Laboratory Networking for Emerging Infectious Diseases

Report of a Regional Meeting
Bangkok, Thailand, 15-19 August 2011

World Health Organization
Regional Office for South-East Asia

SEA-HLM-422
Distribution: General

Laboratory Networking for Emerging Infectious Diseases

Report of a regional meeting
Bangkok, Thailand, 15-19 August 2011

World Health Organization
Regional Office for South-East Asia

Printed in India

Contents

Page

Annexes

1. Background

Emerging infectious diseases (EIDs) are diseases of infectious origin whose incidence in humans has increased within the recent past or threatens to increase in the near future. These include infections that appear in new geographical areas as well as those that re-emerge after a period of quiescence.

Outbreaks of these communicable diseases have frequently occurred in various Member States of the World Health Organization's South-East Asia (SEA) Region in recent years: severe acute respiratory syndrome or SARS in 2003, highly pathogenic avian influenza in 2004, Nipah virus in 2004, rickettsiosis in 2003, chikungunya in 2006, and the influenza pandemic in 2009. Apart from these, recurrent outbreaks of dengue fever, Japanese encephalitis, leptospirosis, malaria, cholera and viral hepatitis have also been reported with regular periodicity. Several outbreaks continue to remain undiagnosed even after they have run their natural course. And these cause significant levels of panic and tangible loss to health and the economy.

The inability to diagnose such infections in the early phases delays the institution of containment measures, prolongs their duration and facilitates the spread of infection. It also exposes the inherent weaknesses in the existing laboratory support system, which plays a critical role in the rapid determination of the causes of outbreaks as well as the characterization of the pathogen so as to better understand its molecular features. Not one laboratory/institution in the SEA Region has either the infrastructure or the expertise to provide comprehensive services for diagnosis and characterization of all emerging pathogens. However, this regional need can be met through an efficient network of laboratories.

The increase in international travel, the transfer of goods across countries, the inexorable environmental degradation that is rampant and the emergence of new infectious agents are likely to cause many more outbreaks in the coming years. Although laboratory-based surveillance through an efficient public health laboratory system is the ideal answer, Member States are often confronted with several technical and logistical challenges, including inadequate resources, in the way of instituting such a system. It may be prudent to synergize available laboratory services by

forging a network of competent and well-equipped laboratories in the SEA Region for selected diseases, thereby improving the management of these outbreaks. This will also augment and formalize a productive collaboration between different national laboratories in the Region.

The efficient implementation of the International Health Regulations (IHR) 2005 also entails that Member States must strengthen the core competence of their public health laboratories and mainstream this network.

Since microorganisms do not respect geographical or political borders, a Regional Network of Laboratories (SEAR LabNet) can be created to harness the wide variety of expertise (health, veterinary, R&D, universities, medical schools, defence establishments, etc.) available in the SEA Region, and be used as a tool in the rapid establishment of diagnosis, determination of appropriate treatment and better understanding of epidemiology. These laboratories may be designated as "collaborating centres"; and their success could serve as a springboard to strengthen laboratory-based disease surveillance in the Region.

To discuss these issues, and forge regional networks of laboratories for priority EIDs, a regional meeting was organized in Bangkok, Thailand, from 15-19 August 2011. The meeting was attended by 23 participants from all Member States of the Region. Experts from Bangladesh, India, Sri Lanka and Thailand facilitated the meeting. The meeting was chaired by Dr Ajith Mendis, Director-General of Health Services, Ministry of Health, Sri Lanka, and co-chaired by Miss Krongkaew Supawat, Deputy Director, National Institute of Health, Department of Medical Sciences, Ministry of Public Health, Thailand. The list of participants and the Agenda are contained in Annex 1 and Annex 2.

2. Objectives

The following were the objectives of the meeting:

(1) To review the status of national networks of public health laboratories in the Region in the context of IHR (2005).

(2) To agree on the composition, functions and mechanism of operations of proposed regional laboratory networks.

(3) To develop follow-up action so as to make regional networks functional on a sustainable basis.

3. Inaugural session

Dr Pathom Sawanpanyalert, Deputy Director-General, Department of Medical Sciences (DMSc), MoPH, Thailand, welcomed the participants on behalf of the Director-General, DMSc. He supported the formation of laboratory networks to support public health actions against emerging infectious diseases. He stressed the importance of sustaining these networks for early diagnosis and containment of the diseases.

In his message, the WHO Regional Director for South-East Asia, Dr Samlee Plianbangchang, noted that communicable diseases continued to be the major health challenge in the SEA Region. As outbreaks of these diseases occurred frequently, early diagnosis was essential for timely prevention and control.

According to Dr Samlee, laboratories play a critical role in the rapid determination of the cause of the outbreak, characterization of the pathogen to understand its molecular features, and to suggest appropriate therapy and control measures. Since no single laboratory or institution in the Region has the requisite infrastructure or expertise to provide these comprehensive services, regional networks of laboratories are essential to meet this need.

The importance of a laboratory network has been repeatedly demonstrated, he said. For many years, the WHO-supported network of poliomyelitis laboratories played a key role in the eradication of the disease. More recently, the Global Influenza Surveillance Network provided critical inputs during the influenza pandemic.

Dr Samlee emphasised the need to replicate these success stories and harness the available expertise (health, veterinary, research and development institutes, universities, medical schools, defence laboratories, etc.) within the Region.

WHO collaborating centres, he said, could play a pivotal role in coordinating the activities of these networks. In turn, they could be used as a springboard to strengthen laboratory-based disease surveillance using the Asia-Pacific Strategy on Health Laboratories that was developed in 2010.

The efficient utilization of networks would ensure regional self-reliance in the diagnosis of EIDs, Dr Samlee said. He reiterated that WHO

would continue to provide the required technical support in the improvement of laboratory services.

4. Proceedings of the workshop

The meeting included the presentation of country reports to review the current status of laboratories in the Region, plenary sessions on various aspects of laboratory networking, group work and discussions on forging networks.

4.1 Current status of laboratories in the SEA Region

Laboratories in the SEA Region are in various stages of development. While national networks are operational in almost all Member States, these are restricted to laboratories in the public health system only. Several laboratories in hospitals, private and other sectors are not integrated into these national networks. A brief summary of the status of key components of public health laboratories in the SEA Region is given in Table 1.

Table 1: ***Brief status of public health laboratories in the SEA Region***

Key elements of laboratory system	Number of countries with key elements
National laboratory policy	2 (In draft stage in 3)
National laboratory plan/programme	7
National focal point for laboratories	7
Number of laboratories in the public sector	Approx. 13 700
Number of biosafety level 3 laboratories	41 (in 4 countries)
National laboratory networks	10
National laboratory standards	9
Mandatory registration of laboratories	6
Availability of disease-specific national networks	10

Country reports

Bangladesh

In comparison with other countries in the SEA Region, Bangladesh has quite a few laboratories in the public (118) and private sectors (4458). There are two BSL3 laboratories, five BSL2 laboratories, 554 laboratories in the public sector periphery, and three laboratories accredited by international organizations.

However, there continues to be a lack of proper networking among these laboratories. The National Laboratory Policy, despite an ordinance issued in 1984, remains under construction. The Director-General of Health Services is currently acting as the National Regulatory Authority, although a National Accreditation Body for laboratories has been formed and is waiting for final approval.

A National Focal Point for laboratories does not exist, nor do standard operating procedures (SOP), external quality assessment schemes (EQAS), or an effective internal audit system. In fact, an effective monitoring, coordination and information system is yet to be developed. Only a few disease-specific laboratory networks are operational.

However, most laboratories have trained staff as well as an adequate supply of reagents and equipment. Bangladesh seems conscious of the need to develop an effective national and regional networking system so as to achieve the requisite goals in combating emerging diseases.

Bhutan

Bhutan lacks both a proper system as well as the capacity to quickly initiate testing for any new pathogens. Although the country is in the process of establishing laboratory capacity to diagnose emerging, re-emerging and rare pathogens, it is unlikely that it will have the capacity to test and identify every new/unknown and re-emerging pathogen.

Therefore, it is critical for a small country like Bhutan to forge institutional linkages and participate in laboratory networking with other laboratories and institutes in the Region so that it has access to help and technical support in case of a health emergency. Such participation will

strengthen its own laboratory capacity to respond as well as carry out surveillance and research.

DPR Korea

DPR Korea has two streams of laboratories; the first deals with public health while the other deals with clinical laboratories. The Central Anti-Epidemic Station is the coordinating national laboratory for public health laboratories and the Pyongyang Medical University is the national apex laboratory for clinical laboratories.

The country has a national policy and a national programme as well as a National Focal Point in place for the laboratory system. The national network of 12 public health laboratories provides support for early diagnosis of EIDs. However, there is no BSL3 laboratory in the country.

DPR Korea requires significant support from WHO in strengthening its capacity, which includes the provision of critical equipment and supplies as well as training of laboratory staff.

India

Public health laboratories in India come mainly under the Ministry of Health and Family Welfare's (MoH&FW) purview. There exists an organized network of laboratories under national programmes for tuberculosis, HIV/AIDS and vector-borne diseases. Under the ongoing Integrated Disease Surveillance Project, 50 district priority laboratories are being strengthened for early detection and rapid response to outbreaks by establishing an effective laboratory- based surveillance system.

A referral laboratory network involving 65 medical schools in nine states has also been established for aetiological confirmation of outbreaks in linked districts. Disease-specific networks for influenza and polio are well established and have been effective in surveillance and response. The ministries of Railways, Defence, Science and Technology and Labour run a chain of hospitals with attendant laboratory facilities. Some veterinary laboratories/institutes under the Ministry of Agriculture have been identified for undertaking the diagnosis of zoonotic infections.

In addition, there are a large number of laboratories in the private sector. Recently, the MoH&FW constituted a multisectoral expert group to advise and assist the government in preparing a roadmap for the strengthening, integrating and networking of public health laboratories for disease surveillance and outbreak investigations.

However, challenges such as mapping of laboratories; network and integration; availability of trained manpower; validated diagnostic kits and participation in EQAS, remain.

Indonesia

Indonesia has more than 11 000 health laboratories that can be divided into public, private and other categories. There are two directorates in the Ministry of Health, the Directorate of Health Services for routine laboratory services, and the National Institute of Health Research and Development for investigation and outbreak of infectious diseases.

Several disease-specific national laboratory networks have also been established, such as for polio, measles, tuberculosis, HIV and influenza. The networking includes a referral system mechanism, supported by a ministerial decree. However, several challenges remain, especially with regard to the sustainability of the laboratory network, the implementation of the national laboratory regulation and, of course, the paucity of resources.

Maldives

Maldives is highly prone to pandemics and newly emerging infectious diseases because of the high tourist inflow as well as the high incidence of travel abroad. As a result, it is imperative to strengthen the national laboratory investigation mechanism as well as establish a network with laboratories that collaborate with WHO in the Region so as to provide effective and accurate services and achieve the targeted results in tackling diseases.

Currently, two laboratories have been strengthened for testing public health-related pathogens. The first, under the Maldives Food and Drug Authority, is used to conduct tests for water and food species, while the other referral laboratory, situated in the Health Care Institute at the Indira

Gandhi Memorial Hospital, Male, has been strengthened to utilize human samples for emerging and re-emerging infectious diseases.

Myanmar

Myanmar has no laboratory with BSL4 facilities, and only two BSL3 laboratories and four BSL2 laboratories. The total number of health laboratories is 852, with 52 laboratories at the central level, 59 laboratories at the intermediate/provincial level and 741 laboratories at the peripheral/district level. There is no information on the number of health laboratories in the private and other sectors.

However, the public health laboratories have adequate trained staff as well as a system in place that ensures the continuous supply of reagents.

The country's National Laboratory Policy, national laboratory standard and national laboratory accreditation body are not in place. Greater participation in international EQAS/twinning programmes is necessary. Modern equipment as well as expertise and training in methodology, technical assistance and WHO-led consultations are required.

Nepal

Nepal has drafted a National Laboratory Policy that is awaiting the approval of the government. There is no functional BSL3 laboratory but a BSL2+ laboratory is being established at the National Public Health Laboratory (NPHL). Major challenges include a weak national regulatory mechanism, the absence of a national accreditation body, few trained staff and inadequate resources.

The national network of public health laboratories (NPHL) consists of 290 public health laboratories. A few disease-specific national laboratory networks exist for influenza, antimicrobial resistance and tuberculosis. The NPHL participates in international/regional laboratory networks in combating these diseases.

Sri Lanka

Sri Lanka's National Laboratory Policy, 2006, has been created in line with IHR (2005). The country's national laboratory programme is an integral part

of the Health Master Plan, 2007–2016, under the project profile of the Deputy Director-General (Laboratory Services). The policy is currently being legally vetted and will be submitted to Parliament before the end of 2011, after which it acquires the status of an Act.

With the DDG (LS) as the national focal point, a network of laboratories exists in professional colleges alongside a digital network in major health institutions.

Sri Lanka has about 1000 public and private sector laboratories, some of which have highly sophisticated equipment. Government laboratories are manned by consultant medical officers, medical officers and medical laboratory technicians holding a three-year diploma. Private sector laboratories are run by degree and diploma holders. Funds are available to purchase equipment and reagents.

Laboratory standards are defined in the *Manual on Laboratory Services, 2007* (a revised print edition is expected to be published in September 2011). The country's Accreditation Board comes under the Ministry of Science and Technology. Smaller laboratories are connected to the network via satellite.

The public health sector provides free services to all citizens as well as foreign tourists.

Thailand

Thailand had 1003 government laboratories and 332 private laboratories in 2011. Of the government laboratories, 906 belong to the Ministry of Public Health (MoPH), 62 to the Ministry of Defence, 16 are university hospitals, while 19 laboratories come under other organizations. All are hospital laboratories, except 15 in the Department of Medical Sciences (DMSc.) under the MoPH.

In the MoPH, 859 general hospitals (764 at the peripheral level, 83 at the intermediate level and 25 at the central level) come under the Permanent Secretary's Office, while 32 special hospitals belong to other departments. A separate National Laboratory Policy, a National Laboratory Plan and a Human Resource Plan for clinical laboratories exist, but a national advisory body on laboratories does not.

As many as 17 BSL3 and many BSL2 laboratories are in operation. Two national standards, ISO 15189, and Laboratory Accreditation (LA), accredited by the Bureau of Laboratory Quality Standards (BLQS), DMSc and Medical Technology Council, respectively, are available. As many as 80 laboratories have been accredited for ISO 15189, 423 laboratories for LA, 1298 laboratories have been certified by hospital accreditation, and four laboratories have been accredited by WHO.

The Faculty of Medical Technology, Mahidol University, and Bureau of Laboratory Quality Standards provide EQAS in all disciplines of clinical diagnosis, whereas the Department of Medical Sciences, National Institute of Health (NIH), provides proficiency-testing of samples for specific pathogens. All laboratories conduct yearly audits, all testing methods are validated and good practices followed for biosafety and proper waste disposal.

Timor-Leste

Timor-Leste has a National Laboratory Policy and Programme, which mandates the registration of laboratories. There are 20 laboratories in the public sector, at the central, provincial and districts levels, and 20 laboratories in the private sector.

Diseases such as multidrug-resistant tuberculosis (MDR-TB), filariasis, HIV, measles-rubella, Japanese encephalitis (JE) and malaria do have national laboratory networks, but coordination is often difficult.

Major national constraints and the need for possible WHO support exist in the following areas:

(1) Significant support for capacity-building, especially with polymerase chain reaction (PCR) technology, for further examination of diseases such as HIV and TB .

(2) Capacity-building to support surveillance and outbreak investigation.

(3) Procurement of laboratory consumables and reagents equipment.

(4) Establishing a National Accreditation Body for laboratories.

4.2 Plenary sessions

Global Public Health Security and Laboratory Networking

Dr Rajesh Bhatia, Regional Adviser, Blood Safety and Laboratory Technology , WHO-SEARO, briefed on the changing scenario in global public health security as well as the role played by efficient laboratory networks in the early diagnosis of EIDs and epidemiological tracings of the spread of infection. Several EIDs have impacted global health in the last three decades. These include HIV, plague, Ebola, variant Creutzfeldt–Jakob disease (vCJD), Nipah, anthrax, severe acute respiratory syndrome (SARS), cholera, avian influenza and the influenza pandemic.

Laboratories have played a critical role in diagnosing these EIDs which lead to mortality, morbidity, panic and economic loss. Timely and reliable public health laboratory capacities are essential components of any efficient public health response. However, not one institute or Member State in the SEA Region has the facilities or expertise to respond adequately each time an EID strikes the population. That is why networking is a tested solution that makes available the desired expertise in all countries as and when needed.

A network is a type of partnership of like-minded institutes that undertake interdependent activities to deliver high-quality products or services in an area of common interest, e.g. public health services. The structure of a network is flexible and the roles are loosely defined. Leadership is low-key and requires minimal decision-making; there is little conflict; and informal communication is widely prevalent. Networking differs from cooperation, coordination, coalition and collaboration, and needs to be sustainable.

Laboratory networks should be based on their willingness to be mapped; must be flexible in terms of testing range; be able to utilize existing networks (such as those for influenza, polio, etc.); sustainable over periods of relative inactivity; ready to cope with additional workload; willing to cooperate with laboratories; and always ready for a win-win situation. The success of laboratory networks with SARS, polio and influenza needs to be replicated for other diseases.

Some objectives of successful networking are as follows:

- provide referral services;
- information exchange in a transparent manner, thereby improving communication;
- knowledge creation through analysis and research;
- capacity-building;
- exchange/sharing of material;
- improving quality;
- development of new tools/interventions and their evaluation;
- provide surge capacity; and
- expand spectrum of services.

Regional network of public health laboratories: Concept, mechanism and benefits

Ms Sirima Pattamadilok, National Institute of Health, Department of Medical Sciences, Nonthaburi, Thailand, provided insights into the concept, mechanism and benefits of laboratory networking.

The focus of public health laboratory capacity-building will continue to be on emerging diseases under the Asia-Pacific Strategy for Emerging Diseases (APSED) 2010, and these activities need to be coordinated with the WHO Asia-Pacific Strategy for Strengthening Health Laboratory Services 2010-2015. If all countries in the Region agreed to set up a regional network of public health laboratories, she said, the benefits would accrue to the general population.

According to Ms Pattamadilok, the successful polio or measles laboratory networks could become a role model for creating other disease-specific networks. The key components for laboratory capacity-building to support emerging disease management are accurate laboratory diagnosis, laboratory support for surveillance and response, coordination and laboratory networking, and biosafety.

Member States are encouraged to consider the following mechanisms for driving the network: common understanding, standardization of components, and monitoring. Advocacy is required to explore ways to consolidate, improve and sustain such coordination and collaboration mechanisms. The efficient and effective implementation of the regional network of public health laboratories will benefit the Region when dealing with public health threats and emergency responses, she added.

Feasibility, utility and intricacies of networks between health and veterinary sectors

Dr P. Vijayachari of the WHO Collaborating Centre for Diagnosis, Research and Reference on Leptospirosis briefed the participants on the feasibility and utility of creating laboratory networks between human and veterinary laboratories.

Several zoonotic diseases have emerged in the recent past. As per the epidemiological pattern, zoonoses can be classified into four groups, namely direct zoonoses (eg. leptospirosis, influenza, anthrax, brucellosis, salmonellosis and tuberculosis); cyclo-zoonosis (e.g. hydatidosis and teaniasis); metazoonosis (eg. babesiosis, JE, yellow fever, plague, borrelioasis, leishmaniasis); and saprozoonosis (eg. coccidioidomycosis, cryptococosis and histoplasmosis). About 250 zoonoses with varied aetiology (viral, bacterial, parasitic and fungal) have been identified so far, their severity ranging from mild to fatal.

The emergence of the genetic recombination of infective agents such as novel influenza A, H1N1, is challenging, and it is important to understand that they originated from the interaction of the infective agent with a wide variety of animals and man. Interdisciplinary links between veterinary medicine and human medicine may help in better understanding the epidemiology, medical ecology and geographical genomics of infectious agents (genetic changes accumulate in the genome as a repertoire of gene acquisition and loss, on an evolutionary time-scale, which in turn contributes towards flexibility in gene content, gene order and gene regulation) and their prevention and control.

Networks can be useful and effective in the study of: (i) changes in the genetic make-up of the microbe that leads to virulence and pathogenesis; (ii) emerging intermediate phenotypes of the agent; (iii) diversity in animal

vectors, either wild or domestic; (iv) change in the biological spectrum of disease, subclinic infection, clinical syndromes and clinical course; (v) change in the drug susceptibility spectrum of prevalent etiological agents; and (vi) medical ecology of various diseases.

These tasks are usually performed much more effectively by veterinary public health units, their main functions broadly classed into animal-related activities and biomedical activities.

Animal-related activities are mainly focused on: (a) production and processing of food from animal origins; (b) zoonoses surveillance, diagnosis and control; (c) investigation of danger to man and supervision of experimental animals; and (d) interchange of research and diagnostic information and safe disposal of infected animals.

Biomedical activities include: (a) epidemiology/epizootiology; (b) evaluation of efficacy and safety of drugs, biological material and toxic chemicals; (c) investigation on the use and misuse of pesticides; (d) comparative medicine – the development of animal models for disease-comparative biology; and (e) carrying out basic and applied biomedical research.

Perspective of the national administrator participating in the regional network

Prof. Md Abul Faiz, former Director-General of Health Services, Bangladesh, presented the perspective of a national administrator participating in the regional network.

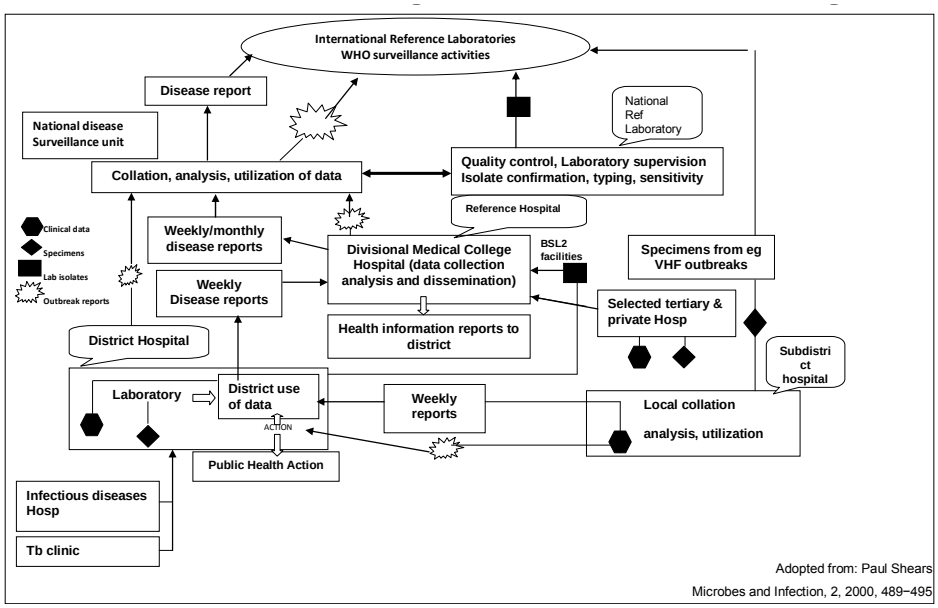
Infectious diseases still dominate the disease profile in low- and middle-income countries of the WHO SEA Region. Along with existing diseases in endemic countries, reports of new emerging illnesses of public health importance have been reported in the last decade, notably SARS, H1N1 and Nipah infection. The diagnosis and treatment of EIDs require a network of quality-assured laboratories at different levels in both the public and private sectors. However, this is nonexistent in many countries, including Bangladesh.

Typically, laboratory services receive little attention in health-care delivery. A basic framework of laboratories should be developed and implemented at different categories of health facilities (Figure 1). A

surveillance of infectious diseases will also provide antimicrobial sensitivity patterns for the provision of evidence-based antibiograms, instead of providing "best-guess" empirical treatment by clinicians. The WHO Strategy for the Prevention and Containment of Antimicrobial Resistance developed by the SEA Region is yet to be implemented in full.

New and emerging diseases should be promptly contained under the aegis of the International Health Regulations (2005) as countries are now committed to reporting events that could have health implications beyond their borders. Many countries, including Bangladesh, have limited capacities in providing adequate laboratory evidence of existing as well as new and emerging illnesses. The inclusion of newer technologies such as BSL3 facilities and molecular diagnostic tools are not optimally available. A network of laboratories within the country and at the regional level, particularly when rapid response is necessary to contain emerging and dangerous pathogens, is necessary.

Figure 1: *Proposed regional networking*



A strategy for surveillance and reporting of selected infectious diseases has been made by Bangladesh, but this is yet to be fully operationalized. It is expected that international organizations under the stewardship of WHO

will continue to provide assistance in training, mentoring and further developing national and regional laboratory networks.

Role of WHO collaborating centres in supporting regional networks

Col. Thippawan Chuenchitra of the Armed Forces Research Institute of Medical Sciences (AFRIMS), Bangkok, the WHO Collaborating Centre (WHO CC) on Emerging Infectious Diseases (EIDs), briefed participants on the activities of WHO CCs with reference to EIDs.

The Armed Forces Research Institute of Medical Sciences is an institution designated by the WHO Director-General to form part of an international collaborative network that carries out activities in support of WHO programmes at all levels. It has been designated as a collaborating centre of WHO for diagnosis, reference, training and investigation of EIDs since 2005.

The AFRIMS, located in Bangkok, Thailand, was founded in 1958 by a group of scientists from Thailand and the United States of America to study the cholera epidemic in Thailand. The US–Thai military medical research venture's mission is to provide medical research, and conduct disease surveillance, and development and evaluation of products for militarily important infectious diseases in order to protect, treat and optimize the health and performance of military and civilian populations.

The roles of the WHO CC of AFRIMS are: (i) to provide training in laboratory biosafety and laboratory diagnostics of endemic, emerging or re-emerging diseases of epidemic potential to countries of the Region; (ii) to act as a diagnostic reference laboratory; (iii) to provide technical expertise for laboratory-based diagnosis; (iv) to assist in outbreak investigations and in the development of preventive measures; (v) to collaborate with regional and global alliances and partners for strengthening laboratory-based disease surveillance and response and public health research; and (vi) to disseminate research findings and technical information on diagnosis, prevention and control.

The essential factors contributing to the success of the WHO CCs for disease prevention and control are human resource development, capacity-building, enhancing national and international networks and collaboration

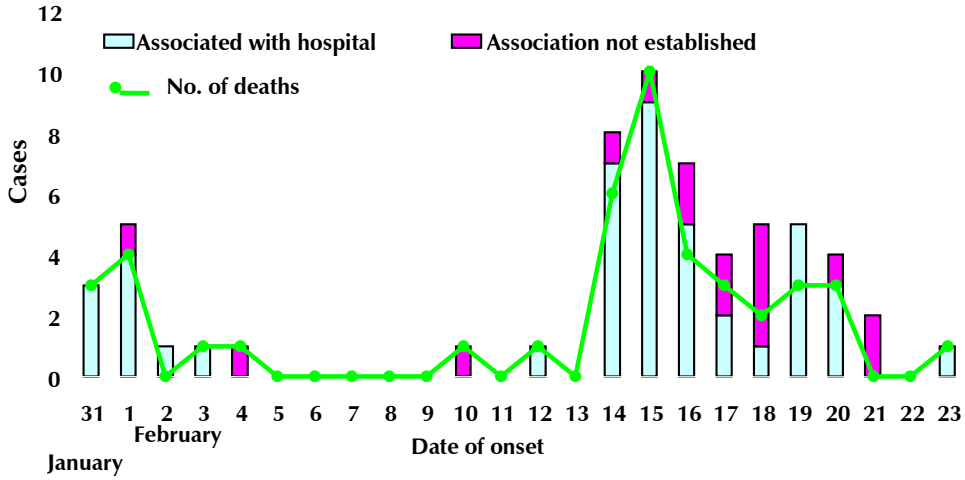
among WHO CCs, as well as improving the collaborative activities of WHO CCs.

Generic network of public health laboratories for EID

Dr A.C. Mishra, Director, WHO CC on EID at the National Institute of Virology, Pune, India, briefed participants on the essentials of generic networks. The role of laboratories in public health, especially in the investigation of outbreaks, has expanded phenomenally and that is why only networks are able to provide the requisite support.

Diagnosing the first Nipah outbreak in India, for instance, would not have been possible without collaboration and networking. In fact, in the initial phase of the Nipah outbreak there was high mortality among health workers and even its diagnosis was not established without help from the Centers for Disease Control and Prevention (CDC), Atlanta, USA.

***Figure 2**: Outbreak of Nipah in Siliguri, India*



Laboratory networks have also played key roles in the diagnosis of outbreaks of infectious diseases such as chandipura, chikungunya and avian influenza in India caused by the H5N1 virus. According to Dr Mishra, strong networks lend credibility to public health laboratories through the use of scientific data, technical support and independent teams, which can

validate the audit findings before they are made public. Publications in peer-reviewed journals also help.

The conditions to establish a network are as follows:

- identifying the problem;
- identifying partners;
- willingness to join the network;
- permission of appropriate authorities;
- terms of reference (ToRs);
- memorandum of understanding (MoU); and
- funding.

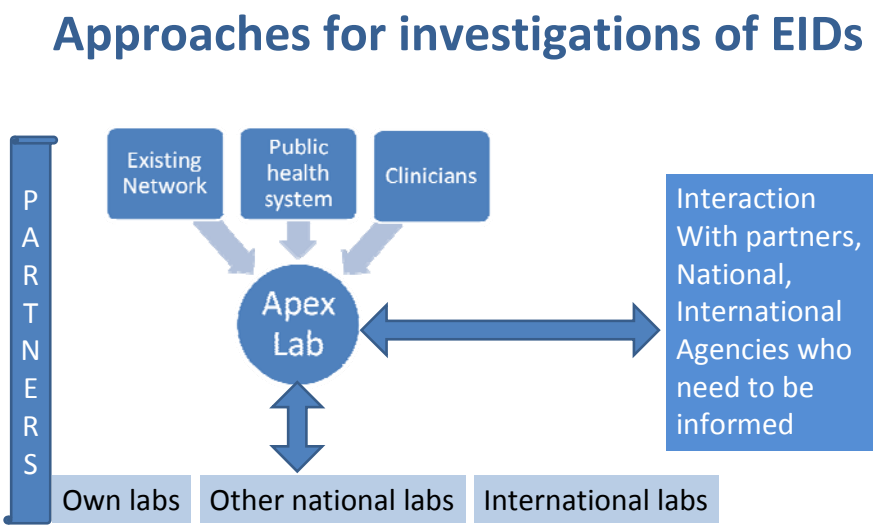
The conditions for individuals to join a network are as follows:

- infrastructure;
- manpower;
- common protocols;
- SOPs;
- supply of reagents/kits;
- communications;
- biosafety and biosecurity; and
- surge capacity.

The sustainability of high-performing networks can be maintained through continuous training and high-quality laboratory output, Dr Mishra said.

The approaches for investigation of EIDs are given in Figure 3.

***Figure 3**: Approaches for investigation of EIDs*



Linkages of regional laboratory networks with global networks

Dr Renu Drager-Dayal, WHO headquarters, Geneva, highlighted the importance of linkages of regional networks with global networks, especially of highly pathogenic organisms (e.g. those causing haemorrhagic fevers or acute encephalitis syndromes) for the benefit of both global and regional networks.

She enumerated the lessons learnt from the outbreaks of Ebola and Rift Valley fever in Africa and subsequent global efforts in building local capacity as well as forging networks to respond to these outbreaks. These networks are now becoming part of the Emerging and Dangerous Pathogens Laboratory Network (EDPLN), whose aim is to harness global expertise and infrastructure against these diseases.

Quality laboratories as participants in regional networks

Mrs Suwanna, Director, WHO CC on Strengthening Quality in Health Laboratories, Thailand, reiterated the centrality of high quality in all activities performed by laboratories. She highlighted the need for national quality standards and EQAS. While it was good to participate in International External Quality Assessment Schemes (IEQAS) for strengthening national capacity, it was also essential to have National

External Quality Assessment Schemes (NEQAS) for diagnosing EIDs. She gave examples from Thailand on the mechanisms followed in the last decade to improve laboratory quality as well as strengthen the accreditation mechanism.

4.3 Group work

The participants had extensive discussions in groups with the following terms of reference:

- Identify laboratory support mechanisms in the investigation of outbreaks of unknown aetiology.
- Identify diseases for which networks are needed in the Region (plague, Nipah, AES, anthrax, haemorrhagic fevers, leptospirosis) – why do these diseases require laboratory networks?
- Identify laboratories that can coordinate networks.
- Identify national laboratories that can act as members of networks.
- Identify roles of laboratories outside the health sector, including the private sector.
- Develop terms of reference for network members as well as the coordinator.
- Identify workable mechanisms for administrative and government approvals.
- Suggest a timeframe for the operationalization of networks.
- Propose a mechanism for sustaining networks.
- What should be the step-by-step approach to forge these networks?
- Recommend actions by participants, the government and WHO.

The salient outcomes of the group work were as follows:

(1) Regional laboratory networks for the following priority EIDs should be forged:

- unusual haemorrhagic fevers

- plague
- unusual acute encephalitic syndrome
- leptospirosis
- anthrax
- highly pathogenic avian influenza

(2) The criteria for prioritizing laboratory networks for these diseases were:

- Emerging diseases with epidemic potential in the SEA Region
- High morbidity, mortality and disability
- Diagnostic capacity not well developed
- No specific treatment or effective vaccines
- No existing networks for early diagnosis

The participants agreed to have coordinating laboratories for these networks and proposed the following institutes to act as coordinators for the Regional Laboratory Networks:

Table 2: ***Proposed coordinators of Regional Laboratory Networks***

Disease	Coordinating institute
Anthrax	National Centre for Disease Control, Delhi, India.
Plague	National Centre for Disease Control, Delhi, India.
Leptospirosis	RMRC, ICMR, Port Blair, India (WHO CC on Leptospirosis).
Unusual haemorrhagic fevers	National Institute of Virology, Pune, India (WHO CC on EID). National Institute of Health, Thailand, Nonthaburi.
Unusual acute encephalitis syndrome	National Institute of Virology, Pune, India (WHO CC on EID). National Institute of Health, Nonthaburi, Thailand.
Highly pathogenic avian influenza	National Institute for Health Research and Development, Jakarta, Indonesia.

(3) The following terms of reference for coordinating laboratories were suggested and agreed to:

- Timely submission of immediate information on occurrence of unusual disease outbreaks, and any other relevant information on surveillance and control.
- Sharing of technology.
- Quality assurance.
- Clinical sample sharing.
- Capacity-building.

5. Recommendations and conclusions

The participants agreed to forge regional networks for selected priority EIDs that included anthrax, unusual haemorrhagic fevers, unusual acute encephalitis syndrome (AES), plague and leptospirosis, and highly pathogenic avian influenza. They also agreed that in future these networks could be expanded in terms of their spectrum of activities for other diseases as well as with regard to membership.

The participants recognized that the establishment of regional networks shall not only strengthen regional self-reliance in the fight against EIDs but also provide technical assistance for building national capacity against communicable diseases, and to mitigate the misery of people and fulfil national obligations towards the International Health Regulations (2005).

Accordingly, participants made recommendations and committed themselves to advocate with their respective national authorities the need and importance of participating in regional laboratory networks for EIDs.

Recommendations

Recommendations for Member States

Member States should:

(1) Accord formal approval to national public health or other designated laboratories to participate in the regional network of laboratories for EIDs.

(2) Utilize regional networks for initiating public health actions against EIDs whenever necessary.

(3) Avail facilities and expertise available through regional networks to build national laboratory capacity against EIDs and core competence related to laboratories as enunciated in the IHR (2005).

(4) Through the regional networks :

(a) Actively share technical information and knowledge on advances in EIDs with other members of the network.

(b) Disseminate technical information available from the networks to other laboratories in the country.

(c) Provide technical support on request, as much as possible, to other members of the network.

(d) As per the national norms and laws, exchange biological material with members of the network in accordance with national regulations and as per prior agreement with the recipient member of the network.

(e) Share available technical material with WHO to post on its website for wider dissemination.

Recommendations for the World Health Organization

WHO should:

(1) Advocate with national authorities on the importance of national laboratories participating in the regional laboratory networks for EIDs.

(2) Facilitate operations of regional networks, especially for efficient exchange of biological material and technical knowledge.

(3) Provide a platform for consolidating laboratory-related, technical resources available within the Region for easy access by all Member States.

(4) Periodically organize physical meetings of networks, especially to expand membership and the spectrum of activities.

(5) Provide non-commercial reagents and other essential supplies that may be needed for the efficient functioning of the networks and also support their local production.

(6) Facilitate linkages between regional laboratory networks and appropriate global laboratory networks to harness global expertise for the benefit of the people of the Region.

Annex 1

List of participants

Bangladesh

Dr AKM Sakawat Hossain
Director
Institute of Public Health
Mohakhali
Dhaka

Dr Mohiuddin Ahmed
Deputy Secretary
Ministry of Health and Family Welfare
Dhaka

Bhutan

Mr Sonam Wangchuk
Head of Pubic Health Laboratory
Department of Public Health
Thimphu

DPR Korea

Dr Kang Kwang Bin
Official Responsible for laboratory
Ministry of Public Health

Dr Kim Jong Myong
Laboratory Technician
Pyongyang City Hygiene and Anti-epidemic Institute

Dr Um Hak Se
Interpreter

India

Dr Mala Chhabra
Joint Director
National Centre for Disease Control
22, Shamnath Marg
Delhi

Dr Lata Kapoor
Assistant Director
National Centre for Disease Control
22, Shamnath Marg
Delhi

Indonesia

Dr Krishna Nur Adriana Pangesti
Researcher
Centre for Biomedical and Basic Technology of Health
National Institute of Health Research and Development
Ministry of Health
Jakarta

Dr Sri Widyastuti
Head, Sub-Directorate Microbiology and Immunology Services
Directorate of Medical Support and Health Facilitate
Jakarta

Dr Bambang Heriyanto
National Institute of Health Research and Development
Ministry of Health
Jakarta

Ms Farida D. Handayani
National Institute of Health Research and Development
Ministry of Health
Jakarta

Dr Armedy Ronny Hasugian
National Institute of Health Research and Development
Ministry of Health
Jakarta

Maldives

Mr Mohamed Rameez
Director
Centre for Community Health and Disease Control
Ministry of Health & Family
Male

Myanmar

Dr Khin Hlaing Wai
Deputy Director
Central Epidemiology Unit
Department of Health
Naypyitaw

Dr Win Thein
Deputy Director
National Health Laboratory
Yangon

Nepal

Dr Senendra Raj Upreti
Chief
Curative Service Division
Ministry of Health and Population
Ramshah Path
Kathmandu

Dr Geeta Shakya
Director
National Public Health Laboratory
Kathmandu

Sri Lanka

Dr MGP Samarasinghe
Deputy Director-General
(Laboratory Services)
Ministry of Health
Colombo

Dr Saman Peduru Hewa
Consultant Clinical Pathologist
Teaching Hospital
Kandy

Thailand

Miss Krongkaew Supawat
Medical Scientist, Expert Level
National Institute of Health
Department of Medical Sciences
Ministry of Public Health
Tivanond Road
Nonthaburi 11000

Miss Aree Thattiyaphong
Medical Technologist
Senior Professional Level
National Institute of Health
Department of Medical Sciences
Ministry of Public Health
Tivanond Road
Nonthaburi 11000

Timor-Leste

Dra Maria Santina de Jesus Gomes
Director-General and President Counsel
Administration for the National Laboratory
Ministry of Health
Dili

Temporary Advisers

Dr Ajith Mendis
Director-General Health Services
Ministry of Health
Colombo
Sri Lanka

Dr A.C. Mishra
Director
WHO CC on Emerging Infectious Diseases
National Institute of Virology
Pune
India

Dr Sirima Pattamadilok
Head, Neural and Circulatory Systems Virus
Laboratory
Deputy Director, National Institute of Health
Department of Medical Sciences
Ministry of Public Health
Nonthaburi 11000
Thailand

Prof. Abul Faiz
Former Director-General
Department of medicine
Sir Salimullah Medical College and Hospital
Dhaka
Bangladesh

Dr Suwanna Charunut
Director
WHO CC on Quality in Health Laboratories
Bureau of Laboratory Quality Standards (BLQS)
Ministry of Public Health
Nonthaburi
Thailand

Dr Paluru Vijayachari
Principal Investigator of WHO CC for Diagnosis, Reference,
Research and Training in Leptospirosis
Regional Medical Research Centre (RMRC)
Indian Council of Medical Research
Post Bag No. 13, Port Blair
Andaman and Nicobar Islands
India

WHO Secretariat

HQ

Dr Renu Dayal Drager
Scientist, Project leader EDPLN
Global Alert and Response
Health Security and Environment
World Health Organization
Geneva

SEARO

Dr Rajesh Bhatia
Regional Adviser
Blood Safety and Laboratory Technology
WHO-SEARO
New Delhi

Dr Aparna S. Shah
TIP (Laboratories)
WHO-SEARO
New Delhi

Others

Col. Thippawan Chuenchitra
Armed Forces Research Institute of Medical Sciences (AFRIMS)
WHO CC on Emerging Diseases
US Army Medical Component
Bangkok 10400
Thailand

Annex 2

Agenda

(1) Inauguration and Introduction.

(2) Review of status of existing networks (national/regional) of public health laboratories in the Region.

(3) IHR (2005) and role of core competence in laboratories.

(4) Network of priority emerging diseases: requirements, ToR and mechanism.

(5) Step-by-step approach to operationalize networks.

(6) Quality systems and safety in laboratories.

(7) Identification of needs/gaps, proposal of solutions for efficient networking.

(8) Development of key follow-up action points.

(9) Conclusions and recommendations.

(10) Closing session.

Laboratories play a critical role in the rapid determination of the cause of the outbreak, characterization of the pathogen to understand its molecular features, and to suggest appropriate therapy and control measures. Since no single laboratory or institution in the Region has the requisite infrastructure or expertise to provide these comprehensive services, regional networks of laboratories are essential to meet this need. To forge regional laboratory networks for priority emerging infectious diseases, WHO organized a meeting at Bangkok, Thailand and this report contains the proceedings and outcomes of this meeting.

World Health Organization
Regional Office for South-East Asia
World Health House
Indraprastha Estate,
Mahatma Gandhi Marg,
New Delhi-110002, India
Website: www.searo.who.int

SEA-HLM-422