

Summary report on the

WHO-EM/LAB/384/E

Intercountry meeting of the directors of public health laboratories in the Eastern Mediterranean Region

Tunis, Tunisia
24–27 February 2015



**World Health
Organization**

Regional Office for the Eastern Mediterranean

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1. Introduction

The intercountry meeting of the directors of public health laboratories in the Eastern Mediterranean Region was held in Tunis, Tunisia from 24 to 27 February 2015. Around 33 participants, including representatives from 17 Member States, temporary advisers, partner organizations, and WHO secretariat attended the meeting. The objectives of the meeting were to:

- review the status of the public health laboratories;
- review the draft regional public health laboratory strategic plan and endorse it for implementation in Member States;
- discuss ways to strengthen laboratory quality management system, biorisk, data management, equipment maintenance and diagnosis of infectious diseases of public health concern to meet the needs of International Health Regulations (2005); and
- adopt recommendations for improving the performance of the public health laboratories.

2. Summary of discussions

2.1 Overview

The introductory session included presentations on WHO global strategy and role of public health laboratory networks in detection of outbreaks of emerging infectious diseases and situation analysis of public health laboratories in the Eastern Mediterranean Region.

The meeting concluded that the role of public health laboratory networks remains critical for detection, surveillance and response to epidemic-prone diseases and implementation of the International Health Regulations (IHR) 2005. There exist a number of well-

established global and regional disease-specific networks that have good infrastructure and expertise and can serve to improve preparedness to emerging pathogens. At the same time, networks for bacterial diseases are lacking, intersectoral collaboration (e.g. with animal health sector) is minimal, specimen referral, access to reagents and quality control/quality assurance of testing remain challenges and subnational public health laboratory networks are weak. National regulatory frameworks for laboratory services are either lacking or inconsistent, quality management and information management systems are weak and inefficient. Many challenges remain related to human resources, infrastructure, equipment and reagents and supplies. There is a need for integrated action, especially at national level, to address cross-cutting issues, such as biosafety, quality management, specimen collection and transport.

2.2 Laboratory quality management system

Tools are available to facilitate implementation of a laboratory quality management system (LQMS). The tools, developed by WHO jointly with other organizations, are the LQMS Training Toolkit, LQMS handbook, quality manual template, Laboratory assessment tool and, most recently, laboratory quality stepwise implementation (LQSI) tool. The latter is a web-based and downloadable tool that translated requirements of the ISO 15189 standard into a phased sequence of practical implementation steps and provides available support materials, such as document templates, guidelines on specific topics, etc. The tool has a built-in checklist function to create personalized checklists for activities or for phases. The goal of the LQSI tool is to help laboratories to implement LQMS in a structured four-phase manner to improve quality of services provided and ideally achieve full compliance with ISO 15189 and/or other international accreditation standards.

Egypt, Pakistan and the United Arab Emirates presented their approaches toward LQMS implementation, future plans and challenges they were facing. In particular, Egypt has undertaken to establish a national laboratory quality body chaired by the Director of the Central Public Health Laboratory and consisting of teams for quality, biorisk management (BRM), training and laboratory information management system. The national laboratory policy and planning process has been initiated in Afghanistan, Pakistan and Sudan; however, absence of a national regulatory framework for licensing and accreditation of health laboratories, shortage of staff, lack of monitoring and evaluation mechanisms significantly hinders the progress.

National external quality assessment schemes (NEQAS) are one of the critical components of LQMS required for accreditation and for compliance with IHR 2005. WHO has established a number of global and regional external quality assessment (EQA) programmes, through subcontracts with international or regional reference laboratories and EQA agencies. The regional microbiology and serology EQA scheme has a goal of strengthening laboratory capacity for priority communicable diseases diagnostic at national level. The programme is free for participating laboratories, not tied to any accreditation or recognition process, is organized mainly by the Central Public Health Laboratory of Oman and Reference Health Laboratory of the Islamic Republic of Iran, with four reference laboratories: National Institute for Communicable Diseases, South Africa; United Kingdom National Quality Assessment Service (UK NEQAS); Lyon University Teaching Hospital, France; and U.S. Naval Medical Research Unit no. 3 (NAMRU-3), Egypt. Since 2006, 13 surveys have been organized; on average, 27 laboratories from 20 countries of the Region participated in each survey. To improve further, the programme would benefit from

a regular review, availability of software for analysis of results, and a website for result entering and viewing. The programme is planning to expand through inclusion of acid-fast bacilli microscopy and molecular diagnostics, use of lyophilized specimens, using past panels for method validation, and other enhancements.

The sustainability of LQMS is determined by several key factors that include commitment and political will of the management, involvement and buy-in by laboratory staff, familiarity of all relevant actors with LQMS concept, objectives, and benefits and their hands-on knowledge of how to implement and maintain the system, as well as supporting regulation and enforcement mechanisms (including licensing and accreditation). Not only does the national regulatory framework for laboratory services communicate government commitment to quality, but it also serves as an important managerial tool for operational planning and resource allocation, monitoring and evaluation, resource mobilization, and coordination of donors and development partners.

During the town hall discussion that followed, the meeting discussed opportunities and challenges in implementing LQMS. The meeting concluded that every laboratory should be managed and run according to a LQMS to assure safe, timely and reliable results. The ultimate aim of implementing such a scheme in all laboratories is to improve the quality of laboratory services rather than accreditation per se. IHR can be used as a strong driver of the implementation of LQMS, but advocacy for LQMS with policy-makers and important stakeholders is crucial. For advocacy, success stories from the Region can be used. The implementation of LQMS should be anchored in national policies and strategic plans.

A first step to ensure that laboratories implement an LQMS is to formulate national quality standards that are endorsed and enforced through licensing, certification or accreditation. Laboratories can strive for implementation of an LQMS based on international standards using the WHO LQSI tool for stepwise implementation of an LQMS. Accreditation proves the compliance with the national or international standards and can also be used for obtaining funds for improvement projects.

Laboratory (system) assessments will help to determine the current situation and can be used for monitoring improvement in the future; the already existing assessments for polio and measles are providing information on the current situation in many public health reference laboratories and can be expanded to include more information on the overall LQMS in the assessed laboratories. Some additional suggested approaches to quality improvement were: twinning between laboratories, regional training of quality officers and training of trainers in the LQSI tool, expansion of the EQAS network, and lastly a clear roadmap with guidance and a time frame.

2.3 Biorisk management: safe working environment

The WHO Biorisk Management Advanced Trainer Programme (BRM-ATP) is a 10-day training-of-trainers programme designed to change the culture from prescriptive to risk-based biosafety practice. So far, 19 training sessions were conducted in all 6 WHO regions and 198 staff were trained. Upon completion of the training, the participants are expected to return to their own country and conduct at least two training sessions for their colleagues; so far, participants, on average, trained 63 more people in biorisk management, indicating a good “return on investment”, even though the results in different regions varied. Further improvement may be expected if trainers receive better

support by their management in terms of funding, time and physical space for training, course materials are translated in native languages, more partners involved and pool of trainers expanded.

Another training developed by WHO to support competency building at the national level is the Infectious Substances Shipping Training (ISST). The course was developed in recognition of challenges faced on a daily basis by the laboratory staff of resource-limited countries while shipping infectious substances and the fact that access to training and certification of shippers required by the international transport regulations may be limited for those countries due to financial and other reasons. The goal of ISST is to increase the communication and understanding between stakeholders to ensure that the appropriate mechanisms are in place for the safe, timely and legal transport and rapid diagnosis that could be critical in preventing further suffering. About 900 shippers have been trained so far; those who successfully complete the training are offered an option to renew their certification online at no cost.

The implementation of BRM at the national level was presented by Bahrain, Jordan and Tunisia. Bahrain has established a Biosafety Committee with monthly meetings to steer up BRM implementation, conducted risk evaluation of the laboratories and trained the staff in WHO-ATP; an accident/incident reporting system was also implemented. Jordan has succeeded in establishing and maintaining an extensive BRM training and evaluation programme at various levels, institutionalizing BRM through inclusion in university curricula, and instituting a national body for BRM implementation and follow-up. Tunisia established a national quality control programme, developed and distributed a guide on good laboratory practice and trained personnel in good laboratory practice and BRM.

During the town hall discussion that followed, the meeting discussed challenges for ensuring safe and secure laboratory working environment. The meeting concluded that implementation of best practices in laboratory BRM in the Region is variable. Some countries have programmes or systems in place, often partial, while others do not. Thus, availability of some kind of national regulation on laboratory biosafety and biosecurity was reported by four countries (Jordan, Morocco, Tunisia, United Arab Emirates), waste management policy by five countries (Egypt, Jordan, Lebanon, Morocco, United Arab Emirates, Yemen). Seven countries (Bahrain, Egypt, Jordan, Lebanon, Oman, Sudan, United Arab Emirates) reported having a training curriculum and conducting exercises on biosafety and biosecurity for laboratory personnel. Mechanisms for shipping infectious substances are in place in all countries. BRM implementation bottlenecks include: infrastructure (lack or properly maintained facilities); lack of biosafety equipment and/or maintenance thereof; shortage of biomedical engineers, especially for maintenance and certification of biosafety cabinets; lack of functioning incinerators; shortage of funds for personal protective equipment; poor waste management practices in some countries; no job-related vaccination programmes for laboratory personnel; and inadequate numbers of certified shippers in different sectors.

To improve BRM in Member States, laboratory staff should be trained on how to conduct a risk assessment; actual risk assessments should be conducted in laboratories; management need to find creative ways of motivating staff to implement and practice principal safety and security measures in the laboratory. Military health services should be engaged in public health activities on BRM. It is important that Member States designate biosafety officers, with appropriate terms of reference included in their job description, to steer up BRM

implementation process. A simulation exercise on shipping specimens presents an inexpensive and simple way to determine existing constraints. Shipping infectious substances at the country level will require close coordination with airlines. Uncertified shippers in some countries need to be recertified through the WHO eISST online refresher course.

2.4 Laboratory preparedness and response to emerging diseases

Participants were updated on laboratory strengthening under the umbrella of IHR. Laboratory is one of the national core capacity requirements under IHR 2005. It includes six pillars: 1) coordination of laboratory services; 2) testing capacity for priority events; 3) quality; 4) biosafety and biosecurity; 5) specimen collection and transport; and 6) laboratory-based surveillance. Laboratory core capacity is monitored through two indicators reported globally to the World Health Assembly: “Laboratory services available to test for priority health threats” (seven questions on the availability of national policies, standards, inventory of laboratories, external quality assessment, accreditation) and “Laboratory biosafety and biosecurity practices in place” (six questions on availability of national biosafety guidelines, regulations, coordination and inspection bodies, trained staff, risk assessment). Building laboratory capacities for IHR includes national political commitment, adequate sustainable financing, partnerships, commitment of laboratory personnel, mapping of laboratory capacity and resources, opportunities to build on existing capacity, collaboration on cross-sectoral issues as well as collaboration among the laboratory unit, IHR national focal point and other entities.

Results of 2013 IHR monitoring tool indicate that most countries of the Region are in compliance with IHR laboratory core capacity

requirements, even though this may be an overestimation to some extent. Twelve countries identified laboratory as a priority to meet the IHR deadline of 2014. Ebola virus disease preparedness and readiness assessment missions have been completed in 21 countries and demonstrated overall limited capacities to handle specimens either for shipment or testing. Networking with WHO collaborating centres testing for Ebola virus disease was poor or non-existent. These limitations were fully exposed by the Ebola outbreak as seen in the experience in Sierra Leone. In particular, turnaround time for test results was quite long, especially in remote districts. Rapid turnaround time requires not just good laboratories but a system supporting pre- and post-analytical stages. Two major gaps were identified: lack of BRM and lack of an effective laboratory information management system. This experience also showed that no component of laboratory core capacity will work unless it is planned and implemented along with all other aspects of the response. Public health laboratories surge capacity in countries will be enhanced through the implementation of the WHO 90-day Ebola preparedness plan, which provides for strengthening of specimen shipment mechanisms and biorisk management, capacity building in viral and clinical diagnostic methods, and provision of supplies and equipment, including Level 3 biosafety cabinets (“glove boxes”) and personal protective equipment.

Palestine and Sudan presented overviews of their laboratory services, along with current challenges and needs for capacity building. National laboratory capacity for emerging infectious diseases, including Ebola virus disease, was presented by the Islamic Republic of Iran. Lebanon reported on the ongoing process of establishing an influenza virus isolation laboratory.

2.5 Partner/donor coordination

During the session, partner organizations presented their ongoing projects aimed at strengthening health laboratory services. NAMRU-3 updated participants on its role as regional centre for preparedness for Middle East Respiratory Syndrome and Ebola virus disease as well as provider of biomedical training. Pasteur Institute is also closely involved in building capacity for Ebola virus disease diagnosis through technical training of laboratory staff, deployment of laboratories in outbreak-affected areas, serving as a reference laboratory as well as through the MediLabSecure initiative to strengthen preparedness to common viral threats and biosafety risks through capacity building and laboratory networking. Laboratory strengthening activities of the Dutch Royal Tropical Institute (KIT) include technical assistance to countries to develop national laboratory policies and plans; curriculum development, training and mentoring; assessments of laboratories and laboratory systems, and others. The U.S. Centers for Disease Control and Prevention (CDC) presented the global health security initiative of the United States and its laboratory component.

2.6 Policy and planning: endorsement of the regional public health laboratory strategic plan

The meeting discussed development and crucial role of national laboratory policy and strategic plan for strengthening health laboratory services. National laboratory policy is a deliberate system of principles that guides the future activities in a particular field. It should be consistent with other policies in related fields and should describe the direction into which the country wants to proceed. The scope of the policy includes potentially all health laboratories: human and animal public health, food safety, clinical diagnostic,

environmental, chemical and radionuclear laboratories, including the private sector. The step-by-step process for developing national laboratory policy was presented in detail by KIT. The process includes establishment of a national laboratory working group and three workshops over a time frame of about 6 months (with national laboratory working group activities in between the workshops), during which the gaps in a country's laboratory system are identified and verified through system assessment, stakeholder analysis, situational, SWOT (strengths, weaknesses, opportunities, threats) and root cause analyses, vision, goals, policy topics and policy statements are formulated, with subsequent submission of the draft policy to a wider range of stakeholders for consultation and review.

Development of a strategic plan, as presented by the University of Washington I-TECH, includes similar steps of a working group formation and information gathering and analysis, followed by development of goals, objectives and activities (tasks and subtasks). A good strategic plan should set a timeframe for activities, define roles and responsibilities of parties involved and develop a realistic and sustainable funding strategy. It should also include a set of SMART (specific, measurable, actionable, realistic, time-bound) indicators for monitoring and evaluation of implementation.

The above approaches to policy and strategic planning are used by the WHO EURO "Better labs for better health" initiative that aims at improving health by providing timely and accurate laboratory results from accredited laboratories that are trusted by the user. The programme employs a comprehensive three-pronged approach to strengthening laboratory services in all sectors dealing with health through: 1) development of national laboratory policy and strategic

plan; 2) improving national training programmes for laboratory staff; and 3) upgrading critical infrastructure.

To provide countries of the Region with a roadmap and guidance for development and implementation of national laboratory policies and strategic plans, there was a perceived need for a regional guiding document (regional strategy). An expert consultation held in Amman, Jordan on 9–11 December 2013 identified priority areas to be strengthened in regional health laboratories and outlined strategic directions and key activities in each priority area, based on which a draft regional strategic plan was developed and presented for discussion at the present meeting.

The meeting, through small working group deliberations, reviewed and recommended revisions to the draft regional strategic plan. It was suggested to rename the document as a “strategy” as it is to provide a general framework for Member States to help them develop their national laboratory strategic plans. As well, the document has no specific timeline and not all provisions of the document are applicable to all countries. Therefore, the word “strategy” better suits the structure and purpose of the document. It was also suggested to state prominently in the document that development of the national health policy is necessary to ensure good governance and effective strengthening of laboratory services. Some mismatches between strategic goals/objectives and corresponding activities and outcomes were noted and it was suggested to align the objectives with the activities and with the outcomes. Outcomes should be adjusted to make them measurable. Some groups suggested escalating several objectives to the level of strategic goals and vice versa, optimizing objectives by combining those that are either repetitive or redundant, as well as introducing some new strategic goals. The goals and

objectives should be sequentially numbered for easy reference. The working groups also made numerous editorial changes.

The regional strategy states that health laboratory services provide vital support for disease prevention, diagnosis, treatment management, screening and surveillance. Effective and cost-efficient laboratory operations are a cornerstone of any country's capacity to investigate biological events in order to apply evidence-based control of detected diseases and prevent the accidental or deliberate release of pathogens from laboratories. Based on a situation analysis in a number of countries, the strategy recognizes existence of serious gaps in areas such as organization and management of laboratory services, human resources management, document and record control, procurement and supply chain management, biorisk management, information systems, and laboratory monitoring and evaluation mechanisms. The oversight of health laboratories is often fragmented within the health system. Ineffective donor coordination, lack of robust national laboratory policies and strategic plans, and diversity of funding sources have contributed to the development of uncoordinated health laboratory services in many countries. These issues need to be tackled in a systematic, cross-cutting and coordinated manner.

The overall goal of the strategy is to guide the strengthening of sustainable national health laboratory systems to improve clinical and public health services in a cross-cutting manner for better preparedness for, surveillance of and response to epidemic-prone diseases, health security concerns and other potential emergencies of public health concern.

The strategy recognizes that the development of laboratory systems is a long-term endeavour that requires the support by country's

government and multiple national and international stakeholders, including in-country stakeholders, multilateral agencies, donors, the private and public sectors, communities, and others. The strategy is intended to provide guidance for countries of the Region in setting priorities, formulating, implementing and evaluating national policies and strategic plans for their laboratory services. It proposes planning actions that should help national health authorities to address the gaps and challenges faced by their laboratory system.

This strategy is designed to support and offer guidance to the national health authorities and national health laboratory focal points in their efforts to strengthen laboratory systems, and the wide-ranging and large number of national, regional and international organizations who are stakeholders in the process.

The vision of the strategy is that within the Eastern Mediterranean Region, health laboratory services are comprehensive, well-coordinated, integrated and sustainable to obtain and report safe, accurate and reliable test results in timely manner for use in clinical and public health settings. To achieve this vision, the strategy proposes the following interrelated strategic goals: 1) Strengthen leadership and governance of the national laboratory systems; 2) Strengthen the organization and management of the national laboratory systems; 3) Ensure safe and secure laboratory environment; 4) Promote effective laboratory referral networking (in-country and among countries) and enhance coordination; and 5) Promote rational and evidence-based use of laboratory services. For each strategic goal, objectives, activities and outcomes are identified.

The strategy will be implemented through a multi-faceted approach combining complementary regional and country-level activities, with

engagement and commitment of national authorities and in cooperation with relevant WHO country offices, other development partners and donors. Synergies and leverage will be sought between grants and partners to optimize implementation of the strategy.

To monitor and evaluate the implementation of the strategy, a set of indicators will be identified and measured at the regional level. These indicators will be selected from the IHR monitoring framework for monitoring progress in the implementation of IHR core capacities in State Parties and supplemented, where necessary, by indicators set up for areas requiring specific consideration. Whenever possible, monitoring and evaluation indicators from relevant existing programmes can be utilized to reduce the burden of data collection.

The meeting endorsed the revised draft of the regional health laboratory strategy 2015–2019 and recommended to finalize it for use by Member States to develop their national laboratory policies and strategic plans.

2.7 Other important topics

The meeting discussed the role of public health laboratories in food safety system and surveillance of antimicrobial resistance (AMR). The food testing profile of the Bahrain public health laboratory was presented, with the Food – Analytical Chemistry Group and Food and Water Microbiology Analysis Group responsible for various aspects of food testing. Bahrain participates in three external quality assurance food programmes on monthly to yearly bases. These programmes cover all major and critical food hazards parameters according to standards of the Gulf Cooperation Council. Among the major challenges are lack of comprehensive food safety laws, regulations

and standards and lack of a professional food safety laboratory training body in the Region.

The Islamic Republic of Iran and Pakistan presented their AMR surveillance programmes and data. AMR surveillance is systematic collection of information on antimicrobial use and resistance and should include an effective mechanism of data collection, compilation, analysis and dissemination and a system to monitor antimicrobial use in hospitals and community and linking them with resistance and disease surveillance. Components of a laboratory-based surveillance programme include selection of pathogens, selection of antibiotics, standard operating procedures, quality control, data management and information sharing, monitoring and evaluation. Surveillance data are essential for AMR containment and to guide decision-making at local, national and international levels. In the Islamic Republic of Iran, AMR surveillance is conducted at the level of reference health laboratory of the Ministry of Health and Medical Education and hospital laboratory level. Rapid diagnostic tests are used for detection of AMR. The AMR surveillance and containment initiative in Pakistan includes the Pakistan Antimicrobial Surveillance Network, antibiotic stewardship programme, compilation and reporting of multidrug-resistant and extensively drug-resistant tuberculosis data by the national tuberculosis programme, and plans to develop national AMR policy and national reference centre for AMR.

Upon a town hall discussion on AMR that followed, the participants concluded that very few countries in the Region have a national AMR focal point, national AMR policy or an equivalent regulatory mechanism, or national AMR action plan. Some countries have AMR laboratory-based surveillance system but its scale is often limited; many important elements of the surveillance system, such as hospitals,

are not involved. Sometimes there are institutional problems preventing integration of hospital information systems with AMR surveillance software.

Coordination within ministries of health and between sectors (health, agriculture, environment, food industry, professional societies, others) is weak or non-existent. The problem of substandard, falsified and other low quality medicines is very serious in many countries. Member States need to use available WHO resources such as the list of pre-qualified medicinal products or the WHO Rapid Alert System for reporting medicinal products of questionable quality.

In many countries antibiotics can still be obtained over the counter without physician's prescription. Coordination of stakeholders needed for effective multisectoral action on AMR presents a formidable challenge. A Global Action Plan to Combat AMR has been developed for review by the World Health Assembly in May 2015; the plan provides a framework for regional and national action for AMR containment.

Upon discussion, the event of signing an individual pledge to use antibiotics responsibly was held; 30 participants of the meeting signed the pledge.

In the end of the session, University of Washington I-TECH presented the Laboratory Leadership and Management Certificate Program, an in-service education and training programme for laboratory managers and directors in both public and private sector. The programme includes 5 courses over 9-month period of blended training with close mentorship. The programme employs an electronic learning management system canvas that allows for user-friendly content

navigation, interactive communication and discussion, scheduling, assignment posting and tracking, and evaluation surveys. Each trainee is expected to implement and present a Capstone project in to address a gap they identified in their respective laboratories.

3. Recommendations

Member States

1. Ensure that the core capacities required of national health laboratories by IHR 2005 are fully met.
 - Continue to work closely with WHO, partners and donors to ensure national health laboratory policy, strategy and action plan are developed/revised in line with the regional strategy, and that adequate logistics, human and financial resources are made available for the implementation, monitoring and evaluation of the national action plan.
 - Make use of opportunities offered by ongoing global health security concerns (such as Ebola virus disease, etc.) to obtain the commitment needed from national authorities.
2. Institutionalize the laboratory quality management system (LQMS) and use the laboratory quality stepwise implementation tool to establish, strengthen and maintain such systems towards achieving the goal of producing accurate, reliable and timely result in a cost-efficient and sustainable manner.
3. Institutionalize laboratory biorisk management at the national level through establishment of a biorisk management unit, designation of biorisk management officers and inclusion of strategic goals related to biorisk management in the national laboratory policy and strategic plan.

4. Consider laboratory twinning programmes, intercountry exchanges and attachments of technical and managerial staff for the purpose of sharing experience, mentoring, and reproducing best practices in the implementation of laboratory quality management systems and biorisk management.
5. Develop national and regional capacity for repair and maintenance of laboratory facilities and equipment, including certification of biological safety cabinets.
6. Strengthen and maintain laboratory capacity for safe, timely and reliable detection and surveillance of antimicrobial resistance and actively participate in regional and international collaborative initiatives.

Member States and WHO

7. Finalize the regional health laboratory strategy 2015–2019 for use in developing national laboratory policies and strategic plans.
8. Support the formulation and implementation of national laboratory policies and strategic plans.
 - National strategic plans should go beyond specific laboratory matters to include operational mechanisms and activities to secure sustainable coordination with key stakeholders in clinical and public health practices.
 - Directors of public health laboratory should play an active role in the overall country framework related to IHR (2005) implementation, country preparedness and response to public health emergencies and the overall global health security
9. Facilitate the establishment of a regional network of laboratories to share experiences and information and coordinate laboratory roles and inputs in terms of global health security.

- Existing subregional collaboration frameworks (GCC, G5, Maghrebian countries) should be used as opportunity to improve intercountry collaboration and coordination.
 - Health laboratories should maintain frequent communication between themselves, reference laboratories and WHO collaborating centres and develop efficient networking to facilitate day to day working and in emergency situations.
10. Identify strategically located regional reference laboratories and collaborating centres for diagnosis, confirmation and research of known and emerging pathogens of public health concern in the Region and formalize their networks and linkages.



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