

Summary report on the

# Workshop on the coordination and capacity-building of the PulseNet Middle East laboratory network

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Muscat, Oman  
13–15 February 2018



**World Health  
Organization**

Regional Office for the Eastern Mediterranean

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## Contents

1.	Introduction.....	1
2.	Summary of discussions .....	2
3.	Recommendations.....	10

## **1. Introduction**

A workshop on the coordination and capacity-building of the PulseNet Middle East (PNME) laboratory network was organized jointly by the World Health Organization (WHO) Regional Office for the Eastern Mediterranean, the USA Centers for Disease Control and Prevention (CDC), and the USA Association of Public Health Laboratories (APHL), in collaboration with the Government of Oman and Oman's Central Public Health Laboratory. The workshop was attended by 43 participants, including representatives from 14 Member States who are operating or planning to establish PNME member laboratories, as well as temporary advisers, partner organizations and WHO Secretariat.

The objectives of the meeting were to:

- review the current status of the food safety and foodborne disease surveillance, preparedness and response in Member States of the WHO Eastern Mediterranean Region;
- review and follow up on the implementation of the recommendations of the PNME and Global Foodborne Infections Network Joint Meeting held in Amman, Jordan, on 25–29 March 2012;
- discuss the achievements and challenges of the PNME network and strategies for further expansion in the WHO Eastern Mediterranean Region; and
- update the knowledge of participants in new and innovative technologies for testing and research of foodborne pathogens, including whole genome sequencing (WGS).

The workshop was inaugurated by His Excellency Dr Sultan Al Busaidi, Advisor for Health Affairs, Ministry of Health of Oman and Dr Akjemal Magtymova, WHO Representative for Oman.

## **2. Summary of discussions**

### *Food safety and foodborne disease surveillance, preparedness and response in the Region*

Participants were briefed on major regional and global regulatory documents pertinent to food safety, including the regional strategic framework for strengthening health laboratory services 2016–2020, regional plan of action for food safety (2017–2022) and the new edition of the international standard ISO/IEC 17025:2017 (General requirements for the competence of testing and calibration laboratories). An update was given on WHO's activities in food safety and laboratory strengthening and on the technical support, guidance and tools available from WHO in this regard. Participants were also introduced to PulseNet International and the comparative efficiency of pulse field gel electrophoresis (PFGE) versus WGS.

### *PNME network*

PNME is part of the PulseNet International network and was established by WHO, CDC and the Naval Medical Research Unit Three (NAMRU-3) in December 2006 for molecular surveillance of foodborne infectious diseases to support the regional food safety plan and promote technical collaboration among countries. NAMRU-3 hosted a training centre for PFGE and BioNumerics software and administered the certification programme for the network, while a network coordinating centre was established in Oman's Central Public Health Laboratory.

The objectives of the PNME laboratory network are to: detect foodborne diseases case clusters which might be part of widespread outbreaks and activate the outbreak investigation system; act as a

rapid alert system for possible foodborne outbreaks through an effective means of communication between public health laboratories in the Middle East region and to share the information of any widespread outbreak with PulseNet International; and assist epidemiologists in investigating outbreaks by separating outbreak-associated cases from other sporadic cases and facilitating rapid identification of the outbreak source.

Since 2006, laboratories from 13 countries in the WHO Eastern Mediterranean Region have joined the network. However, the membership criteria and procedure have never been formalized, resulting in some members being inactive. Some attempts to certify member laboratories in their use of the PulseNet standard subtyping method (PFGE) had been made, with seven laboratories receiving certification, although the certification mechanism has never been properly defined, documented and formalized. Due to the reduced functioning of NAMRU-3, the certification mechanism has been inactive for the last two years.

*Recommendations of the PNME and Global Foodborne Infections Network Joint Meeting*

The last meeting of all PNME stakeholders took place in Amman, Jordan, in March 2012 and resulted in recommendations to: (1) improve communication, with an emphasis on risk communication; (2) develop case studies for training purposes, including those that combine laboratory and epidemiological expertise; (3) develop PulseNet epidemiology certification to provide a formal way for epidemiologists to develop competency in PulseNet activities; and (4) conduct two PulseNet training courses in the Region annually, tailored to the level of PulseNet laboratory capacities of the participating countries.

Upon review of the above recommendations, the workshop concluded that only recommendations (2) and (4) had been implemented, in part, as CDC had developed case studies and two training workshops had been held in 2014 in Muscat, Oman, and in 2016 in Dubai, United Arab Emirates.

### *Challenges for the PNME laboratory network*

Communication, especially data sharing, whether among members of the PNME network or between laboratories and epidemiologists within countries, remains a challenge. An effective and sustainable certification and proficiency testing mechanism should be re-implemented following NAMRU-3 leaving the network, formalized and institutionalized.

Other challenges that the PNME network faces include the overall sustainability of the programme, a shortage and instability of funding, especially funds for equipment purchase, long and complicated procurement processes for equipment and supplies, and a shortage and turnover of trained and qualified staff. Moreover, in order to increase the effectiveness of outbreak detection and investigation, the network needs to involve new members, especially from countries where foodborne disease outbreaks are frequent, such as Pakistan and Sudan.

### *Review of current surveillance status*

The workshop reviewed the current status of foodborne disease surveillance activities in PNME network countries. The results of the review allowed the division of countries into three tiers based on their level of implementation and related needs. Tier 1 (Iraq, Libya, Pakistan, Sudan) comprises countries that are just starting molecular surveillance and therefore need either PFGE equipment or BioNumerics software, or both, along with personnel training on how



to perform PFGE and analyse the results. Tier 2 (Egypt, Islamic Republic of Iran, Jordan, Kuwait, Morocco, Palestine, United Arab Emirates) consists of countries that have all necessary equipment and software, and experience with PFGE, but no plans yet of switching to WGS (even though the Dubai municipal laboratory in United Arab Emirates has capacity for WGS); these countries are mostly in need of training on BioNumerics software and certification. Finally, the countries of Tier 3 (Bahrain, Lebanon, Oman, Saudi Arabia, Qatar) are working towards the establishment of WGS and need advice and support for obtaining equipment, upgrading BioNumerics software and staff training on WGS.

### *Capacity-building*

The workshop discussed feasible and cost-efficient options for PNME training, concluding that although on-site training is the most effective option in terms of training outcomes, it is prohibitively cost-inefficient. For some types of training, remote sessions (via WebEx, Skype and the like) may be a suitable option. The use of demonstration materials, such as videos, should also be encouraged wherever appropriate and such training materials should be developed and made available to member laboratories. The workshop commissioned the PNME Steering Committee to develop a training plan that would take into account the needs and capacities of member laboratories.

### *Certification*

Possible certification mechanisms in the Region were discussed and it was agreed that the experience of PulseNet International and other regional PulseNet networks should be taken into account. The workshop considered options for certifying laboratories or individual laboratory technicians, as well as providing certification to laboratories

newly joining PNME, with subsequent confirmation of certified status based on the results of annual proficiency testing, or renewing certified status through periodic re-certification. It was emphasized that certification should be a two-phase process, in which the documented results of molecular testing are initially certified by a primary certifier and then confirmed by a secondary certifier. The importance of having a pool of authorized primary and secondary certifiers was also noted. It was observed that the PulseNet quality assurance programme consists of individuals becoming certified per organism, while the annual proficiency testing programme is per organism per laboratory and not individual. There was a consensus that standard certification strains should be used throughout the Region. The workshop requested the American University of Beirut (AUB), Lebanon, CDC and Oman's Central Public Health Laboratory to take the lead on developing a realistic and sustainable mechanism for certification, with subsequent submission to the Steering Committee for approval and implementation.

#### *Terms of reference of the PNME laboratory network*

The workshop discussed the terms of reference of the PNME network, with a draft developed in 2008 serving as the basis for discussion. It was noted that the draft was outdated, over-bureaucratic and as such not feasible for practical implementation. The discussion produced several major principles on the basis of which the draft should be updated, specifically:

- 1) The terms of reference should be shorter and provide a simple, straightforward and functional model for the governance and operations of the PNME network.
- 2) PNME is a network of individual laboratories; however, they are deeply embedded in national epidemiology and surveillance structures

and are in constant need of support from their governments. Therefore, seeking official designation of member laboratories by their governments will be an appropriate way forward.

3) The language of the document should be simplified.

4) The ultimate decision-making authority will be the general meeting of the representatives of member laboratories (however called). While having a dedicated budget for the network is not realistic, the general meeting, along with other organic components of the network (Steering Committee, Coordinating Centre), may and should be involved in resource mobilization activities for the network.

5) The Steering Committee will comprise seven members, of which one will be a representative of the Coordinating Centre (currently, Oman's Central Public Health Laboratory). The remaining members will be elected by the general meeting and include two representatives from each tier of PNME member laboratories. The tiers will be reviewed periodically and revised as appropriate to reflect the evolution of the member laboratories. Annual or more frequent face-to-face meetings of the Steering Committee seem unrealistic due to financial reasons; however, with widespread availability of modern communication technology, regular video- and teleconferences may be organized quarterly or at any other frequency as may be decided.

6) Simple and workable ways of communication within the PNME and between the PNME and PulseNet International should be developed. They may include email, listserv, website (including the PulseNet International website), SharePoint and other communication platforms.

7) Proficiency testing is one of the cornerstones of ensuring the quality of PNME results and should be conducted at least annually, or

more frequently, if resources permit. Participation in the proficiency testing programme should be one of the criteria of network membership. Proficiency testing results may also serve to confirm the certified status of member laboratories.

8) Data sharing is crucial for the detection and investigation of outbreaks; each member laboratory should ensure that the data it shares within the network or with PulseNet International have been cleared by the corresponding government, as appropriate for the country context.

9) The terms of reference of the PNME network should not commit any external organizations or agencies to any objectives or activities of the network.

The workshop decided to commission the Steering Committee to update and finalize the draft terms of reference based on the major principles and submit to the next PNME general meeting for review and approval.

#### *Steering Committee of the PNME laboratory network*

The workshop elected the Steering Committee of the PNME network as follows:

- Dr Amina Al-Jardani, Central Public Health Laboratory, Oman
- Dr Ghassan Matar, AUB, Lebanon
- Dr Wafaa Alhussaini, Central Public Health Laboratory, Iraq
- Dr Marjan Farzami, Reference Health Laboratory, Islamic Republic of Iran
- Dr Amjad Ali, National Institute of Health, Pakistan
- Mr Ibrahim Salem, Central Public Health Laboratory, Palestine
- Mr Mohamed Y. Al Wetaid, Food and Drug Authority, Saudi Arabia.

The Steering Committee had its first meeting on the sidelines of the workshop, during which the recommendations of the workshop were finalized, and timelines and lead agencies designated, as appropriate.

### *PFGE and WGS*

Deliberating on the introduction and implementation of WGS in the Eastern Mediterranean Region, the workshop noted that the Ion Torrent platform from Thermo Fisher was prevalent, while the MiSeq platform from Illumina was almost non-existent in the Region. It was emphasized that the existing PulseNet protocols are developed mostly for the MiSeq platform and should be updated to suit the needs of Ion Torrent users. The need for training on the latest 7.6 version of BioNumerics for the analysis of WGS data was noted. Availability of storage space for the testing results is an imperative as they accumulate very rapidly. Even though free-of-charge public databases (such as NCBI) are available, they have limitations, such as incomplete data. For that reason, public databases are not to be fully relied upon, and the use of commercial clouds may be a reliable and cost-effective option. It was agreed that the current capacities of PNME member laboratories and their readiness for WGS implementation should be assessed using a standardized and structured checklist addressing information technology capacity, bioinformatics and infrastructure. The workshop emphasized that WGS should only be introduced in those member laboratories that have the human and financial resources to ensure sustainability. The workshop commissioned the PNME Steering Committee to develop a strategy with a plan of action for implementing WGS in the PNME network.

The last day of the workshop was dedicated to training on PFGE and WGS. The participants familiarized themselves with tips for PFGE data generation and were given a demonstration on PFGE pattern naming,

cluster detection, linking demographic information and data sharing. The participants were then introduced to the basics of WGS data, WGS laboratory workflow and the PulseNet protocol and requirements for laboratory and information technology capacity. At the end of the training session, there was discussion on a case study and exercise on using WGS data for outbreak detection and investigation.

### **3. Recommendations**

#### *To the PNME Steering Committee*

1. Finalize the terms of reference of the network based on the general principles discussed and agreed upon during the workshop, with the assistance of all relevant stakeholders including APHL, CDC and WHO. Timeline: 1 month for the first draft. Lead agency: Oman's Central Public Health Laboratory.
2. Develop a strategy with an action plan for introducing WGS in the PNME network. Timeline: 3 months for the first draft. Lead agency: AUB.
3. Develop a training plan tailored to the needs and level of existing capacities of the member laboratories. Timeline: 3 months for the first draft. Lead agency: Iraq's Central Public Health Laboratory.

#### *To the PNME laboratory network*

4. Establish a regular proficiency testing programme for PFGE and potentially for WGS, with incorporation of BioNumerics software analysis, to be administered through Oman's Central Public Health Laboratory, with panels provided by CDC. All PNME member laboratories should participate in proficiency testing surveys at least once a year. Panels will be sent to the Regional External Quality Assessment Scheme participating laboratories,

while PNME member laboratories will be responsible for collecting the panels from the Regional External Quality Assessment Scheme participating laboratories.

5. Develop and implement a mechanism(s) for communication and data sharing among PNME member laboratories.
6. Establish a sustainable mechanism for certification of laboratory technologists at new PNME member laboratories. Lead agencies: AUB, CDC and Oman's Central Public Health Laboratory.

*To WHO*

7. WHO and other development partners should provide technical support for implementation of the activities of PNME network.



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