



INVITED EDITORIAL

Strengthening clinical microbiology laboratories and prevention programs: a call to action for better infection control

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Date of first submission, April 15, 2026

Date of final revised submission, May 3, 2026

Date of acceptance, May 23, 2026

Cite this article as: Girma A. Strengthening clinical microbiology laboratories: a call to action for better infection control. *Universa Medicina*, 166-168. Available at: <https://univmed.org/ejurnal/index.php/medicina/article/view/1940>

The coronavirus disease 2019 (COVID-19) pandemic has revealed severe vulnerabilities in the global clinical laboratory systems, especially in low- and middle-income countries, where diagnostic capacity is still poor. As the world emerges from the acute phase of the pandemic, antimicrobial resistance (AMR) has re-emerged as the silent pandemic demanding urgent attention. Clinical microbiology laboratories are not just support services, they are the first line of defense against the disease outbreaks, healthcare-associated infections, and the increased risk of the drug-resistant pathogens. However, in most environments these laboratories are poorly funded, staffed and equipped. Enhancement of clinical microbiology laboratories should, therefore, be considered as one of the health priorities in the world.

Laboratories in clinical microbiology supply the necessary information that informs the decision of preventing and controlling infections. In the absence of proper and timely detection of pathogens and antimicrobial susceptibility profiles, the infection control teams become fail to isolate the affected patients, take the right precautions, or monitor the transmission of drug-resistant organisms to other patients in the healthcare facilities. This principle is evident in recent work in Ethiopia. The Global Action in Healthcare Network Antimicrobial Resistance (GAIN-AR) project, which is a partnership of The Ohio State University, Johns Hopkins Hospital,

and Ethiopian partners in the public health sector has shown that enhancing laboratory capacity should be developed in parallel with infection prevention. The project at Tikur Anbessa Specialized Hospital and St. Pauls Hospital Millennium Medical College focused on the basic methods of infection control, including hand hygiene, environmental cleaning, isolation measures, and at the same time, developed laboratory diagnostic capacity to test carbapenem-resistant organisms. The rate of hand hygiene compliance increased by about 20 percent, which indicates that even in the resource-constrained environments, when laboratories and infection control teams collaborate, incremental change will be possible.⁽¹⁾ Clinical microbiology and infection control synergy are not just on paper. An analysis of healthcare facilities in Korea in 2025 found four areas where integration is especially effective, which include shared governance frameworks, integrated electronic surveillance systems, joint clinical guidelines and education, and co-managed intervention protocols of multidrug-resistant organism containment.⁽²⁾

The past year has witnessed unprecedented attention to clinical laboratory strengthening. In November 2025, the World Health Organization (WHO) released the Integrated Drug Resistance Action Framework of HIV, Hepatitis B and C and Sexually Transmitted Infections, 2026-2030. This framework is categorical in stating that the laboratory capacity is among five strategic areas

that must be urgently invested in. According to Dr. Tereza Kasaeva, the Director of the WHO Department of HIV, Tuberculosis, Hepatitis and STIs, drug resistance is threatening years of achievement and she described the framework as a call to action to countries, communities and partners to pull together on a common agenda.⁽³⁾ Global frameworks are being translated into action at the country level. Subsequently, the National Public Health Laboratory through the WHO Country Office support in Nepal successfully inaugurate microbiology laboratories in 21 provincial and local hospitals across the 7 provinces of Nepal between July 2025 and February 2026. These newly established laboratories now provide bacteriology culture and antimicrobial susceptibility testing services, with WHO-supported hands-on training to ensure quality and sustainability. This project contributes directly to the National Action Plan of AMR in Nepal and provides a model that can be followed by other countries.⁽⁴⁾

In recent years, access to microbiology diagnostics is also being increased by technological innovation. The “Mini-Lab,” an all-in-one clinical bacteriology laboratory designed by Médecins Sans Frontières for low-resource settings, was prospectively evaluated in a district hospital in the Central African Republic. In a 2025 study, the Mini-Lab was reported as having 97% concordance at genus level and 90% concordance at species level in bacterial identification, with very good category concordances ($\geq 90\%$ category concordances) in antimicrobial susceptibility testing relative to reference methods. Importantly, laboratory technicians with limited prior experience found the system easy to use. The Mini-Lab is a potential solution in remote locations where conventional laboratory facilities are not present.⁽⁵⁾ Laboratory problems still persist in high-income countries. In March 2026, the Royal Cornwall Hospitals NHS Trust started an internal upgrade of a Containment Level 3 clinical microbiology laboratory, which underscores that ensuring laboratory infrastructure necessitates sustained investment. High-containment testing was outsourced after the facility closed in August 2025, which has added two to four days to turnaround times and adversely affected clinical workflows, especially with respiratory and infectious disease patients.⁽⁶⁾ This example shows that the issue of laboratory strengthening is not a problem of low-income countries only but a concern of the health system as a whole.

On the basis of reviewed evidence, several priority steps can be identified to enhance clinical microbiology laboratories and the overall infection control. Initially, incorporate antimicrobial stewardship and infection control measures. The 2025 Korean analysis indicates that siloed strategies are not as effective as integrated models. Shared governance, joint surveillance systems and collaborative intervention protocols optimize the use of limited resources and enhance patient outcomes.⁽²⁾ Second, invest in novel diagnostic solutions suitable for low-resource settings. The successful test of the Mini-Lab in the Central African Republic is evidence-of-concept that good microbiology diagnostics can be provided beyond tertiary referral centers.⁽³⁾ Such innovations should be scaled by governments and donors. Third, focus on training and retaining workforce. Since, equipment alone is not sufficient. The Nepal experience shows that hands-on training is essential for quality and sustainability.⁽⁴⁾ Likewise, Ethiopia project highlighted that protocols do not alter behavior without continuous evaluation and feedback.⁽¹⁾ Fourth, enhance the national reference laboratory networks. In February 2026, a WHO webinar on Legionnaires disease emphasized the pivotal role of national reference laboratories in early detection, investigation of outbreaks, and evidence-based control strategies.⁽⁷⁾ Good reference networks will aid in quality assurance and facilitate genomic surveillance of emerging threats. Fifth, obtain a sustainable financing for laboratory services. In February 2026, the United States Centers for Disease Control and Prevention announced a \$150 million cooperative agreement opportunity to build national partnerships to prevent infectious diseases with particular focus on antimicrobial resistance and infection control capacity.⁽⁸⁾ The same mechanisms of funding are required all over the world.

The clinical microbiology laboratories are inseparable with infection control and patient safety. The 2025 and 2026 evidence is clear: strategic investment in laboratory capacity, workforce growth, and program integration results in the quantifiable terms of decreased infections, enhanced antimicrobial utilization, and good health outcomes. The 2022–2030 global health sector strategy is given to all by the WHO. Proofs of concept can be found in country-level initiatives in Nepal and Ethiopia. The tools are provided through technological innovations such as the Mini-Lab. Political will and long-term investment

are what is required now. Each day when there are no proper microbiology services is a day of missed diagnosis, misuse of antibiotics, and preventable infections. The call to action is urgent, and the path forward is clear. Strengthening clinical microbiology laboratories is essential for better infection control, better patient care, and a safer future for all.

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