Management of Anthrax

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

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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

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

### 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

LIST OF PARTICIPANTS

Bangladesh

Prof (Dr) Tofayel Ahmed
Principal and Professor of Medicine
Dhaka Medical College
Dhaka
Phone 9669340 and 8613252

Prof (Dr) Badrul Islam
Director
Instt of Epidemiology, Disease Control
and Research (IEDCR),
Mohakhali
Dhaka
Phone 8821237

Dr Humayun Sattar
Department of Microbiology and
Immunology
Bangabandu Sheikh Mujib Medical
University
Shahbag, Dhaka 1000
Phone: 8618304

Mr Zunnun Reza Chowdhury
Department of Microbiology and
Immunology
Bangabandu Sheikh Mujib Medical
University
Shahbag, Dhaka 1000
Phone 8618303

Bhutan

Dr Tenzin Penjor
Joint Director

Public Health Division
Department of Health Services
Thimphu
Phones 325984; 322602
e-mail: tenjor2000@yahoo.com

Mr Tandin Dorji
Incharge, Public Health Laboratory
Jigme Dorji Wangchuk National
Referral Hospital
Thimphu
Phones 323317, 323312
e-mail: tandind@yahoo.com

Cambodia

Mr Mao Sarim
National Institute of Public Health
No. 14 St. 476 toul tumpuong,
Khan chamkamorn, Cambodia
Phone: 011 877 121, fax: 855–23 880
346
e-mail: nphri@comnet.com.kh

Simoth Denna
National Institute of Public Health
c/o Paul Mills, Box 30, US Embassy
APO AP 96546
Phone: 205–4537, 880–345 Fax: (66–2)
254–1165
e-mail: nphri@camnet.com.kh

India

Dr Veena Mittal
Joint Director (Microbiology)
National Institute of Communicable
Diseases
22, Sham Nath Marg
Delhi – 110 054
Phone: 3971262, 3971060, Fax: 3922677
e-mail: surbhimittal@vsnl.net

Dr S T Pasha
Joint Director & Head
Division of Biochemistry & Biotechnology
National Institute of Communicable Diseases
22, Sham Nath Marg
Delhi – 110 054
Phone: 3912960, fax: 3922677
e-mail: pashadelhi@yahoo.com

Indonesia
Dr Widarso HS, MSc
Head of Sub Directorate Zoonoses,
Directorate VBDC
Directorate–General of CDC
Ministry of Health
Jakarta
Phone: 424–7608 ext 151 Fax: 424–7573
e-mail: widarso50@yahoo.com

Suprodjo Hardjoutomo DVM, MSc
Principal Veterinary Research Officer
Research Institute for Veterinary Services
Jt R.E. Martadinata 30,
Bogor,16114
Phone: 331408 Fax: 336425
e-mail: balitvet@indo.net.id

Cicilia Windiyaningsih
CDCREH, Ministry of Health,
Jt Percetaken
Negala 29
Jakarta

Laos
Dr Bounnanh Phanthouamath
Medical Officer, Laboratory of
Bacteriology
Center for National Laboratory and
Epidemiology
Vientiane, Lao PDR
Phone: 856–21–312–351 FAX 856–21–315347
E-Mail: laonambl@pan–laos.net.la

Mr Thongchanh Sisouk
Senior Lab tech. Serology and Virology Laboratory
Center for National Laboratory and Epidemiology
LAO, PDR
Phone: 856–21–312–351 FAX 856–21–315347
E-Mail: laonambl@pan–laos.net.la

Mr Chamnong Thongkham
Laboratory Pathologist
Australian Embassy Clinic
PO Box 292
Vientiane
Phone: 413603

Mr Jamie Conlan
Research Scientist, Animal Health Research
Australian Centre For International Agricultural Research Project
PO Box 7042, Vientiane
Phone: 218367
e-mail: ahr9438@laotel.com
Dr Ben Burford  
Australian Embassy Clinic  
Vientiane  
Laos  
Phone: 413603  Fax: 414700  
e-mail: benjamin.burford@dfat.gov.au

**Malaysia**

Dr Johara Mohd. Yob (Ms.)  
Head, Bacteriology Division  
Veterinary Research Institute  
59 Jalan Sultan Azlan Shah  
31400 Ipoh, Perak, Malaysia.  
Tel. # 605-545-7166/87.  
Fax # 605-546-3368  
Email: johara@jphvri.po.my

Ms Tay Ah Wan  
Bacteriology Unit  
Infectious Diseases Research Center  
Institute for Medical Research  
Jalan Pahang  
50588 Kuala Lumpur.  
Tel. # 603-4040-2363  
Fax # 603-2692-4949  
Email: awtay@imr.gov.my

**Maldives**

Dr Abdul Azeez Yoosuf  
Director –General of Health Services  
Ministry of Health  
Male  
Phone: 324523  
e-mail: dghs@health.gov.mv

Ms Shareefa Manike  
Assistant Director Laboratory Services  
Indira Gandhi Memorial Hospital  
Male  
Phone: 313980  
e-mail: shareefamanike@hotmail.com

**Myanmar**

Dr Ye Hla  
Deputy Director  
Central Epidemiology Unit  
Department of Health  
Yangon  
Phone: 286930  Fax: 202026  
e-mail: MBDS@mpt.com

Dr Khin Yi Oo  
Consultant Bacteriologist  
National Health Laboratory  
Department of Health  
Yangon –282520  
e-mail: yis@mptmail.net.mm

**Nepal**

Dr Kokila Devi Shrestha  
Epidemiology & Disease Control Division  
DHS/Ministry of Health  
HMG of Nepal  
Teku, Kathmandu  
Phone: 255796  Fax: 262268

Dr Madhuri Adhikari  
National Public Health Laboratory  
DHS/Ministry of Health  
HMG of Nepal  
Teku, Kathmandu  
Phone: 255796  Fax: 262268

**Singapore**

Mr Loh Jin Phang  
Defence Medical Research Institute  
Singapore  
Phone: 7790954  Fax 7791677  
e-mail: jimmyloh@dsta.gov.sg
Ms Tan Yoke Cheng  
DSO National Laboratories  
Singapore  
Phone: 8712888  Fax: 8730742  
e-mail: tyokeche@dso.org.sg  

Sri Lanka  
Dr Phelomena Chandrasiri  
Medical Research Institute  
Colombo Sri Lanka  
Phone: 693532  Fax: 691495  
e-mail: medresit@slt.lk  
Dr Pranitha Somaratne  
Medical Research Institute  
Colombo Sri Lanka  
Phone: 693532  Fax: 691495  
e-mail: medresit@slt.lk  

Thailand  
Mrs Sutudsanee Vimolsarte  
Medical Technologist  
Medical Science Regional Centre, Khon Kaen  
400/2 Na Sun Ratchakarn Road, Muang District  
Khon Kaen Province 40000  
Phone 242871  Fax: 242845  

Dr Darika Kingnate  
Public Health Veterinarian  
Division of General Communicable Diseases  
Department of Communicable Disease Control  
Ministry of Public Health, Tiwanon Road  
Nonthaburi 11000  
Phone: 662–590–3189  
e-mail: darika@health.moph.go.th  

Dr Pitaya Laorakpong  
Medical Officer  
Division of General Communicable Diseases  
Department of Communicable Disease Control  
Ministry of Public Health, Tiwanon Road  
Nonthaburi 11000  

Vietnam  
Dr. Doan Mai Phuong  
Khoa Vi Sinh  
Bệnh viện Bạch Mai  
78 Dương Giai Phong  
Hanoi  
Mobile phone: 0903 404960  
Fax: (844) 8691 607  
e-mail: doannaiphuong@yahoo.com

Dr. Vo Thi Chi Mai, PhD  
Chief of Microbiology  
Cho Ray Hospital  
Trường khoa, Khoa Vi Sinh  
Bệnh viện Cho ray, 201B Nguyễn Chí Thanh  
Quận 5, Hồ Chí Minh City  
Phone: 8554138  
Email: Chimai@hcm.vnn.vn  

Temporary Advisers & Resource Persons  
Dr M K Lalitha  
Professor of Microbiology  
Department of Clinical Microbiology  
Christian Medical College & Hospital  
Vellore–632 004  
India  

Dr H.V. Batra  
Head of Microbiology  
Defense Research Development
Establishment
Gwalior
India

Mrs Surang Dejsirilert (and local host)
Head of Miscellaneous Bacteriology Laboratory
National Institute of Health
Department of Medical Sciences
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand
Phone: 662–589–9850 ext 9404
e-mail: sudejsi@health.moph.go.th

Dr. Prawit Chumkasien
Epidemiology Division
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand
Phone: 662–590–1774

Dr Thira Sirisanthana.
Faculty of Medicine
Chiang Mai University
Chiang Mai
Thailand

Dr. Wattana Auwanit
National Institute of Health
Ministry of Public Health
Tiwanon Road, Nonthaburi 11000
Thailand

Dr Supamit Chunsuttiwat
Senior Medical Officer
Department of Communicable Disease Control
Ministry of Public Health
Tiwanon Road, Nonthaburi 11000
Thailand

Phone: 662–590–3370
e-mail: sahansu@health.moph.go.th

Dr Pathom Sawanpanyalert
Director, National Institute of Health
Department of Medical Sciences
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand

US Centres for Disease Control,
International Emerging Infections Program.

Dr Scott Dowell
Director CDC/IEIP
DMS6 Building
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand
e-mail: sfd2@cdc.gov

Dr Jordan Tappero
Director CDC/HIV AIDS Collaboration
DMS6 Building
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand

Dr Tamara Fisk
Emerging Infections Fellow, Anthrax Expert
DMS6 Building
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand
e-mail: tgf3@cdc.gov
Report of a Bi-regional Workshop

Mark Simmerman. MS, Deputy, Admin.
CDC/EIP
DMS6 Building
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand

US Embassy, Bangkok Thailand
Dr Gary Penner
Regional Medical Officer

WHO Secretariat
Dr Sudarshan Kumari
Regional Adviser–BCT
Regional Office WHO South East Asia
IP Estate
New Delhi 110 002
Phone: 3370804 ext 26504
e-mail: kumaris@whosea.org

Dr Rajesh Bhatia
STP/BCT
Regional Office WHO South East Asia
IP Estate
New Delhi 110 002
Phone: 3370804 ext 26504
e-mail: bhatiaraj@whosea.org

Mrs Nutwaree Chotcjinda
Administrative Assistant
WR Thailand Office
Nonthaburi 11000
Thailand

Nonthaburi 11000
Thailand
Dr Elisabeth Emerson
Border Health Program Officer
Office of WR Thailand
Ministry of Public Health
Tiwanon Road
Nonthaburi 11000
Thailand
e-mail: emerson@whothai.moph.go.th

CSR, Lyons
Dr. Marta Valenciano
WHO/CSR Office in Lyons
58 Avenue Deboura
69007 Lyons
France
Phone: 33472716472
e-mail: valencianom@Pyan.who.int

OIE
Dr John Edwards
Organization International de Epizooties
(OIE)
Bangkok
Thailand
e-mail: oiercu@loxinfo.co.th

Observers
Dr Surachai Vichankaiyakij
UN– Bangkok Physician
vichankaiyakij@un.org
Dr Somsak Pattarakulwanich
Senior Expert in Preventive Medicine,
Report of a Bi-regional Workshop

Mrs Jatarat Thawornanun  
Department of communicable Diseases  
Control  
Ministry of Public Health  
Tiwanon Road  
Nonthaburi 11000  
Thailand
### Annex 2

#### PROGRAMME

**Thursday, 6 December 2001**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0800 – 0830 hrs</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>0830 – 0845 hrs</td>
<td>Inaugural session – All participants</td>
<td>Dr S. Kumari, Dr Pathom</td>
</tr>
<tr>
<td>0845 – 0850 hrs</td>
<td>Inaugural Programme</td>
<td></td>
</tr>
<tr>
<td>0850 – 0900 hrs</td>
<td>Welcome and overview of Workshop</td>
<td></td>
</tr>
<tr>
<td>0900 – 0915 hrs</td>
<td>Objectives and Mechanism of Workshop</td>
<td></td>
</tr>
<tr>
<td>0915 – 0930 hrs</td>
<td>Address of RD WHO–SEARO</td>
<td></td>
</tr>
<tr>
<td>0930 – 1000 hrs</td>
<td>Vote of thanks</td>
<td></td>
</tr>
<tr>
<td>1000 – 1030 hrs</td>
<td><strong>Plenary Session – All participants</strong></td>
<td></td>
</tr>
<tr>
<td>0915 – 0930 hrs</td>
<td>Global overview of threat of bioterrorism</td>
<td>Dr Marta Valenciano</td>
</tr>
<tr>
<td>0930 – 1000 hrs</td>
<td>with special reference to anthrax (L)</td>
<td>CSR/WHO, Lyons</td>
</tr>
<tr>
<td>0930 – 1000 hrs</td>
<td>Threat of anthrax and role of WHO in its</td>
<td>Dr S. Kumari</td>
</tr>
<tr>
<td>1000 – 1030 hrs</td>
<td>management (L)</td>
<td>WHO, SEARO</td>
</tr>
<tr>
<td>1000 – 1030 hrs</td>
<td>Update on US anthrax cases (L)</td>
<td>Dr Scott Dowell</td>
</tr>
<tr>
<td>1030 – 1100 hrs</td>
<td>Epidemiology of anthrax and Thai experience (L)</td>
<td>Dr Prawit Chumkasien Division of Epidemiology, MOPH, Thailand</td>
</tr>
<tr>
<td>1030 – 1100 hrs</td>
<td>Challenges in Laboratory Diagnosis (L)</td>
<td>Dr Tamara Fisk,</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td>Speaker(s)</td>
</tr>
<tr>
<td>------------</td>
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</tr>
<tr>
<td>1100 – 1130 hrs</td>
<td>Challenges in Public Health Management (L)</td>
<td>CDC / HAP Dr Jordan Tappero</td>
</tr>
<tr>
<td>1130 – 1200 hrs</td>
<td>Question and Answer</td>
<td></td>
</tr>
<tr>
<td>1300 – 1400 hrs</td>
<td>Public Health Session</td>
<td></td>
</tr>
<tr>
<td>1300 – 1400 hrs</td>
<td>Clinical Presentations, Nasal Swabbing Interpretation, Antimicrobial susceptibilities (L)</td>
<td>Dr Thira Sirisantana. Faculty of Medicine, Chiang Mai University</td>
</tr>
<tr>
<td></td>
<td>Photographs from recent US cases – Dr. Tamara Fisk, CDC</td>
<td></td>
</tr>
<tr>
<td>1430 – 1600 hrs</td>
<td>Establishing Uniform Case Definitions – Exposure, Threat, Cutaneous, Inhalable Case, Nasal Carrier, etc. (D)</td>
<td>Dr Tamara Fisk CDC</td>
</tr>
<tr>
<td>1600 – 1700 hrs</td>
<td>Protecting Exposed Persons – Prophylaxis decisions, Vaccine issues (L)</td>
<td>Dr Scott Dowell IEIP moderator.</td>
</tr>
</tbody>
</table>

**Thursday, December 6 2001**

<table>
<thead>
<tr>
<th>Time</th>
<th>Laboratory Session – Laboratory Participants only</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1300 – 1400 hrs</td>
<td>Safety consideration in specimen processing and laboratory procedure (L)</td>
<td>Dr Wattana Auwanit Thai NIH, MOPH</td>
</tr>
<tr>
<td>1400 – 1500 hrs</td>
<td>Laboratory diagnosis of <em>B. anthracis</em> (L)</td>
<td>Kh Surang Dejsirilert</td>
</tr>
<tr>
<td>1530 – 1700 hrs</td>
<td>Laboratory demonstration: spore and capsular stain, phenotypic characterization</td>
<td>Prof M K Lalitha Kh Surang Dejsirilert and 7 other lab instructors</td>
</tr>
<tr>
<td></td>
<td>Laboratory practice: culture method, biochemical test (Demonstration)</td>
<td></td>
</tr>
</tbody>
</table>
Friday December 7, 2001

0800 – 0900 hrs  
Teleconference  
CDC Expert Panel – Atlanta

**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  
- getting correct specimens to the Lab  
- shipping/safety issues  
- interpreting interim results  
- sensitivity/specificity of various  
Mark Simmerman, MS  
IEIP Moderator  
All facilitators
test approaches
- Dot-ELISA: Application in developing countries (L/D)

1400 – 1530 hrs
Development of a national plan for combating anthrax. Regional and International Resource Contact Information (Group work)

1600 – 1700 hrs
Mock Exposure Scenario
Decision making by all participants Group Work

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

Dr Pathom Sawanpanyalert, Thai NIH Moderator

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