BIOTERRORISM AND PUBLIC HEALTH - PREPAREDNESS FOR IMMEDIATE ACTION
BIOTERORIZEM IN JAVNO ZDRAVJE - PRIPRAVA NA HITRI ODGOVOR

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Abstract

Work plans of the Council of EU for 2003-2008, and work plan 2005 of EU and Ministry of Health of the Republic of Republic Slovenia stress the need for preparedness for health threats. Different kinds of microorganisms and their natural toxins have been recognised as potential threats in event of bioterroristic attack. Most of them are rarely reported because of their nonspecific clinical features and complex laboratory confirmation. Some diseases are easily propagated from person to person, or from animals to humans, and some are not highly contagious. The degree of public health threat they represent depends on the level of awareness, knowledge and preparedness for a rapid response in different institutions, including health care settings.

Key words: bioterrorism, public health, microbiology, bacterial toxins, disease notification

Pregledni znanstveni članek
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Izvleček

Usmeritve Delovnega načrta Evropske skupnosti za obdobje 2003-2008 ter Delovnega načrta EU in Ministrstva za zdravje Republike Slovenije za leto 2005 narekujejo izboljšavo pripravljenosti na nenadne dogodke, ki lahko vplivajo na zdravje prebivalstva. Različne mikroorganizme ter njihove naravne toksine uvrščamo med morebitne agense napada. Večji del teh povzročiteljev redko zaznamo oz. o njih poročamo zaradi velikokrat nespecifične bolezenske slike ali zahtevne mikrobiološke laboratorijske diagnostike. Nekatere bolezni se hitro prenašajo od človeka na človeka ali z živali na človeka, druge pa ne sodijo med visoko nalezljive bolezni. Nevarnost za javno zdravje je odvisna od zavesti, znanja in pripravljenosti različnih služb, vključno z zdravstvom, za hitri odgovor na različno ogrožanje javnega zdravja.

Ključne besede: bioterorizem, javno zdravje, mikrobiologija, bakterijski toksini, prijave bolezni

Introduction

The European Parliament and the Council adopted a Decision establishing a programme of Community action in the field of public health, 2003-2008 (1). European Union (2) and Ministry of Health of the Republic of Slovenia (3) adopted working programmes for 2005. All the above mentioned documents give priority to rapid action-oriented response to public health threats.

One of the achievements of health care in the past century is easy access to preventive medicine, i.e. to immunisation, screening, health education and preventive treatment. At the same time, rapid progress in the development of biological weapons was notified (4). Last years, a large number of publications have been published all over the world dealing with health protection against bioterrorism.

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All the decisions taken should be professional and based upon proper medical evaluation and training of all services engaged in reducing the harm of biological attack. Prompt decisions and actions should be based on carefully prepared plans. Preventing general fear and panic is part of a rapid response to a potential attack. The response should be well coordinated between the government and various public health institutions.

Definition of biological weapon

World Health Organisation (WHO) defines biological weapons as ones whose intended target effects are due to the infectivity of disease-causing microorganisms (5).

Predictions

Nearly any infectious disease can occur as a result of biological attack. Some of them are transmitted via respiratory or alimentary route, or through contacts with contaminated environment or animals (6). Infections as a result of ingestion of contaminated food or water can be expected as well (7, 8). The onset of the disease can be abrupt, or progressive over several days or weeks, depending on the incubation time. Some diseases are propagated from person to person. Clinical presentation of infectious diseases varies largely, and depends on the kind of microorganisms used in biological terrorism attack (9, 10, 11).

Bioterrorist attacks usually create general panic in the affected region. As a result, victims of panic and those in need of medical care seek immediate medical attention in the nearest health care institutions. They mostly arrange for their own transport to the hospital rather than wait for the arrival of rescuers.

Measures should be taken to prevent the dissemination of infectious disease at the site of attack, in the nearby primary health care institutions and in the closest hospitals. Decontamination of casualties should be planned for all these settings. Security workers and medical personnel should be available to combat panic, solve traffic and telecommunication problems and meet needs for medical care. Safeguards and health care personnel should be protected against vaccine-preventable infectious diseases by immunization. If there is a high risk of some uncommon diseases, additional vaccination against emerging infectious diseases is required. Prophylactic medication is recommended for protection against diseases preventable by prophylactic treatment (12).

Emergency personnel should immediately locate and identify the contaminated area. They may have to act within minutes if lifes are to be saved. A covert release of a biological agent may not be noticed for days or even weeks, depending on the incubation period. The disease may spread to other parts of the country or world because of movement of victims during the symptom-free incubation period after the exposure.

Assessing the threats to public health

Many pathogens have been investigated for their potential use as biological weapons, but few have been found satisfactory candidates, and even fewer have actually been used. Biological agents listed as possible weapons for use against human beings by WHO (5), United Nations (13), NATO (4) and Australia group (14) include:

- *Bacillus anthracis,*
- *Brucella species,*
- *Burkholderia psuedomallei,*
- *Franciscella tularensis,*
- *Yersinia pestis,*
- *Coxiella burnetii,*
- *Rickettsia prowazeki,*
- *Rickettsia rickettsii,*
- *Tick-borne encephalitis,*
- *Dengue,*
- *Yellow fever,*
- *Eastern equine encephalitis,*
- *Chikungunya,*
- *Venezuelan equine encephalitis,*
- *Variola major (smallpox),*
- *Others*

The United Nations define bioterrorism as the unlawful use, or threatened use, of microorganisms or toxins derived from living organisms to produce death or disease in humans, animals, or plants.

Medical aspects

Various methods of disseminating biological agents are available. The most likely route of transmission, which poses the highest risk, is inhalation of microorganisms. Only few bioagents penetrate the skin, but many can enter the digestive system with contaminated food or drinking water. Infection may also be transmitted by a hand-mouth contact after touching contaminated surfaces.

Clinical presentation of diseases caused by biological attack is usually delayed, with exception of some toxins. A considerable interval may elapse between a biological attack and identification of the first cases of disease. The patients may present with atypical early clinical findings. Epidemiological investigation is required to determine symptoms of the disease, mode of microorganism transmission and source of infection[10]. Mixed infections or intoxications with two or more different pathogens are possible, and they are likely to complicate or delay the diagnosis.
Attack indicators are as follows:

- a disease pattern may differ from a naturally-occurring epidemics in a known geographic area;
- severe respiratory involvement;
- resistance of microorganisms to usually used antibiotics;
- occurrence of "old" or newly identified infectious diseases in regions where they occur very rarely or had been eradicated;
- increased numbers of sick or dead animals, witness to an attack, or discovery of an appropriate delivery system.

Incubation period

The interval between infection of an individual and the onset of symptoms depends on (15):

- the infecting microorganism;
- virulence of the particular strain of the causative agent;
- infecting dose and route of infection;
- host susceptibility.

The incubation period of pathogens ranges from several hours (food poisoning), to several days (plague) weeks (smallpox, Q-fever) or even months (anthrax) (16,17). The incubation period after the use of a toxin is usually shorter, i.e. from a few minutes to several hours for T-toxin, Staphylococcal toxin or castor oil.
During the incubation period, except just before the disease onset, the infected person is usually not able to transmit the disease to another person. Immediately upon the identification of a bioterrorist attack, decontamination of the contaminated environment should be started.

Notifiable diseases

Many infectious diseases (18) are notifiable under the public health regulations (Table 1).

Many diseases are likely to be caused by a biological attack. Local health care institutions and the Institute of Public Health of the Republic of Slovenia are responsible for infectious disease control in Slovenia. Doctors have to send reports on infectious diseases to the regional Institute of Public Health. Epidemiological investigations and control measures are required to limit the spread of infection. Data should be collected from a variety of sources with the aim provide effective disease surveillance, including the following activities:

- facilitating early identification of changes in disease patterns;
- identifying changes in environmental and host factors that may lead to an increase in the frequency of disease;
- monitoring the safety and effectiveness of preventive and control measures.

Epidemics

An epidemic is characterised by a temporary increase in the incidence of infectious disease. Most epidemics are public health emergencies and require prompt identification of infectious agent and effective control measures.
The course of an epidemic depends on the biological properties of the agent, on whether the environment is favourable to its survival and transmission, and on the immunity of the host population. Epidemics are most commonly caused by microbials, but may also be due to bacterial toxins or chemical poisoning.
There are two main types of epidemics:

- common source,
- propagated.

Both of them can occur as a result of a biological attack.

International assistance

According to the WHO most countries can make a major contribution to the preparedness for deliberate release of biological agents by strengthening public health infrastructure, particularly public health surveillance and response. International assistance is of primary importance and falls into the following categories:

- application of international law;
- medical and other assistance;
- practical protection (provision of equipment, and of material, scientific and technical information).

Table 1. *Notifiable infectious diseases in Slovenia.*
Tabela 1. *Infekcijske bolezni, ki jih je treba v Sloveniji obvezno prijaviti.*

AIDS/HIV	Lambliasis / Lamblioza	Paratyphoid fever / Paratifus
Anthrax / Vranični prisad	Legionelosis / Legioneloza	Poliomyelitis / Poliomielitis
Botulismus / Botulizem	Leptospirosis / Leptospiroza	Psittacosis / Psitakoza
Brucellosis / Bruceloza	Lyme disease / borelioza Lymska	Rabies / Steklina
Cholera / Kolera	Malaria / Malarija	Relapsing fever / Povratna mrzlica
Diphtheria / Davica	Malleus / Smrkavost	Rubella / Rdečke
Dysentery (amebic and bacillary) / Griža (povzročitelj: ameba ali bakterije)	Measles / Ošpice	Scarlat fever / Škrlatinka
Echinococcosis / Ehinokokoza	Meningitis / Meningitis	Tetanus / Tetanus
Encephalitis / Encefalitis	Meningococcal septicaemia / Meningokokna sepsa	Tuberculosis / Tuberkoloza
Enterobiasis / Enterbioza	Microsporiasis / Mikrosporija	Tularemia / Tularemija
Enterocolitis / Enterokolitis	Mononucleosis infectiosa / Infekcijska mononukleoza	Typhus abdominalis / Trebušni tifus
Febris haemorrhagica virosa / Hemoragična mrzlica	Mumps / Mumps	Viral haemorrhagic fever / Hemoragična mrzlica
Febris Q / Vročica Q	Morbilli / Ošpice	Viral hepatitises / virusni hepatitis
Gonorrhea / Gonoreja	Morbus Brill-Zinsser / Brill-Zinserjeva bolezen	Whooping cough / Oslovski kašelj
Influenza / Influenca	Pertussis / Oslovski kašelj	Yellow fever / Rumena mrzlica
	Plague / Kuga	Some others / nekatere druge bolezni

The United Nations with various agencies or related organizations will advise and assist national governments in developing and maintaining global defense against biological weapons (13).

Preventive measures

A rapid and coordinated action will be necessary to identify the cause and to institute effective control measures (19).
First responders to an attack with toxic substances or biological weapons with *prompt effects* will most likely be police and fire department personnel, while first responders to an initially undetected attack with an infective agent, or with a toxic agent with *delayed effects*, will more likely be health care personnel.

Protection measures for first responders include:
- impermeable surgical gowns;
- oral-nasal masks;
- face shields or goggles;
- vaccination;
- preventive medication.

Separation of contaminated victims of bioattack and implementation of barrier nursing procedures should be initiated immediately.
Preventive treatment and vaccination should follow laboratory confirmation of causative agent.

Conclusion

There is a need for intensified activities in the field of protection and defence against bioterorrism on the

national level. Slovenia can participate with the knowledge and experience of civil defence experts, Red Cross, microbiological laboratories, and public health workers from government ministries and public health institutions. National action plan will be designed in accordance with the WHO, EU and the United Nations directions.

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