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Strategies of Preparedness against the Threat of Biological Warfare and Bioterrorism in South-East Asia

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Abstract: Risks associated with deliberate use of biological agents to harm human health and the need for a strong public health system are well recognized. In spite of infrequent occurrences of such episodes, the potential use of selected biological agents, with or without genetic alterations, is mounting everyday especially with growing political dissidence as well as religious and resource conflicts in several countries. Countries in the South-East Asia Region of WHO have considerable vulnerability because of dense susceptible populations, poverty, inadequate response capacity and large number of outfits having continuous low intensity conflicts with the established administrative system. Though the high prevalence of communicable diseases and frequent epidemics have stimulated national health authorities to strengthen their early recognition and response systems; these may not be adequate to combat a deliberate onslaught with biological agents. WHO has been sensitizing the countries with the need to integrate preparedness against biological weapons in their national disaster preparedness plans as well as strengthen their core competences in early detection of biological agents, mounting a quick response; strengthening public health and case management infrastructure; creating mechanism for risk communication and forging strong collaborations with other national agencies namely intelligence, defense sector and police.

Introduction

Poisons and pathogenic microorganisms are among the natural health hazards with which human beings are obliged to coexist. Difficult to perceive and therefore to avoid, they present a threat that is both insidious and damaging or deadly. Historically, the codes of professional behaviour adopted by the military that forbid the use of poison and microorganisms may be regarded as a part of the same social adaptation.

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From the Manu Laws of India to the Saracen code of warfare based on the Koran, the Lieber Code of 1863 in the United States and the 1925 Geneva Protocol, this taboo seems widespread and ancient.[1] In the recent past there has been much fear of deliberate use of microorganisms as weapons of mass destruction (biological weapons) either by states or by individual terrorists,[2] though such instances have been fortunately rare.[3]

Most recently, and in the aftermath of 9/11, letters containing *Bacillus anthracis* spores were distributed in the United States postal system. The dissemination of anthrax spores through the United States postal system in 2001, killing five people, has now further increased fears of deliberate use of biological agents and need to accord response priority to this mode of harming human health.[4] The deliberate use of biologicals has significant potential for not only damaging the human health but also causing mass panic and public hysteria. The threat is real and must be faced by the global community.

In comparison to nuclear and chemical weapons, biological weapons require relatively less complex technology to convert widely available raw material and require an infinitesimally low cost (see Table 1).

Theoretically speaking, biological agents are ideal agents to be used as weapons of mass destruction.[5] However, all microbes cannot be used as weapons. Several characteristics are required to make an organism an ideal biological agent that can be used as a potential weapon of mass destruction or bioterrorism. These pertain to virulence, infectivity, lethality, ease of production, stability in environmental conditions, and post-dissemination retention of features, availability of a susceptible population and lack or inadequacy of tools to prevent or treat the disease. While many thousands of toxic chemicals and hundreds of pathogenic microorganisms have been investigated for their potential utility as military weapons, relatively few, around 40, have been found capable of meeting military requirements of the kind just specified,

Table 1: Comparisons of weapons' potentials for mass destruction

	Nuclear	Chemical	Biological
Complexity of technology	High	Moderate	Moderate
Difficult to acquire raw material in adequate quantities and quality	High	Moderate	Minimal
Cost	High	Moderate	Moderate

and fewer still have been documented to have been weaponized.[6] The Centres for Disease Control and Prevention (CDCP)[7], USA have further characterized these into three categories depending upon their suitability for use as bioweapons (see Table 2).

Implications of Deliberate use of Biological Agents

Only a few years ago, an attack with a biological agent would have been considered almost unthinkable. Today however, the threat of bioterrorism is real and growing.[8] Weaponization of biological agents for aerosol dispersal is difficult and has often proved to be the rate-limiting step for a successful attack. Although some feel that a successful biological attack is unlikely even though it is still feasible there is no doubt that if it happens the consequences could be great.[9] In considering strategies for national preparedness against such attacks the possibility of a low-probability catastrophic outcome must be weighed against that of public health hazards of higher probability but smaller magnitude. It would certainly be irresponsible to disregard the possible effects of deliberately released biological agents, but it would be prudent

Table 2: CDCP Classification of agents which can be used as bioweapons

Category	Characteristics	Organism/disease
A	• Easily disseminated • High mortality • Major public health impact • Cause public panic and social disruption • Require special action for Public Health preparedness	• Smallpox • Anthrax • Plague • Botulinum • Tularaemia • Haemorrhagic viruses
B	• Moderately easy to disseminate • Moderate morbidity • Low mortality	• *Coxiella burnetti* • *Brucella* species • *Burkholderia mallei* • Epsilon toxin (*Cl perfringens)* • *Staphylococcus* enterotoxin B • Food or waterborne agents (*Salmonella, Shigella, etc)*
C	Emerging pathogens that could be engineered for mass dissemination	• Nipah virus • Hantaviruses • Tickborne hemorrhagic fever viruses • Tickborne encephalitis virus • Yellow fever virus • Multidrug-resistant *M. tuberculosis*

Source: Porche 2002.

not to overestimate them. Given the emotional shock of even an alleged threat of a biological release, it is considered wise to plan for such dangers, should they occur, as an integral part of the national response.

If biological agents are used to cause diseases that are not endemic in the country attacked, this may result in the disease becoming endemic, either in human populations, or in suitable vectors such as arthropods and other non-human hosts, such as rodents, birds, equids or cattle. Spores of *Bacillus anthracis* are highly resistant to environmental degradation, and can persist, particularly in soil, for long periods. By infecting and reproducing in animals, they can establish new foci. Microbes causing gastrointestinal infections in humans such as species of *Salmonella* and *Shigella* can establish persistent reservoirs. *Salmonella* strains can do likewise in domestic animals. A particular concern would be that a deliberate release of *variola* for hostile purposes could cause a resurgence of smallpox that was finally eradicated from natural occurrence in the 1970s bringing a special benefit to developing countries.[10]

The biological weapons can create considerable panic amongst the general public. This, in many instances, is the primary aim of the user of these weapons. Extensive morbidity and mortality may not be possible with those agents and with the limited expertise that are available to small terrorist groups. However, their actions, fuelled by the local media, can cause severe psychological implications for the public (see Table 3).

Several countries have the triple burden of communicable diseases. Most of the infectious diseases are endemic. Some old and hitherto considered vanquished have reemerged and many new infections continue to appear. The countries with a backdrop of this spectrum of infectious diseases find it enormously difficult to differentiate between naturally occurring diseases or those that have

Table 3: Psychological implications of biological weapons

- Horror
- Anger
- Panic
- Fear of invisible agents
- Anger at terrorist, government or both
- Attribution of arousal symptoms to infection
- Paranoia
- Social isolation
- Demoralization
- Loss of faith in social institution

been deliberately inflicted. The countries[11] of South-East Asia Region (SEAR) belong to this category of nations.

Impact of Modern Technology on Biological Weapons

The modern genetic modification techniques offer possibilities for producing new biological-warfare agents. The accessibility of biological agents on a militarily significant scale has been substantially increased by advances in industrial microbiology and its greater use throughout the world.

New knowledge in the life sciences is now accumulating so rapidly that major changes in the nature, accessibility or efficacy of biological weapons may already be possible. Increasing concern pertains to certain emerging nonmilitary technologies that are emerging from research advances in new science and which are being disseminated throughout the world. Some of these technologies, and notably biotechnology, are dual use technologies that are applicable to biological and chemical warfare. In fact, as the old armament imperatives of the Cold War recede, the threat may not be decreasing; but it is unfortunately true that the duality of the new science is making the threat seem larger.

The advent of genetic engineering offers opportunities for the improvement of human health and nutrition, yet in principle it could also be used to produce novel and perhaps more aggressive biological agents and toxins as compared with those used in earlier bioweapons programmes. Ability to modify more or less at wil,l the genetic properties of living organisms could allow the insertion of new heritable characteristics into microorganisms that make them more virulent or pathogenic and resistant to available defences; more difficult to detect by routine assays; and better able to withstand the stresses of an unnatural environment. Experience shows that other necessary characteristics of the microorganism are likely to be lost; but perhaps not invariably so.

Genetic engineering also offers the possibility of making accessible toxic substances that have hitherto been available in quantities far too small for hostile use. For example, the fact that recombinant technology has been used to insert genes for a number of non-microbial toxins into microorganisms, leading to toxin expression, could enable those toxins to be produced on a large scale.[12] Moreover, new vaccines and biological agents can be developed with new technology against bioweapons.[13]

Potential Risk and Vulnerability of South-East Asia Region

Infectious diseases have always been closely interwoven with the history of developing countries which are ideal sites for emergence and propagation of infectious diseases. In spite of considerable success in control of communicable diseases, recent epidemics of SARS and avian influenza, have amply demonstrated the vulnerability of the Asian countries to the threat of the biological agents. It is well recognized that given the confluence of the existing environmental, socioeconomic and demographic situation, Asia shall be the most likely epicentre of any future pandemic due to a known, genetically modified or unknown microbe. The occurrence of outbreaks-naturally occurring or deliberately caused creates far greater impact in the developing world as compared to the developed countries.

Eleven countries of SEAR cover only 5 per cent of the global land mass but is home to 25 per cent of the of world's population. In Bangladesh and the Maldives almost 1000 people occupy one square kilometre of land. The increased density of population carries increased potential for person-to-person disease spread. More people virtually guarantee extensive urbanization. By 2015, there will be 23 megacities in the world with populations exceeding 10 million each of which seven shall be from SEAR. Availability of a large number of target people in the South-East Asia Region augments the perceived damage due to biological weapons and heightens the vulnerability of this Region.

Poverty breeds ill health and ill health in turn breeds poverty. Poverty remains the number one killer. Today, poverty amidst plenty is the world's greatest challenge. More than 522 million people in South-East Asia Region are living in abject poverty with an income of less than a dollar a day. The impact of any deliberate use of biologicals shall get amplified because of the inherent inability of the vulnerable population to acquire prophylactic or therapeutic services.

The differences in political views and ideas within a country can at times lead to use of biological agents to cause harm to human health, create panic in communities and in the process tarnish the image of the governments. The ease of production of the biological agents and the scale of economics make these attractive tools to terrorize populations and arouse public opinion against the administration.

The sudden appearance of any infectious disease in communities threatens to disrupt the health care system. Conversely, a strong health system is a prerequisite for effectively combating such infectious diseases.

Left unchecked, unknown and unexpected biological agents can assume a pandemic proportion causing social and economic disruption and ultimately become endemic. The capacity of the public health systems in countries of the South-East Asia Region is usually overwhelmed by the series of outbreaks of communicable diseases which continue to occur at regular frequency.

A well functioning public health infrastructure can minimize the impact of any infectious disease, including deliberately inflicted agents of infectious diseases. Weak public health surveillance and outbreak investigation machinery can result in a rapid spread of infection and massive epidemics. The occurrence of epidemics is an indicator of weakness of the public health system. An efficient public health system not only quickly detects, and responds to the epidemic during its initial phase but also is sensitive and sophisticated enough to spot a new or hitherto unidentified infection. Achieving an effectively functioning public health infrastructure is thwarted by inadequate funding and low priority by the national governments. The health systems come under considerable stress at times of natural calamities and upheavals and crumble most of the times. The extraordinary burden of communicable diseases in the SEAR countries requires considerable augmentation in response capacity.

Infectious diseases continue to be a major challenge in SEAR. They are estimated to be responsible for about 40 per cent of the 14 million deaths annually in the Region and account for 28% of the global burden of infectious diseases. The South-East Asia Region accounts for 89 million of the 350 million Disability Adjusted Life Years (DALYs) that are lost due to communicable diseases globally. The Region has witnessed several outbreaks of new and emerging infections as new microorganisms continue to appear and some of the existing ones alter their characteristics to promote their survival at the expense of human health. Japanese encephalitis, Chandipora virus, Nipah virus and leptospirosis are examples of emerging infectious diseases that appeared a few years back and that have now established endemicity. SARS created considerable panic in the SEA Region during 2003; and during 2004-2005, the highly pathogenic avian influenza had a similar impact. These infections are gradually and steadily progressing to conquer newer areas and populations. Deliberate use of biological agents can, apart from an immediate catastrophe, establish endemicity of another epidemic-prone disease in these countries.

Existing Response Capacity in Health Sector

The health sector forms an essential part of the intersectoral system for disaster preparedness and response. Its organization and response mechanisms need careful planning, and should take into account the vulnerability of a country or a specific region, health policies and legislation on disasters, and the administrative and technical organization of the health sector's institutions.

Asia, considered a cradle for the emergence of some new infections, also has Centres of Excellence for training and research on emerging infectious diseases and some of the finest WHO Collaborating Centres. It has a vibrant pharmaceutical sector with a significant capacity to manufacture drugs and vaccines. The countries are working towards a strategy for integrated disease surveillance and response. In addition, there are public health institutions with a capacity to investigate and control infectious disease outbreaks and provide appropriate human resource development through field epidemiology training programmes to upgrade the skills of public health professionals.

All countries have public health institutions that respond to outbreak investigations and the institution of control measures. Any attack due to biological weapons is also handled by the same institutes. In the initial phase it may be very difficult to differentiate between naturally occurring outbreaks and those caused by the deliberate use of microorganisms; and though there is a need to improve the efficacy and efficiency of the response mechanism, the basic infrastructure for the same has been created. Rapid response teams have been constituted in some countries to quickly initiate action in times of outbreaks.

Global alert and response systems have also been created which countries from this Region are benefiting from. In 2000, WHO launched the Global Outbreak Alert and Response Network (GOARN) which links more than 130 networks, institutes and experts to provide support to countries on behalf of the international community in responding to disease outbreaks. Health Canada has instituted a Global Public Health Intelligence Network (GPHIN) which is a customized search engine that continuously scans the internet for rumours and reports. Data from GPHIN is available to WHO as well as to all countries for early detection of outbreaks — natural or deliberately caused, and for the initiation of rapid response. Advanced information technology was successfully used by WHO during the SARS epidemic to create virtual networks of experts and institutions to gather and consolidate global experiences and

knowledge in fighting SARS. GOARN made a noteworthy contribution to communicable disease response during the Asian Tsunami which struck several countries on 26 December 2004.

Upgradation of skills of public health professionals has been an ongoing process. Field epidemiology training programmes are being regularly conducted in India and Thailand for all countries of WHOs South-East Asia Region. Almost 40 WHO Collaborating Centres are currently operational in the area of communicable diseases in this region.

Globally, networks of the laboratories are being forged to combat threats of biological weapons.[14] There is also a growing realization that emerging diseases can be better fought collectively. The existing regional organizations such as SAARC and ASEAN, initiated with the central objective of economic cooperation between countries, are now being utilized to extend collaboration in public health as well.

Implementation of the revised International Health Regulations (IHR) is likely to commence from 1 January 2006. The IHR shall facilitate containment of the international spread of emerging infectious diseases with minimal disruption in the trade and human activities across borders. Even with extensive advocacy and preparations, the commitment and capacity of countries to combat emerging infectious diseases in the developing countries requires considerable strengthening.

State of Preparedness against Deliberate use of Biological Agents

Disaster planning is an arduous task. Perhaps no form of disaster is more difficult to prepare for than one resulting from the intentional, covert release of a biological pathogen or toxin. The complexities of response operations and the perils of inadequate preparation cannot be overemphasized. Even with detailed planning, deviations from anticipated emergency operations plans are likely to occur.[15] The basic management plans to take care of the disasters are in place in most of the countries of the SEA Region but a biological weapons related disaster management plan is not generally part of this plan (see Table 4). This means that the magnitude of the effects of biological weapons emergencies has not yet been understood by policy-makers of the majority of the Member Countries. Moreover, all disaster plans will only be of practical use if they are backed by funds without which none of the requirements for meeting the biological weapons emergencies will be met.

Table 4: Status of Emergency Preparedness in SEAR[16]

Topic	BAN	BHU	IND	INO	MMR	NEP	SRL	THA	TLE
General									
1. National Disaster plan	+	+	+	+	+	-	-	+	+
2. National BCR Emergency plan	-	-	+	-	+	-	-	±	-
3. State / District BCR Emergency Plan	-	-	-	-	-	-	-	+	-
4. Funds for BCR Plan	-	-	-	-	-	-	-	+	-
Biological Emergency									
1. Legislation	-	-	-	-	±	NA	-	±	±
2. Incidents	+	-	-	-	-	-	-	-	-
3. Facilities /Equipment	±	-	+	±	±	±	±	±	±
4. Safety and Security (BSL-3/BSL-4)	-	-	-	-	-	-	-	+	-
5. International Assistance	±	-	+	+	NA	+	-	-	+

Keys:+= Definitely Yes; - = Definitely No; ±= Yes /No; NA= No answer

Another distressing fact is that even though disaster plans are made there is no preparedness action plan at the lower administrative level in most of the countries. This means that presently, biological weapons emergencies are generally being met on an *ad hoc* basis only in most of the countries except for Thailand where medical and public health preparedness and bioterrorism preparedness plans were already present to respond to biological emergencies. These plans are multisectoral. In addition to the plans being operated from the Federal Government there are agencies in the provinces and at local levels that are prepared for such emergencies. According to the Thailand experience, training, making available drugs and medical supplies, establishment of rapid response teams, proper coordination of different agencies and providing correct and authentic information to the public are the key elements for a successful programme.

The deliberate use of biological agents of any kind has the potential to overwhelm a community, and at times, the whole nation. During such an attack the number of patients requiring hospitalization and critical care is likely to be enormous. Physicians will be at the forefront and will have to play an important role in dealing with the influx of patients and will require extensive training and back-up of adequate and specific drugs and equipment.[17] It is crucial to develop realistic strategies for a bioterrorism event for the process of health care

prioritization (triage planning) for efficient use of resources under compelling health care demands.[18]

Occurrence of biological weapons emergencies could be reduced through proper legislation to control and regulate activities related to radiation sources, and toxic chemical and pathogenic organisms. A national registry of the existing biological weapons elements and sources needs to be prepared and proper precautionary measures taken to safeguard from both accident and theft. Unfortunately, whilst such regulatory mechanisms generally do exist for chemical and radiological sources, legislation and regulation for biological agents remain inadequate.[19]

Skilled health officials and health infrastructure play key roles for handling Biological, Chemical and Radionuclear (BCR) emergencies. Though there are hospitals to take care of such patients in countries of the South-East Asia Region, the training of physicians to respond to BCR emergencies seems to be inadequate.

There is general awareness amongst the Member Countries of the existence of international agencies that will take care of biological weapons emergencies. This networking needs to be further strengthened.

Routine sensitive and near-real-time disease-surveillance systems are thus essential in both disease outbreaks and those caused by biological agents. Such systems should be in place well in advance of an attack, so that the background disease prevalence in the area concerned is known. The performance of a surveillance system in terms of the timeliness of its response to naturally occurring outbreaks of disease provides an indication of its probable contribution during deliberately caused outbreaks.

Development of national preparedness and emerging responses to biological agents is dependent upon the rapidity of intervention by trained group of professionals comprising of microbiologists, physicians, psychologists, hospital staff and law enforcing agencies.[20] Investing in public health surveillance helps enhance domestic preparedness in dealing with bioterrorism, emerging diseases and foodborne infections.

If it is to have any chance of success, a plan for providing information to the public and thus demystifying the subject of biological and chemical weapons needs to be drawn up well before an incident occurs. If this is to be effective, the public needs to know how they are expected to act if an attack takes place, long before any such attack occurs. The communication plan may include radio and television

broadcasts, or the distribution of brochures to the public describing the potential threat in plain, unemotional language. Clear advice should be given on how the alarm will be raised, and what to do if that happens. A well-constructed media plan is essential, both as part of the pre-incident education process, and to avoid overreaction after an incident. It must contain explicit and exhaustive instructions on channels of communication and clearance procedures for potentially sensitive information. Of course, any public preparedness or information programme needs to be evaluated in the context of the specific local circumstances, including the possibility that too much information may be counterproductive, or even dangerous.

Strategies to Combat Deliberate use of Biological Agents to harm Human Health

Four strategic elements that are needed to strengthen the response to deliberate use of biological agents to harm human health are namely:

a. Preparedness and rapid response
b. Public health infrastructure
c. Risk communication
d. Partnership

a. Preparedness and Rapid Response

Surveillance in its simplest form is collection of information for action. A disease or an event under surveillance is first picked up by the health care system which reports it to the public health authority for interpretation and initiating action. The conceptual framework for surveillance and response system for deliberate use of biological agents is essentially the same as that for any other communicable diseases. However, in several developing countries implementation of this framework is hampered by several deficiencies. Prominent among these are inadequacies in data collection and capacity for its analysis by health care workers; weak feedback mechanism and inadequate public health laboratory support system. Implementation of the Integrated Disease Surveillance Programme as advocated by WHO and increasing use of information technology in health management information systems in countries of the region are steps in the right direction in improving surveillance. Combating deliberate use of biological agents should be an integral part of any National Disaster Preparedness Plan.

Implementation of a national plan requires strengthening of capacity, development of infrastructure and availability of qualified

and trained human resources. The capacity needs to be built or enhanced for scaling–up of the known interventions, and for application of newly-discovered technologies and solutions once these have been assessed to be useful in field conditions.

The objectives should include strengthening of routine in-country surveillance for unusual infectious diseases; enhancing detection of outbreaks by the development of early warning systems, and forging strong surveillance networks to facilitate flow of information and initiation of appropriate action.

The capacity of the health systems to detect early warning signals should be created and frequently tested. In most instances, the initial few cases of any disease caused by biological weapons are often detected by the clinician whereas an unusual or new pathogen can be detected by an alert and efficient laboratory. Therefore, an astute clinician or a laboratory technician is able to identify a cluster of cases of similar nature. The clinicians should, however, have knowledge and skills to access the public health systems in order to alert it to investigate and institute appropriate control measure. This process needs to be institutionalized. More often than not, clinical and public health services tend to operate independent of one another even though the reality is that both are intensely interdependent.

Response to deliberate use of biological agents warrants extensive planning and a continuous state of preparedness. Priority actions to improve response include development of contingency plans, better mechanism for coordination between various agencies/institutions preferably through a designated focal institute, much greater surge capacity[21] at regional and national levels including capability to quickly put together trained rapid response teams, strengthened laboratory capacity and systems for information technology. The revised International Health Regulations emphasize the strengthening of core competencies of countries in these areas.

Mechanisms to implement revised International Health Regulations that provide a powerful tool for harmonizing public health action amongst various countries and a framework for the notification, identification and response to public health emergencies of international concern should be established. Existing infrastructure should be strengthened and new multidisciplinary infrastructure created with expertise and skills in different specialties such as epidemiology, virology, entomology, mammology, clinical medicine, and

biotechnology. Centres of excellence for emerging infections should be identified and charged with undertaking continuous population-based studies, collating information from various centres and investigating outbreaks of emerging infectious diseases in addition to augmenting national capacity, and imparting training to various levels of healthcare workers.

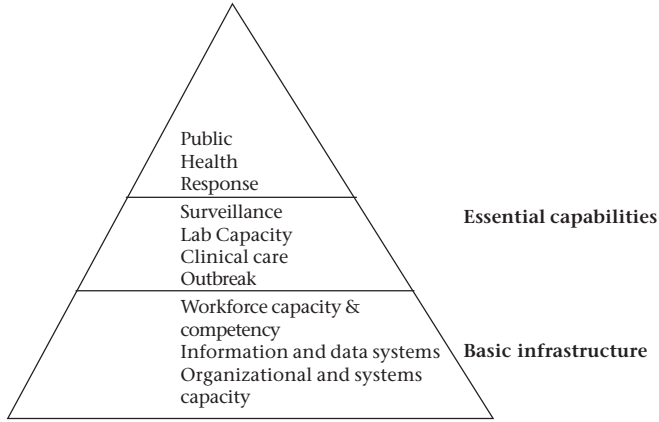
An attack by a biological agent shall also require specific clinical care services. It is expected that these services will be overwhelmed especially during the initial phase of the outbreak. Apart from logistics and training of healthcare workers to handle such unprecedented crisis, infrastructure for quarantine and efficient infection control practices shall play a critical role in mitigating the initial impact.

b. Public Health Infrastructure including Laboratory Capacity

Public health infrastructure is the backbone of any efficient public health activity. It consists of people who work in the field of public health, epidemiology, entomology, environmental hygiene, infection control, laboratories and information and communication specialists at provincial, state and national levels (see Figure 1).

The institutions, human resource, equipment and technologies as well as quality assurance of the activities should be developed and strengthened in such a way that all contribute efficiently to achieve the objectives of combating biological weapons. These would include public health laboratories for identification and molecular

Figure 1: Public Health Infrastructure



characterization of causative agents, development, appropriate use and availability of diagnostic tests and reagents; cooperation from informed communities, and use of modern communication and information technology.

Accurate and timely laboratory analysis is critical for identifying, tracking and limiting public health threats. An efficient national network of public health laboratories strengthens the health system and augments its capability to respond effectively to the needs of public health. Similarly, microbial agents' surveillance should utilize modern computing and communication technologies to transform data into useable information quickly and effectively. Accurate and efficient data transfer with rapid notification of key partners and constituents is critical to effectively address the threats of biological agents. New statistical and mathematical models as well as geographical information systems that make use of satellite imagery can yield valuable information.

A network of public health laboratories should be created with strong linkages between various laboratories. Facilities for virological diagnosis should be established in a large number of laboratories with adequate biosafety containment measures at different defined laboratory safety levels (e.g. Biosafety levels 1 to 4) appropriate to the class of organisms to be handled. The expertise and infrastructure already available within the countries in different sectors must be harnessed especially from the veterinary sciences, universities, medical colleges and research institutes.

National authorities should designate and strengthen national reference laboratories with linkages to WHO Collaborating Centres to create competence in molecular epidemiology and to promote its use in detection and monitoring of emerging infectious diseases. It is equally important to promote development, availability and appropriate use of diagnostic tests and reagents.

c. Risk Communication

Risk communication is an interactive process of exchange of information and opinion amongst individuals, groups and institutions with the overarching principle of rapidly containing a crisis with as little social, economic and political disruption as possible. It is aimed at combating irrational fear, hysteria and panic that may lead to huge economic and social disruption and to the antagonization of public health activities for containment of deliberate use of biological agents.

The objectives of risk communication are two-fold: (1) to ease public concern by informing the public about the risk, the treatment, the transmission dynamics and clinical features; and (2) to make the public aware of actions that need to be initiated by people themselves for their own benefit as well as for cutting short the transmission of infection.

The risk communication targets the general public as well as the mass media, the latter being informed to facilitate wide dissemination of appropriate messages. A strong partnership with the mass media should be forged to reach out to the wider section of people in the shortest time. Communication technologies when used effectively can amplify the available resources and accelerate progress in both the generation and dissemination of knowledge.

The essence of risk communication is to:

- Deliver messages that inform without frightening and educate without provoking alarm.
- Assist public officials through sound and thoughtful risk communication in preventing ineffective, fear-driven, and potentially damaging public responses to serious crises such as the outbreak of an unusual infection.
- Foster through appropriate risk communication trust and confidence that are vital in a crisis situation.

d. Partnership building

Prevention and control of natural or deliberately caused outbreaks of infectious diseases is the responsibility of national governments. This cannot be delegated to any other agency or organization. At the same time efficient programme management can be implemented only if there is a strong political will and commitment, adequate financial and human resources as well as productive partnership with different sectors. The goal can be achieved through strong infrastructure, competent and skilled human resource and an efficient inter-sectoral partnership.

Unlike other scientific areas, combating biological agents requires strong inputs from intelligence agencies, the police and defense establishments. The network of intelligence agencies maintains surveillance on those elements that are likely to act against the interest of the public and the state. The defense establishments specialize in detection methodologies and in the development of tools to counteract

the effect of biological agents. A strong collaboration with these agencies helps assist health authorities in strengthening their state of preparedness.

The collaboration between governmental agencies is easier and feasible. It becomes challenging when the private sector and mass media are to be roped in. These are essential players in any endeavour to tackle emerging infectious diseases. The mass media enjoys immense power over the communities through its inherent strength of providing information. The private sector has an extensive reach. Both are critical partners.

A thorough review of the public health infrastructure is warranted to create a new comprehensive national plan to develop and apply established standards for public health infrastructure. A national commitment and nationally coordinated efforts are, therefore, necessary. In most countries the public health system is fragmented and a renewed commitment to national approach is needed. Planning needs to be strategic and not reactive for emerging infectious diseases because no one knows what new biological agent will emerge, where and how. Hence, the public health system must be prepared for the unexpected.

WHO response to deliberate use of biological agents

On 21 May 2001 the Fifty-fourth World Health Assembly, in resolution WHA54.14 requested the Director-General "to provide technical support to Member States for developing or strengthening preparedness and response activities against risks posed by biological agents, as an integral part of their emergency management programmes". A year later on May 18, and through resolution WHA55.16, the Assembly requested the Director-General "to continue to issue international guidance and technical information on recommended public health measures to combat deliberate use of biological agents.

The specific advices that the WHO has been providing since then includes strengthening public health surveillance and response activities, with an emphasis on:

1. More effective national surveillance of outbreaks of illness;
2. Better communication between responsible agencies (for public health, water supply, food safety, veterinary, radiological, nuclear safety, poison-control and related services) and better coordination of their responses;

3. Improved assessments of vulnerability, and effective communication about risks to both professionals and the public;
4. Preparation for handling the psychosocial consequences of the deliberate use of pathogens and chemicals to cause harm; and
5. Contingency plans for an enhanced response capacity (with the ability to enlist additional resources for public health, clinical management, civil defence, security, law-enforcement authorities and other bodies, and the preparedness to work together, spelt out through cooperative agreements).

The WHO's guidance to countries on strengthening national preparedness and effective responses is set out in the document "Public health response to biological and chemical weapons: WHO guidance".[22]

The objective of emergency preparedness is to ensure that appropriate systems, procedures, and resources are in place to provide prompt, effective assistance to the victims, thus facilitating relief measures and rehabilitation services. Emergency preparedness is an ongoing, multisectoral activity that forms an integral part of the national system responsible for development plans and programmes for disaster management including prevention, mitigation, preparedness, response, rehabilitation, or reconstruction.[23]

The South-East Asia Regional Office has set up a Coordination Committee to address BCR incidents. The BCR Committee meets on a regular basis to review the current status and to initiate/propose actions. An intercountry meeting organized in 2003 assessed the present status of preparedness and, through sharing of experiences and information, the augmentation of the existing structure to meet biological weapons related emergencies. The experts in the meeting put together several recommendations for the Member States and for the WHO pertaining to policy, managerial and operational areas. The WHO has given support to these recommendations which urge Member States to incorporate elements to combat biological weapons within the existing emergency health plans and to allocate necessary resources from their national budgets for public health preparedness and response.

At the managerial level, it was suggested that:

- Threat assessment should be adopted as a tool to establish requirements and to prioritize programmes;
- An inventory of all BCR sources/elements and all existing national BCR public health capabilities should be prepared;

- Capacity building of relevant agencies such as epidemiologists, clinicians and laboratories, should be established, and that,
- Augmented and enhanced risk communication strategies, particularly for the media and the general public, should be addressed.

At the operational level, the strengthening of ongoing public health surveillance systems, establishment of protection for first responders, and provision of the necessary capacity building for laboratories, isolation units and hospitals were suggested.

Asian countries are served by two Regional Offices of WHO i.e SEARO in India and Western Pacific Regional Office (WPRO) in the Philippines. Geographical boundaries between these two adjoining Regional Offices of WHO are not the limiting factor in fighting the menace of emerging infectious diseases. Both offices realize the need for critical support in coordinating international response and in providing country specific support. Each of these two WHO offices have established an Information and Communication centre that functions:

- As an operations room for information management and dissemination;
- As part of an outbreak alert and response network;
- As a Regional Outbreak Alert and Response Network to supplement Regional/national efforts against outbreaks of emerging infectious diseases;
- In the development of an inventory of institutes and experts in the SEA Region and in forging linkages between them to construct networks of epidemiology and public health laboratories.

The successful detection and treatment of biological weapons is a formidable challenge. The periodic occurrence of epidemics of infectious diseases serves to underscore the importance of the public health system. To combat bio-warfare and bio-terrorism public health needs to be strengthened and expanded. Research on the epidemiology and biology of microbes, vectors and intermediate hosts needs to be undertaken. An awareness on the possibility that biological agents can be used with impunity to cause damage to human health by several possible groups with resultant serious consequences needs to be established. A perpetual state of collective vigil by the international community is the only answer for this.[24]

The WHO also proactively collaborates with other agencies such as the Food and Agricultural Organization (FAO) in Rome and the

World Organization for Animal Health (OIE)[25] in Paris for harnessing technical expertise available within these, and, other UN agencies and for work jointly with them to strengthen the capacity of Asian countries in responding to the use of biothreats of the deliberate misuse of biological agents.

Emerging infectious diseases are real. Their challenge is overt. With strong political support and efficient health systems the challenge can be met with. Tested strategies and tools are available and so is the willingness of the international community to work together. The need of the day is continuous vigil and the harnessing of national, regional and international resources to protect humankind from the onslaught of emerging infectious diseases

Conclusions

The deliberate use of biological agents to harm human health has assumed considerable importance in recent past. The ease of production and the capacity to create panic have attracted individuals or groups of individuals towards the use of biological agents as weapons. Modern biotechnological tools have the capacity to enhance their virulence as well as to diminish the possibility of their detection. Though deliberate use of biological agents has added another dimension to the threats to public health, combating these biothreats requires use of the conventional principles of outbreak investigation supported by efficient laboratory systems. The WHO has been advocating, supporting, and strengthening national public health responses such that any outbreak, natural or deliberate, can be rapidly investigated and effectively contained.

Endnotes

1 Marin 1957; Mandelbaum 1981.
2 DaSilva 1999.
3 Cole 1996.
4 Block 2001.
5 Atlas 1998.
6 Porche 2002.
7 Report CDC. http://www.bt.cdc.gov/agent/agentlist-category.asp#catdef
8 Hamburg 2000.
9 Karwa *et al.,* 2005.
10 WHO 2004.
11 SEAR Countries are: Bangladesh, Bhutan, DPR Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste.
12 Cieslak *et al.,* 2000.
13 Ales and Katial 2004.

[14] Gilchrist 2000.
[15] Flowers *et al.,* 2002.
[16] Based on reports presented at an Intercountry Meeting on Biological, Chemical and Radionuclear (BCR) Emergency Preparedness Strategies (Bangkok, Thailand, March 2003: WHO South-East Asia Regional Office Publication No SEA-EHA-4)
[17] Karwa *et al.,* 2003.
[18] Burkle 2002.
[19] WHOSEA 2003.
[20] Kaufmann *et al*. 1997; Green and Kaufmann 2002.
[21] Surge capacity is a health care system's ability to rapidly expand beyond normal services to meet the increased demand for qualified personnel, medical care, and public health in the event of bioterrorism or other large-scale public health emergencies or disasters.
[22] Second Edition of *Health Aspects of Chemical and Biological Weapons: Report of a WHO Group of Consultants*, World Health Organization, Geneva 2004, pp. 340, ISBN: 92 4 154615 8.
[23] Hamburg, 2002; Jones *et al.,* 2002.
[24] Roffey *et al.,* 2002.
[25] Twenty-eight States obtained an "international agreement" on 25 January 1924. The ratification of this 1924 Agreement established the Office International des Epizooties (OIE) in Paris, France. In 1994 The World Trade Organization recognized the OIE as an international reference for safe trade in animals and animal products as regards risks due to animal diseases and zoonoses. In 2003, the International Committee and the Delegates of Member Countries at the 71st General Session adopted the use of the name 'World Organization for Animal Health' while keeping for time being the historical acronymn 'OIE'.

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