Clinical microbiology laboratories in low-resource settings, it is not only about equipment and reagents, but also good governance for sustainability

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Editorial

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Good-quality microbiological diagnostics should be at the heart of tackling infectious diseases in general, whether it is for guiding optimal treatment or for detecting and controlling outbreaks of emerging and drug-resistant pathogens. However, the resources and skills required to perform accurate and reliable microbiology are scarce in low-resource settings [1]. Simply having a laboratory and the latest equipment is not enough. Rather, investing in quality clinical microbiology services that meet a minimum set of standards is of extreme value both for routine clinical care and also for early detection of hospital outbreaks, epidemics and potential pandemics [2]. Further, implementing solid governance is crucial to ensure retention of skilled staff, maintenance of equipment and adoption of a quality mindset. Strong governance implies in key aspects such as accountability, transparency, sustainability, engagement, equity and international collaboration, as demonstrated in the similar discussions in the area of antimicrobial resistance (AMR) in low-resource settings [3,4]. There is a need to combine both binding and non-binding governance mechanisms including the contributions of public-private partnerships and innovative funding processes [4]. Poor governance can lead to ineffective coordination of resources and actions across stakeholders, impeding sustainable collaborations to improve laboratory capacity in low-resource settings.

In this theme issue we want to touch on several of these issues and provide inspiration and good examples for improvement in the future. How can we improve clinical microbiology in low-resource settings? What is the role of a digital environment for optimal use of microbiological data? Increasing numbers of “leapfrog” innovations provide a promising future for improving the quality and utilization of microbiological diagnostics and surveillance data and closing the gaps in clinical microbiology in low-resource settings [5]. The COVID-19 pandemic illustrates that preparedness for outbreaks is a fundamental task for microbiological laboratories, but should that go beyond the level of (rapid) diagnostics?

Building a sustainable AMR surveillance system is essential for the implementation of the national action plans to control AMR. Lim et al. provide a comprehensive review of the AMR surveillance strategies using case-based surveillance of clinical syndromes and routine microbiology data generated as part of standard care in low-resource settings. The review looks at specific strategies in case identification, data collection, sampling, and data processing and analysis, identifies the associated limitations and potential biases, and highlights the areas where actions are needed to improve the quality of AMR data. The authors plead to increase use of microbiology testing, but only when the costs decrease and quality improves. Until so far, AMR focuses on antibacterials, but there will be a shift to include antiviral, antiparasites and antifugal resistance too.

Supportive policy environment with stringent government oversight and enforcement is a prerequisite for successful and sustainable delivery of any national health plans [6]. Malania et al. explore the basic requirements for implementing a laboratory-based surveillance system in low-resource settings and illustrate by a description of a successful project in setting up and expanding the AMR surveillance network in Georgia. The authors identify four pillars for AMR surveillance system implementation including (a) government support, (b) laboratory capacity and quality management, (c) materials and supplies and (d) sample collection, data management, analysis and reporting. Government support was shown to be a fundamental pillar for setting up and sustaining the surveillance network. This is highlighted in specific actions undertaken, such as developing a national plan for AMR, providing secure funding mechanisms, establishing a national reference laboratory, forming centralized coordination, and adopting relevant regulations. This high-level commitment and leadership with dedicated internal funding is crucial for sustaining the AMR surveillance network in this country.

The need to strengthen laboratory capacity in low-resource settings has become more urgent than ever in the current global health crisis of COVID-19 and the escalating burden of AMR [7]. Bacteriology laboratories in low-resource settings with conventional cultured based techniques face numerous infrastructural, technical, and behavioural challenges in implementation [1]. Though considerable progress has been made for diagnostics of malaria, conventional culture assays are still the cornerstone for diagnosing septicaemia in these settings and should be included in the services of first-level referral hospitals according to the World Health Organization (WHO). Orekan et al. review the challenges associated with culture media in these settings and summarise the best practices for in-house preparation. The roles of different players are analysed, highlighting the centralized role of the national reference laboratory in ensuring access to high-quality media, the involvement of diagnostic manufacturers and public-private partnerships and the need for temperature and

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humidity customized media formulations for manufacturers in tailoring bacteriology products for low-resource settings. Several recommendations are made, also with respect to reducing costs by alternative gelling agents and use of blood free media.

In many low-resource and remote settings, microbiology laboratory capacity is simply non-existent [8]. The most frequently requested diagnostic tests are the diagnosis of septicaemia and parasitaemia for which several approaches are available. Rapid diagnostic tests using commercially available polymerase chain reactions and point-of-care (POC) testing are performed in most of the hospital associated microbiological laboratories, but can also be used in mobile laboratories, as occurred in the 2013–14 West Africa Ebola virus disease outbreaks. A more comprehensive approach of the need and performances of mobile diagnostics is explored by Médecins Sans Frontières (MSF), stimulating a role for non-state and humanitarian actors in collecting AMR data. Many countries do not have the resources or capacity to meaningfully contribute to the WHO Global AMR Surveillance System (GLASS) and encounter restrictions to collect data. Will "leapfrog" innovations improve the quality and utilization of microbiological diagnostics and surveillance data? Will they close the gaps in clinical microbiology in low-resource settings? Ronat et al. highlight the importance of active contributions from all actors including public and private partners and identify the role of MSF and introduce the initiative of a simplified context-adapted clinical microbiology laboratory, the Mini-Lab, as a bridging solution until quality microbiology diagnostics can be implemented and managed independently by local actors. Results of the pilot implementation of the Mini-Lab in Haiti demonstrate the acceptability and feasibility of this innovative solution in low-resource settings.

In an era of increasing POC testing in non-laboratory settings, laboratories have an important supportive role to ensure the quality of the tests and to apply confirmatory testing [9]. The interface between laboratories and clinicians needs to be strengthened to facilitate the uptake and impact of integrating POC testing into the health system [10]. In their commentary, Toskin et al. provide an in-depth discussion on the potential applications of POC and near-patient testing in the syndromic management and control of sexually transmitted infections performed by clinical staff, outside of laboratory in low-resource settings. The authors urge for a leading role of clinical and reference laboratories to provide training, technical and supervisory support in the introduction and implementation of simple diagnostic tests and the availability of confirmatory testing.

The discussions and observations presented in this theme issue provide a diverse and rich picture of the current state of play in clinical microbiology in low-resource settings. They highlight the importance of addressing the gaps from the basic building blocks, an open mind for innovative ideas and adapting to the local needs, and good governance for sustainability of the programmes in these settings. The global spread of AMR has gained much attention in the past years with intensive collaborations between laboratories, countries and international organisations. However, it seems that such developments have left behind the microbiological staff in various parts of the world, who encounter the problems of infectious diseases, including a rising AMR numbers on a daily basis, but have lack of (financial) support to diagnose and prevent infectious diseases in general. Enthusiasm in young medical professionals for clinical microbiology needs to be promoted with support for career paths and active memberships in well organised professional societies. A sustainable clinical microbiology department should lead to improved patient care and outcomes and will enable improved early detection of outbreaks. We hope the current pandemic will provide the insight these are the investments that need to be made. Reliable clinical microbiology is not only a key component of everyday patient care but also of tackling AMR issues more sustainably, and pandemic preparedness and response. Clinical microbiology is the pillar in a properly functioning infectious disease care pathway (prevention, diagnosis, treatment) in any healthcare system. Absence of clinical microbiology is like sailing a ship without a compass.

Transparency declaration

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