboratory.

SECTION IV - IDENTIFICATION OF SPECIFIC BW AGENTS

208. Identification Methods.

Methods of identification of BW agents include:

- a. Isolation of the etiologic agent by culture (possible in one to two days for some agents).
- b. Detection of toxin by mass spectroscopy, animal inoculation, or other methods.
- c. Antibody detection (specific immunoglobulin M (IgM) may appear within 3 days).
- d. Antigen detection via enzyme immunoassay or other sensitive assay methods.
- e. Genome detection employing DNA probes.
- f. Detection of metabolic products of the infectious or toxic agent in clinical specimens.

SECTION V - PSYCHOLOGICAL EFFECTS

209. Psychological Impact.

The term “biological warfare” may provoke feelings of horror; even if the direct effects of a recognized biological attack were slight, the psychological impact of this invisible, intangible threat could lead to panic and collapse of morale. There may be an accompanying loss of confidence in individual protective equipment and medical countermeasures, all of which may have serious repercussions on the military operation.

210. Effect on Individuals.

On the battlefield, there are many psychological pressures on the individual. Command, control, and communications will be made more difficult by the wearing of respirators. The psychological effect of biological attack on the individual and the unit must be considered in a full nuclear, biological, and chemical (NBC) context.

211. Psychological Operations.

Enemy saboteurs may be used as panic mongers for the purpose of spreading rumours of a biological attack. The effectiveness of such psychological operations would depend largely on the mental preparedness of the target populations. For operations in which biological warfare is considered possible, each case of illness on the battlefield could be attributed to a biological attack; even minor symptoms might be interpreted as the initial signs of an artificially-produced disease. Control of panic and misinformation thus assumes a significant role.

212. Countermeasures.

- a. An adequate appreciation of the threat, together with the implementation of defensive measures, will help to prevent panic. This can be achieved only by adequate preparation (for example, standard operating procedures) and by training prior to such an attack. Many positive defensive measures can be taken prior to, or in

- anticipation of, this contingency. Food chains and water sources should be protected. The control of rodents and insects should be a hygiene priority. Available biological detection equipment and decontamination equipment should be fielded. Soldiers must be trained in the proper use and rapid deployment of individual protective equipment (IPE). Attention to such preparatory measures will increase confidence and enable the BW threat to be met.
- b. Defensive measures should not be limited to the military population. Civilian populations are unlikely to have any form of specialized protective equipment. Moreover, civilian medical services do not routinely plan for biological warfare casualties. It is imperative that medical planning include coordination between military and civilian medical authorities in order to minimize casualties and prevent panic. As an initial step, such fundamental concepts as protection of food and water supplies, creation of rudimentary collective protection (colpro) shelters, and the effectiveness of hygiene and sanitation in an NBC environment might be introduced.