Summary report on the

Regional consultative meeting on the Emerging and Dangerous Pathogens Laboratory Network (EDPLN)

WHO-EM/CSR/168/E

Cairo, Egypt
22–23 August 2017

World Health Organization
REGIONAL OFFICE FOR THE Eastern Mediterranean

WHO-EM/CSR/168/E

Summary report on the

Regional consultative meeting on the Emerging and Dangerous Pathogens Laboratory Network (EDPLN)

Cairo, Egypt
22–23 August 2017

World Health Organization
REGIONAL OFFICE FOR THE Eastern Mediterranean

Document WHO-EM/CSR/168/E

Contents

1. Introduction

The countries in the World Health Organization (WHO) Eastern Mediterranean Region experience frequent epidemics from emerging and dangerous pathogens (EDP). These include, but are not limited to, anthrax, chikungunya, cholera, Crimean-Congo haemorrhagic fever, dengue, epidemic typhus, Middle East respiratory syndrome-related coronavirus (MERS-CoV), plague, Rift Valley fever (RVF), West Nile virus and yellow fever. Early confirmation of these diseases requires specialized laboratories with appropriate biosafety levels, capacity for accurate detection and diagnosis of emerging viral and bacterial pathogens, and a referral network of laboratories to provide advanced diagnostic services.

As part of assessing current capacities in the Region, WHO conducted a self-assessment survey and site visits to selected public health laboratories to assess the biosafety, readiness and capacity for timely detection and response to EDP.

In order to enhance the laboratory diagnostic capacity of public health laboratories in the Region for detection of EDP, especially those causing viral haemorrhagic fever, WHO is looking to establish a regional network of high security laboratories. The purpose of this network would be to enhance both the readiness and response of countries for timely laboratory detection and management of outbreaks of EDP, and to facilitate the transfer of safe and appropriate diagnostic technologies, practices and training to laboratories in the Region. The technical capacity of public health laboratories for detection and reporting of EDP would be improved, and some may be able to function as regional reference laboratories for confirmation of viral haemorrhagic fever cases and outbreaks caused by other EDP, such as plague.

Against this background, the WHO Regional Office for the Eastern Mediterranean organized a regional consultative meeting on the WHO Emerging and Dangerous Pathogens Laboratory Network (EDPLN) in Cairo, Egypt, from 22 to 23 August 2017.

The objectives of the meeting were to:

- review the findings from the self-assessment survey on laboratory capacities in the Region to diagnose and respond to EDP;
- present the concept and role of the EDPLN in the Region, taking into consideration the global experience of such networks existing in other WHO regions; and
- discuss and finalize the terms of reference for the Eastern Mediterranean Region EDPLN and define key priority activities for the functioning of the Network.

The meeting was attended by 43 participants, including directors and representatives of central public health and animal health laboratories, Ministry of Health communicable disease control departments and Pasteur Institutes from 18 countries in the Region, as well as WHO staff from headquarters, regional and country levels.

The first day of the meeting provided an overview of EDP and laboratory capacities in the Region, EDP laboratory networks in other WHO regions, the role of these networks in research and development for new diagnostic tools and technology for detection of EDP, and country experiences in dealing with EDP in the Region. On the second day, the concept, role and function of the EDPLN were discussed and draft terms of reference finalized.

2. Summary of discussions

EDP threats in the Eastern Mediterranean Region

The Eastern Mediterranean Region faces several challenges, including frequent epidemics from a number of EDP. In addition, ongoing humanitarian crises makes many countries' health systems extremely vulnerable. There are approximately 76 million people in the Region living in countries experiencing humanitarian crises or complex emergencies. The Region also hosts annual mass gathering events that provide opportunities for rapid regional and international spread of infectious diseases. The differences in income and socioeconomic development amongst countries, negatively affects health system capacities for early detection and timely response to EDP.

EDP caused outbreaks in at least 16 of the 22 countries in the Region during 2000–2016. These include A(H5N1) influenza, Alkhurma haemorrhagic fever, chikungunya, cholera, Crimean-Congo haemorrhagic fever, dengue fever, hepatitis A and E, meningococcal meningitis, MERS-CoV, Rift Valley fever and yellow fever. Most outbreaks were detected late and the response delayed as a result. A number of factors, including absence of appropriate laboratory capacities and weak collaboration between animal and human health sectors in the Region, contributed to these delays.

Ways to improve preparedness and response include strengthening surveillance and laboratory networks to detect, control and prevent emerging disease threats, improving public health infrastructure, the development and update of national, regional and international standards, guidelines and recommendations, and strengthening regional and international capabilities to respond to infectious disease

outbreaks with adequate medical and scientific resources, infrastructure, equipment and expertise.

Overview of global networks and their contribution to outbreak response and research and development for EDP

The Global Outbreak Alert and Response Network (GOARN) is an operational partnership hosted by WHO to coordinate outbreak response support. Partners rely on WHO for leadership, information and logistics. GOARN was established in 2000, with a founding group of 60 institutions, and now comprises over 200 partners and networks, and reaches an additional 500 institutions through network hubs and cascades. GOARN focuses on governance and oversight, alert and risk assessment, coordinated rapid response capacities, training, conducting research and developing tools. In addition to coordinating the response to outbreaks, GOARN can be an operational platform for research in emergencies and between outbreaks.

The WHO EDPLN is part of GOARN and is made up of global and regional EDPLN networks of high security diagnostic laboratories able and willing to collaborate and share their knowledge, biological materials and experimental research results in a real-time framework to detect, diagnose and control novel disease threats. A total of 23 human and animal high security laboratories (biosafety level 4 and selected biosafety level 3) are EDPLN members. EPDLN missions include: reducing the international spread of emerging infectious disease outbreaks; supporting long-term outbreak preparedness; encouraging sharing of pathogens specimens and fair and equitable access to technology transfer; and supporting development of assays and reagents. The EDPLN also provides technical support such as standard operating procedures and laboratory testing strategies for emerging infectious diseases, and serves as a platform for research and development on emerging infectious

diseases. During the 2014–2016 Ebola virus disease outbreaks, the EDPLN supported real-time sequencing, assessed and validated three rapid diagnostic tests and six nucleic acid tests, and provided laboratory support for vaccine and therapeutics trials.

Current laboratory capacities and collaboration in the Region

Several assessments have highlighted existing capacities, gaps and ways to improve the preparedness and response to infectious diseases. International Health Regulations 2005 (IHR 2005) Joint External Evaluation (JEE) missions conducted in several countries in the Region indicate that all countries have established electronic systems to implement active indicator and syndromic surveillance. However, an event-based surveillance system is not fully established and functioning. On laboratory, most countries have laboratory systems that are able to detect 5–10 core tests, but few have a designated reference laboratory. All countries have functioning specimen transport mechanisms, but few meet international standards. Regarding biosafety, all countries have established an accreditation and licensing process for private and public laboratories, but none has a national system for quality assurance and biosafety/biosecurity.

As part of a mapping of health laboratories, 45 laboratories in the Region participated in an independent assessment, including public, private, nongovernmental organization and academic laboratories. One third achieved international/national accreditation. Most have biosafety level 2 facilities and six have biosafety level 3 facilities. There is currently no biosafety level 4 laboratory in the Region. Findings of this assessment indicate that the baseline conditions of health laboratory services vary widely from country to country. Most countries have a solid foundation but challenges remain. Quality management, biorisk management, and network and coordination need to be prioritized

across the Region. Next steps for health laboratories include assessing candidate laboratories to become regional or reference laboratories, building their capacities, and enrolling them in the relevant external quality assessment schemes. Experience sharing and communication between countries and at a regional level will help speed up implementation and achieve better results.

A self-assessment for EDP, involving 21 laboratories in the Region, provided a baseline and helped identify opportunities for leveraging and building on existing resources. On specimen referral and testing, 55% of surveyed laboratories reported having an inventory for tracking shipments. The assessment highlighted the need to establish a training programme for safe packaging and transportation of EDP at a national level, as 50% of surveyed laboratories reported not having such training. Capacities exist within the Region for molecular and serological techniques for EDP diagnosis, and laboratories with these capacities are willing to offer training and, in some cases, reagents. Despite 60% of laboratories reporting an operational protocol in place to procure molecular reagents during outbreak response, this remains an issue. Although 70% of responding laboratories indicated they have capacity to deploy equipment, human resources and reagents in the case of emergencies within their country, only 25% indicated that they had this capacity for within the Region. Currently, there are no mobile laboratories in the Region.

Collaboration on diagnosis of EDP needs substantial strengthening. Currently, limited collaboration exists between public health laboratories and veterinary laboratories nationally and regionally, or support and collaboration among countries in the Region. This could be due to the lack of enabling national policies and regulations, as well as limited existing collaboration mechanisms among countries. This may result in poor coordination during outbreaks or humanitarian crises.

The assessments highlight gaps in laboratory capacities in the Region, with most countries having limited capacities for early detection and diagnosis of EDP. However, some laboratories have specialized skills in diagnosis for one or more specific EDP and should be regional or national reference laboratories for one or more specific pathogens. WHO has put substantial effort into strengthening laboratory capacities for individual countries based on their current needs. Establishing a reference laboratory in each country may not be realistic due to varied infectious diseases patterns and limited resources among countries. However, sharing experience and technologies among laboratories would be a feasible approach, and establishing a laboratory network is a feasible and effective way to narrow laboratory capacity gaps and improve early detection and timely response to EDP.

Examples of country capacities for responding to different EDP

Lessons learned from Pakistan while facing its first major outbreak of chikungunya virus highlighted the need for strengthening event-based surveillance and rapid response. Although Pakistan was able to detect and diagnose chikungunya virus, challenges included the availability of confirmatory assay and the need to establish a referral/shipment system of samples given the lack of public health testing facilities at provincial level. To improve preparedness and response, Pakistan will be developing/reviewing guidelines for integrated vector-borne diseases surveillance and vector control strategies, and laboratory diagnostics, with a focus on point-of-care testing.

Crimean-Congo haemorrhagic fever has been reported in the Islamic Republic of Iran for two decades. The country has strengthened early detection and investigation of suspected cases, which in turn has accelerated the diagnosis and treatment of cases. The surveillance system is based on an electronic disease-based system and integrates

human and animal surveillance data. The Institut Pasteur in the country is the Crimean-Congo haemorrhagic fever national reference laboratory.

The Islamic Republic of Iran has also seen a decrease in rabies cases. This can be explained by close collaboration among the Ministry of Agriculture (in charge of owned dog samples and testing), Ministry of Environment (in charge of wild animals), Ministry of Health (in charge of dog bite management in humans), and Ministry of Interior (in charge of implementing local policy on owned dog control). This was facilitated through the establishment of a national committee and the maintenance of a strong laboratory network across the country.

Saudi Arabia has been managing MERS-CoV cases since 2012. The country has built a system, the Health Electronic Surveillance Network, to timely manage and process suspect case alerts, sample collection, shipments, testing and reporting. The Network allows each level of the surveillance system, including local hospitals, referral hospitals, carriers, the Local Health Affairs directorate and others, to intervene in the process in a timely fashion. The system improves case management and field investigation, and connects epidemiological, clinical and laboratory databases.

Egypt has developed, under the Ministry of Health and Population, an integrated surveillance system for pneumonia, avian influenza, severe acute respiratory infections and influenza-like illness, all reporting to the Central Public Health Laboratory The system links community-based surveillance, health care facilities at several levels and laboratories. It builds on a strong collaboration between public health and veterinary sections, notably in sharing information, producing joint risk assessment and joint field investigation. Key successes include broad communication with all stakeholders, capacity-building at all levels and increased awareness. Future steps include further

laboratory strengthening (full gene sequencing and antiviral characteristics), and serological and epidemiological studies.

In Jordan, the Princess Haya Biotechnology Center, established in 2003, focuses on translating knowledge and technology for the service of students, researchers and communities. The Center is able to provide training and capacity-building for biorisk management and genomics, and can support diagnostics and sequencing within the Region. The Center works closely with Los Alamos National Laboratory in the United States of America, particularly on molecular diagnostics for infectious diseases. It is supported by many international partners, including Canada, Centers for Disease Control and Prevention (CDC), Defense Threat Reduction Agency, and Walter Reed Army Medical Center.

The benefits of a regional EDPLN for the Region

Examples of regional EDPLNs exist in the WHO's European Region (EVD-LabNet, 76 members), Africa Region (13 members), South-East Asia Region (ASEAN project, three members), and West Pacific Region (ASEAN project, seven members).

A regional EDPLN could be a platform for research and development on measures against EDP. Crimean-Congo haemorrhagic fever could be a case study as it is widely distributed in the Region. A current challenge is the delay incurred by relying on reverse transcription polymerase chain reaction (RT-PCR) undertaken in centralized reference laboratories, which delays time to treatment and isolation, and increases the risk to health care workers. A regional EDPLN could support the development of a commercially-available, biosafe, rapid, viraemia-quantifying, point-of-care test with operational characteristics suited to field use or use in low-resource and/or low-capacity settings. In addition, a regional

EDPLN could support research into Crimean-Congo haemorrhagic fever therapies. The success of Crimean-Congo haemorrhagic fever research and development efforts will depend on collaboration between high-resource countries and endemic countries, and on leveraging existing networks, collaboration and projects to minimize duplication of effort and ensure collaborative sharing of information.

A regional EDPLN could also support regional capacities for early detection and control of three bacterial epidemic diseases of concern in the Region: anthrax, epidemic typhus and plague. These diseases can be as severe and challenging to control as viral diseases. Because of their potential for weaponization, there occurrence raises concerns that go beyond public health, especially in areas of conflict. Early detection is key and control measures at community level can be complex to implement. WHO Collaborating Centres are available to train and support national reference laboratories, and to provide them with the requested reagents.

Steps to establish a regional EDPLN

The countries present unanimously agreed on setting up an EDPLN for the Region. Moving forward, several arrangements need to be further discussed and agreed upon: the benefits of establishing the EDPLN, roles and responsibilities of countries and WHO, and terms of reference of the EDPLN.

The main goal of the network is to improve early detection and response to outbreaks. In addition, it intends to enable laboratories to participate in research and development initiatives through the development of diagnostics, standards and capacities in research and development of EDP, targeting technical and professional support, and experience, expertise and technology exchange among laboratories. This will provide

opportunities to develop new diagnostic technologies for EDP in the Region, and create a platform for better connection and communication among laboratories in countries and with those outside the Region.

Countries should play a key role in identifying laboratory profiles and advocating for commitment for better connections, communication and coordination among laboratories nationally. The laboratory profile for EDP diagnosis should be identified in each country. To avoid wasting available resources and time, all countries in the Region should assess or identify their own laboratory capacities before requesting support from outside. Each country should identify a list of laboratories that are able to detect specific types of EDP, and then conduct a capacity assessment to nominate which laboratory in the list would be competent to be a national/regional reference laboratory and for which EDP.

Following a One Health approach, each country should develop close collaboration mechanisms between public health and veterinary laboratories.

Pooling experts and mapping laboratories with specific technical capacities will facilitate sharing of technical support, experience, and expertise, technologies exchange, and specimen management.

WHO will play a vital role in establishing, maintaining and supporting the regional EDPLN. WHO should advocate in regional meetings for commitment from countries and for the related regulation and legislation development. WHO should also support the creation of a platform for better connection, communication and coordination among countries and with other Regions.

Most laboratories in the Region have not been accredited at national level, and WHO should encourage and promote national laboratory

accreditations, as well as provide further support in monitoring and evaluation, particularly for external evaluation involving well-known external laboratories and WHO Collaboration Centres.

Regarding research activities, a research agenda should be developed for laboratories, supported by regulation and legislation on conducting research, including on ethical issues, biosafety and biosecurity.

To ensure sustainability and support for the functions and activities of the EDPLN, WHO should share best practices, provide guidelines, protocols and standard operating procedures related to EDP, and build laboratory capacities through training and consultative meetings, as well as involving laboratories in research and development.

Terms of reference for the regional EDPLN

The draft terms of reference for the regional EDPLN, outlining five overall objectives and a set of activities, were reviewed and discussed in five working groups. All working groups agreed with them.

Additional suggestions included the following.

- National preparedness and response plans for epidemics should be closely linked with the situation analysis of laboratory capacities at national level.
- Mapping and assessing laboratory capacities at national level should include the private sector, other governmental sectors and deployment of mobile laboratories.
- A formal material transfer agreement between countries for sharing specimens, data and publication should be considered by countries.
- Legislations, ethics, conflicts of interest and confidential issues should also be considered.

3. Conclusions

Representatives from 18 countries unanimously agreed to establish a regional EDPLN. The following benefits of doing this were identified.

- The capacities of public health and veterinary laboratories in the Region will be enhanced for timely detection and diagnosis of emerging and high threat pathogens.
- The readiness and operational capacities of laboratories in the countries of the Region will be strengthened so that these laboratories can participate in outbreak response operations in the Region, including through deploying mobile laboratories in outbreak settings, thereby reducing dependency on support from laboratories outside the Region.
- The Network will facilitate the transfer of safe and appropriate diagnostic technologies, practices and training to laboratories in the Region, enabling them to participate in research and development for emerging pathogens included in WHO's Research and Development Blueprint for action to prevent epidemics.
- The Network will help more laboratories from the Region to be recognized as WHO Collaborating Centres for emerging pathogens (there are currently none) through forging cross-collaboration with laboratories outside the Region.

4. Recommendations

To Member States

1. Establish a national pool of experts composed of well-trained technicians in the management of specimens (such as in sample shipment, handling, biosafety, biosecurity and so on).

2. Advocate for the commitment and support of all member laboratories to EDPLN functions, taking into account national laws and regulations pertaining to international cooperation.

To WHO

3. Identify an EDP research agenda for the Region.
4. Promote better communication between countries to encourage countries to volunteer support for other countries within and beyond the Network.
5. Consider ethical issues in research and development on EDP, and security issues (biosafety/biosecurity).
6. Encourage national laboratory accreditation.
7. Support EDPLN member countries to monitor and externally evaluate their laboratories, involving external laboratories (WHO Collaborating Centres) when required.
8. Promote and make a case for a regional EDPLN to support resource mobilization.
9. Advocate for improvement in national regulations and legislation.
10. Link and align Network activities with other laboratory strengthening initiatives and strategies, including the regional strategic framework for strengthening health laboratory services 2016–2020.
11. Organize annual meetings for the managers of laboratories in the regional EDPLN.

5. Next steps

The meeting concluded with the following list of priority actions for implementation regarding the functioning of the regional EDPLN.

- Finalize the terms of reference and share with all Member States in the Region.

- Establish mechanisms of collaboration and communication within the Network.
- Establish working groups on specific technical areas (diagnosis, response, research and development, biosafety and knowledge management).
- Promote and facilitate the exchange of experiences, expertise and technologies.
- Prioritize capacity-building activities.
- Establish the criteria and process for choosing regional laboratories and identify specific/reference laboratories to provide support nationally and to other countries in the Region.
- Adapt, adopt and establish standard testing algorithms and operational modalities, protocols and guidance notes.
- Adopt and adapt benefit-sharing schemes.
- Ensure technical capacities and human resource expertise in the Region are updated.
- Apply the One Health approach and promote close links between laboratory and surveillance, as well as laboratory and clinical medicine.

World Health Organization
Regional Office for the Eastern Mediterranean
P.O. Box 7608, Nasr City 11371
Cairo, Egypt
www.emro.who.int