

SEA-HLM-344
Distribution: General

Management of Anthrax

*Report of a Bi-regional Workshop
Bangkok, Thailand, 6-8 December 2001*

WHO Project: ICP BCT 001



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CONTENTS

	<i>Page</i>
EXECUTIVE SUMMARY	v
1. INTRODUCTION.....	1
2. OBJECTIVES	1
3. INAUGURAL PROGRAMME.....	1
4. WORKSHOP	2
4.1 Global Status	2
4.2 Regional Status	3
4.3 Epidemiology of Anthrax and Occurrence of Human Cases in Thailand and USA.....	4
4.4 Public Health Aspects of Management of Anthrax.....	4
4.5 Laboratory Aspects of Management of Anthrax	6
4.6 Role of WHO EHA Programmes.....	6
4.7 Development of National Plan of Action	7
5. CONCLUSIONS AND RECOMMENDATIONS	7

Annexes

1. List of Participants.....	10
2. Programme.....	16

EXECUTIVE SUMMARY

Anthrax represents one of the greatest biowarfare threats. The recent occurrences of anthrax in United States of America, and the resultant panic have increased the awareness about the extreme difficulty in handling such threats in a coordinated manner. The infrastructure available in developing countries to meet this challenge is grossly inadequate with rudimentary technical expertise. No central agency for dealing with such outbreaks, or effectively coordinating the national activities against biowarfare exists in countries of South-East Asia Region. Accordingly, an Intercountry Workshop on Management of Anthrax was organized in collaboration with Centres for Disease Control and Prevention of USA (CDC) and Ministry of Public Health, Thailand (MOPH) at Bangkok from 6 to 8 December 2001. Epidemiologists and bacteriologists from nine countries of South East Asia Region and five countries of Western Pacific Region of WHO participated. Experts from India, CDC, MOPH, Regional Office for SEA and WHO/CSR Office in Lyons facilitated this workshop. The workshop was organized to upgrade the skills of the participants in investigation and control of an outbreak of anthrax.

The workshop was designed to have considerable interaction of facilitators with epidemiologists as well as bacteriologists. Specific sessions were organized for epidemiology, clinical presentations, case definitions, laboratory processing, chemoprophylaxis and investigation of outbreak. The activities also included lecture-discussions, panel discussions and demonstrations in the laboratory. A problem-solving session was also organized between the participants and an expert panel at CDC, Atlanta, USA through teleconference. Since most of the countries do not have any well developed plan of action to respond to the outbreaks of anthrax or any other potential biological weapon, the participants were guided to develop a plan of action. They were advised to finalize it in consultation with national authorities.

The workshop highlighted the inadequacies that exist in the state of preparedness of Member Countries against anthrax and bioterrorism. It was clearly emphasized by the CDC experts that processing of environmental samples can lead to aerosolization and such samples must never be handled unless containment facilities of biosafety level 3 (BSL-3) are available. Mere processing of clinical material may be undertaken in BSL-2 facilities.

The participants of the workshop recommended that each country must have a national action plan to meet this challenge, develop and maintain suitable infrastructure, adopt WHO guidelines for strengthening of their laboratory and epidemiological capabilities, train various categories of staff (physicians, public health professionals, bacteriologists, postal authorities, police etc) develop IEC material as well as mechanisms to utilize the mass media to prevent panic among communities and develop effective linkages with various laboratories within the country as well as outside.

1. INTRODUCTION

An Intercountry Workshop on Management of Anthrax was organized in collaboration with Centres for Disease Control and Prevention of USA (CDC) and Ministry of Public Health, Thailand (MOPH) at Bangkok from 6 to 8 December 2001. Epidemiologists and bacteriologists from nine countries of South East-Asia Region and five countries of Western Pacific Region of WHO participated. Experts from India, CDC, MOPH, Regional Office for SEA and WHO/CSR Office in Lyons facilitated this workshop. A complete list of participants can be seen at Annex 1. The detailed programme of work has been appended as Annex 2.

2. OBJECTIVES

Following were the objectives of the workshop:

- (1) To orient the participants about the possible role of anthrax bacilli as a weapon of bioterrorism;
- (2) To train epidemiologists in investigation and management of cases of suspected anthrax;
- (3) To train public health microbiologists in laboratory procedures to confirm the diagnosis of anthrax, and
- (4) To orient the participants about bio-safety and decontamination measures against anthrax bacilli both within the laboratories and in public places.

3. INAUGURAL PROGRAMME

The inaugural session was attended by representatives of WHO, CDC, MOPH, facilitators, participants and staff of the National Institute of Health, Ministry of Public Health, Thailand. The address of Dr Uton Muchtar Rafei, Regional Director, South-East Asia Region, WHO, read out by Dr B. Melgaard, WHO Representative in Thailand, emphasized the importance of

strengthening epidemiological, laboratory and clinical skills in meeting the challenge of various biological agents that could be used as weapons of mass destruction. The special importance of anthrax bacteria was stressed because of its inherent characteristics, making it an ideal bioweapon. The role of WHO in providing technical support to its Member Countries in enhancing their state of preparedness against bioterrorism was also elaborated. The objectives and mechanism of the workshop were described by Dr Sudarshan Kumari, Regional Adviser, BCT/SEARO, WHO. She informed that both epidemiologists and bacteriologists were participants in the workshop since they had to work together in identification and investigation of cases of anthrax. The global cooperation and collaboration in mankind's fight against agents of mass destruction such as anthrax was highlighted by Dr Dowell Scott of CDC.

4. WORKSHOP

The workshop was designed in such a way as to have considerable interaction of facilitators with epidemiologists as well as bacteriologists. In addition, for specific issues pertaining to epidemiology and laboratory components, separate sessions were conducted for these groups of professionals. The activities included lecture-discussions, panel discussions and demonstrations in the laboratory. An one hour problem-solving session was also organized between the participants and an expert panel at CDC, Atlanta, through teleconference. Salient issues which were discussed in this workshop are described briefly hereunder.

4.1 Global Status

Dr Marta Valenciano of WHO/CSR Office in Lyons gave a global overview of the threat of bioterrorism with special reference to anthrax. Among hundreds of possible bacteriological warfare agents, only about 20 are considered potential weapons of biowarfare. Some characteristics of these are: toxicity, infectivity, lethality, ease of production, stability and ease of dissemination. Biological agents present some "advantages" as terrorist weapons: they could be disseminated to cover large areas; their release is difficult to detect; symptoms may occur days or weeks later; some have secondary spread, and their use can cause panic in the population. Moreover, genetic engineering

makes it possible to produce more efficacious biological agents by making them more resistant, virulent and difficult to detect. Some of the clues that can suggest a bioweapon release are: the presence of a large epidemic, especially in a previously healthy population; more severe disease than expected for a given pathogen; the occurrence of a disease that is unusual for a specific area; multiple simultaneous outbreaks of different diseases; an outbreak with zoonotic and human consequences; and recent terrorist activity.

Anthrax represents one of the greatest biowarfare threats as it is easy to obtain, produce and store; its spores are resistant to sunlight, heat and disinfectants and are easily dispersed as aerosol; the inhalable form of anthrax produces high mortality.

As for natural epidemics, to address bioterrorism threat (intentionally caused epidemics) an early detection, a prompt response and a rapid control are essential. The World Health Organization (WHO) with different partners has established the Global Outbreak Alert and Response Network to address the challenge of epidemic-prone and emerging diseases. Moreover, a new WHO programme in Lyons has been initiated in 2001 to increase national capacities for the detection and response of epidemic diseases. The second version of "Health aspects of biological and chemical weapons" prepared by WHO in collaboration with experts from international organizations and NGO is going to be published in 2002. Key information on bioterrorism is available on the WHO web site (www.who.int/emc/deliberate_eou.html). WHO is developing guidelines for preparedness and response to intentional epidemics, establishing a network of experts and laboratories on selected agents, and providing technical support to countries for the establishment of national plans.

4.2 Regional Status

Dr S. Kumari briefly described various features of anthrax bacilli that make this organism an attractive biological weapon. She stressed that strengthening of public health activities both at field and laboratory levels with strong surveillance mechanism and early detection systems are keys to the success of combating the challenges of infectious diseases that may occur naturally or inflicted as a tool of biowarfare. Because of inadequate infrastructure and

minimal expertise in developing countries against organisms such as anthrax bacilli, any widespread outbreak with this organism can cause considerable damage, misery as well as panic. She also emphasized that strong infrastructure and expertise shall also help countries in containing outbreaks due to various other infectious diseases occurring naturally or designed by humans.

The status of infrastructure and expertise against anthrax in Member Countries of South-East Asia has been summarized in the table. The status shows gross inadequacies in technical capabilities and infrastructure required to diagnose anthrax.

4.3 Epidemiology of Anthrax and Occurrence of Human Cases in Thailand and USA

An overview of epidemiology of naturally occurring anthrax in animals and its transmission to human beings was presented by Dr Prawit Chumkasien. He also described the experience gained in Thailand. Recent occurrences of cases with inhalable anthrax through contaminated powder being sent by post in the USA were discussed by Dr Scott Dowell. The resources, infrastructure, expertise and coordination that were utilized in identification of anthrax bacilli from clinical and environmental specimens were described in this presentation. Dr Dowell also gave details of management of cases and contacts.

4.4 Public Health Aspects of Management of Anthrax

The clinical and epidemiological aspects of anthrax were discussed by various experts from CDC, WHO and MOPH. These included features of various clinical presentations of anthrax; case definitions that can be used while investigating an outbreak; circumstances under which a facility is to be shut down because of its contamination; decontamination processes; criteria for restoration of the facility; transportation of clinical and environmental material for laboratory processing and role of chemo- and immunoprophylaxis in anthrax. The participants were encouraged to seek clarifications on their doubts and implementation of the control measures in the context of their country-specific situations.

**Table 1. Status report on Anthrax capabilities
in countries of SEA Region**

Description	BAN	BHU	INO	IND	MAV	MMR	NEP	SRL	THA
Occurrence of human cases of anthrax	No	Yes	Yes	Yes	No	Yes	No	No	Yes
Number of human cases in 2000	0	0	32	43	0	0	No	No	16
Occurrence of anthrax in animals	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Outbreak of anthrax in animals	Yes	NA	Yes	Yes	No	Yes	No	Yes	Yes
Containment level of laboratory	None	None	P2	P2	P2	P2	P2	P3	P3
Number of clinical samples processed for anthrax in 2001	29	None	50	1	0	None	None	3	26
Number of environmental samples tested for anthrax in 2001	0	None	10	400	10	None	None	130	191
Isolation of anthrax bacilli from clinical specimens	0	No	Yes	Yes	No	No	No	Yes	Yes
Tests employed for diagnosis									
• Presumptive diagnosis	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
• Confirmatory diagnosis	-	-	-	Yes	-	-	-	-	-
Professionals trained in anthrax									
• Clinician	No	No	Yes	Yes	No	No	No	No	No
• Epidemiologist									
• Bacteriologist									
Availability of SOP for anthrax outbreak or handling of post having suspected contaminated material	No	No	Yes	No	No	Yes	No	Yes	Yes
Nationally coordinated disaster management programme exists	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock of anthrax specific antimicrobial agents	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes

4.5 Laboratory Aspects of Management of Anthrax

Challenges, problems and methodology in laboratory processing of material for anthrax bacilli were discussed with the participants by experts from CDC, MOPH and India. Various conventional diagnostic tests including staining, culture and biochemical reactions and methods of antimicrobial susceptibility testing were demonstrated to the participants. Theoretical aspects of PCR and newly developed dot ELISA were discussed and tests shown to the participants. The requirements of a laboratory infrastructure for undertaking processing of material suspected to be having anthrax bacilli were described. Emphasis was placed on biosafety measures within the laboratory as well as in transportation of specimens.

A teleconference was arranged between facilitators and participants of the course and the experts at CDC Atlanta, USA. Various questions raised by the participants were answered by the experts, especially about the infrastructure required for laboratories to initiate handling of anthrax bacilli, interpretation of various tests, availability of reagents and biosafety gears and chemoprophylaxis.

To give the participants confidence in handling an outbreak due to anthrax, a mock scenario was enacted wherein participants were confronted with a situation when an outbreak has just started. The facilitators guided the participants in the investigation of the outbreak and resolved a few problems that were encountered.

4.6 Role of WHO EHA Programmes

Dr Elisabeth Emerson, WR Office Thailand, gave a concise overview of the WHO EHA programme, presented WHO recommendations for emergency preparedness planning for chemical and biological hazards at the country level, and listed some of the resources available for emergency preparedness through WHO.

Three key points about disaster management at WHO were made:

- All disasters are public health challenges and are at the core of WHO's mission of reducing mortality and morbidity.

- For maximum effectiveness and efficiency, emergency preparedness planning is essential. It is too late once an emergency occurs.
- Emergencies involve many areas of health, many sectoral ministries of government and a large number of players among whom coordination is essential.

Emergency preparedness for chemical and biological hazards emphasize the need to establish plans, identify resources and strengthen the capacity of health workers with appropriate training and clear definitions of roles and responsibilities. Laboratory capacity also needs to be strengthened, and expert response teams created.

WHO can provide support in emergency management through provision of technical information, which is available on the website: www.who.int/eha/disasters.

4.7 Development of National Plan of Action

Since most of the countries do not have any well developed plan of action to respond to the outbreaks of anthrax or any other potential biological weapon, the participants were guided to develop a plan of action. They were advised to finalize it in consultation with the national authorities and develop a state of preparedness.

5. CONCLUSIONS AND RECOMMENDATIONS

The workshop highlighted the inadequacies that exist in the state of preparedness of Member Countries against infections such as anthrax that can strike either naturally or as an act of bioterrorism leading to considerable mortality, morbidity, economic loss and panic amongst public. To obviate these, the following recommendations were made:

- (1) Each country must have a national action plan to meet the challenge of anthrax in particular and harms due to biological agents in general. Suitable infrastructure must be created and maintained for public health activities. All countries will maintain

a state of preparedness to effectively mount a rapid response to any occurrence of harm due to anthrax bacilli.

- (2) WHO guidelines (WHO EMC 97) can be adopted by the countries. The guidelines provide practical steps for epidemiology and laboratory aspects that can be implemented in various developing countries.
- (3) Handling of clinical material may be done at BSL-2 level, if BSL-3 facilities are not available. However, BSL-3 facility is essential for handling powder and other environmental material. Since these facilities are expensive to create and maintain, it may not be possible for all the countries in SEAR to have these immediately. Accordingly, networking of laboratories in the Region becomes essential. The countries with BSL-3 facilities should provide diagnostic support to those countries which currently do not have these. WHO, in consultation with Member Countries, will develop an effective mechanism for same.
- (4) The presumptive diagnosis of anthrax may be based on an examination of stained smears and biochemical reactions. For confirmation of diagnosis, PCR, fluorescent antibody test and susceptibility to gamma phage need to be adopted.
- (5) The confirmatory tests for anthrax require testing the isolate with gamma bacteriophage. CDC has a limited supply of this phage at present. American Type Culture Collection (ATCC) is likely to make available the gamma phage as well as its propagating strain. The Member Countries will procure these from ATCC as and when these become available.
- (6) Dot ELISA test for detection of protective antigen of anthrax bacilli and developed by DRDE, Ministry of Defense, India will be evaluated to assess its efficacy. If found appropriate, this may be used as a confirmatory test. Subsequently, WHO will make arrangements to provide a limited number of these kits to all the Member Countries.
- (7) Biosafety measures require use of masks and other safety gears to prevent infection of laboratory staff. CDC will provide the source of the masks and their cost to WHO as well as to the participants.

- (8) Member Countries should impart training to the following categories of staff at national level, so as to have a core group of trained professionals
- Physicians
 - Public health professionals
 - Bacteriologists
 - Postal authorities
 - Police
 - Health education staff
- (9) Member Countries should effectively utilize the mass media through accurate information/fact sheets to allay fears among communities.

Annex 1

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Annex 2

PROGRAMME

Thursday, 6 December 2001

0800 – 0830 hrs	Registration	
	Inaugural session – All participants	
0830 – 0845 hrs	Inaugural Programme	Dr S. Kumari, Dr Pathom
	Welcome and overview of Workshop	
	Objectives and Mechanism of Workshop	
	Address of RD WHO-SEARO	
	Vote of thanks	
	Plenary Session – All participants	
0900 – 0915 hrs	Global overview of threat of bioterrorism with special reference to anthrax (L)	Dr Marta Valenciano CSR/WHO, Lyons
0915 – 0930 hrs	Threat of anthrax and role of WHO in its management (L)	Dr S. Kumari WHO, SEARO
0930 – 1000 hrs	Update on US anthrax cases (L)	Dr Scott Dowell CDC/IEIP
1000 – 1030 hrs	Epidemiology of anthrax and Thai experience (L)	Dr Prawit Chumkasien Division of Epidemiology, MOPH, Thailand
1030 – 1100 hrs	Challenges in Laboratory Diagnosis (L)	Dr Tamara Fisk, CDC
1100 – 1130 hrs	Challenges in Public Health Management (L)	Dr Jordan Tappero CDC/HAP
1130 – 1200 hrs	Question and Answer	
	Public Health Session	
1300 – 1400 hrs	Clinical Presentations, Nasal Swabbing Interpretation, Antimicrobial susceptibilities (L)	Dr Thira Sirisantana. Faculty of Medicine, Chiang Mai University
	Photographs from recent US cases – Dr. Tamara Fisk, CDC	

1430 – 1600 hrs	Establishing Uniform Case Definitions – Exposure, Threat, Cutaneous, Inhalable Case, Nasal Carrier, etc. (D)	Dr Tamara Fisk CDC
1600 – 1700 hrs	Protecting Exposed Persons – Prophylaxis decisions, Vaccine issues (L)	Dr Scott Dowell IEIP moderator.

Thursday, December 6 2001

Laboratory Session – Laboratory Participants only

1300 – 1400 hrs	Safety consideration in specimen processing and laboratory procedure (L)	Dr Wattana Auwanit Thai NIH, MOPH
1400 – 1500 hrs	Laboratory diagnosis of <i>B. anthracis</i> (L)	Kh Surang Dejsirilert
1530 – 1700 hrs	Laboratory demonstration: spore and capsular stain, phenotypic characterization Laboratory practice: culture method, biochemical test (Demonstration)	Prof M K Lalitha Kh Surang Dejsirilert and 7 other lab instructors

Friday December 7, 2001

0800 - 0900 hrs	Teleconference	CDC Expert Panel - Atlanta
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Laboratory Session

0900 – 0945 hrs	Laboratory Practice : stains, and identification (Demonstration)	Prof M K Lalitha Kh Surang Dejsirilert
0945 – 1015 hrs	Molecular diagnosis of anthrax (L)	Dr Harsh Batra, India
1030 – 1200 hrs	Laboratory Practice (continue) Inoculation of Dot ELISA	Prof MK Lalitha Dr Harsh Batra Kh Surang/staff

Public Health Session – Public Health Participants only

0900 – 0930 hrs	Environmental Sampling and Facility Assessment (L)	Dr Tamara Fisk CDC
0930- 1015 hrs	Determining Worker Exposures and Disease Risk (L)	Dr Gary Penner, Department of State
1045 – 1100 hrs	Determining when to close a facility (L/D)	Dr Supamit Chunsuttiwat, MOPH, Thailand

1100 – 1200 hrs	Facility Cleanup and Restoration (L/D)	Panel
1300 – 1400 hrs	Laboratory – Public Health Interactions <ul style="list-style-type: none">- getting correct specimens to the Lab- shipping/safety issues- interpreting interim results- sensitivity/specificity of various test approaches- Dot-ELISA: Application in developing countries (L/D)	Mark Simmerman, MS IEIP Moderator All facilitators
1400 – 1530 hrs	Development of a national plan for combating anthrax. Regional and International Resource Contact Information (Group work)	Dr Pathom Sawanpanyalert, Thai NIH Moderator
1600 – 1700 hrs	Mock Exposure Scenario Decision making by all participants Group Work	Dr Scott Dowell, CDC/IEIP
1700 – 1715 hrs	Closing Plenary Session – All participants	

Saturday, December 8, 2001

Laboratory Session – Laboratory Participants only

0800 – 1000 hrs	PCR for determination of toxin and capsular gene demonstration	Thai NIH
	Dot-Blot ELISA Demonstration	Dr Harsh Batra
	Infrastructure required for a laboratory to undertake work on anthrax (L)	Dr Lalitha/Surang

L: Lecture; L/D: Lecture Discussion