Dr. Tedros Adhanom Ghebreyesus has just been announced as the new Director-General of the World Health Organization (WHO). Starting on July 1st, 2017, he will be the first African to head up the UN agency. As an internationally recognized malaria researcher, former Ethiopian minister of health and foreign affairs, and chairman of the board for the Global Fund to Fight AIDS, tuberculosis (TB) and malaria, he has promised to stand up for the rights of the poor and respond rapidly and effectively to disease outbreaks and emergencies. This is an ambitious mandate.

According to the Global Burden of Disease 2015 study, published in The Lancet in October 2016, infectious diseases (IDs) account for five of the top 12 causes of disease burden globally, as measured by years of life lost. Lower respiratory infections, diarrheal diseases, HIV/AIDS, malaria and TB together killed > 7 million individuals. Economically disadvantaged regions of the world bear the brunt of this burden as they are often ill-equipped to implement effective ID management strategies. Many of these countries are also afflicted by neglected tropical diseases (NTDs), accounting for an additional 112,600 deaths and significant morbidity. While the mortality rates of many NTDs have declined over the last decade, mortality from Chagas disease, leishmaniasis and dengue has risen. The re-emergence of Ebola and Zika viral outbreaks and the challenge of antimicrobial resistance have added further pressure to overstrained healthcare systems.

Paradoxically, disasters can catalyze advances in control measures, driven by technological innovations and increasing investment from economically-developed countries. This was exemplified by the formulation of a highly protective Ebola vaccine, rVSV-ZEBOV, following the 2013–16 West African outbreak. Final results of the cluster-randomized trial were published on December 22nd, 2016, demonstrating the expedited vaccine development timeline. Yet, post hoc mechanisms to manage emergencies need to be complemented by robust ongoing efforts to combat endemic IDs. As part of the UN’s Sustainable Development Goals, progress has been made in distributing preventative chemotherapy to tackle diseases that primarily affect developing countries. Nevertheless, the development of appropriate diagnostic tests—used for surveillance and to guide treatments—is sadly lagging, mainly due to a poorly defined market and little scope for commercial gains.

Diagnostic tests are needed at different stages of ID management: early on to map the presence of disease and to interrupt transmission; at later stages to monitor the impact of therapy and to assess the extent of disease elimination; and finally for continued vector surveillance. The WHO has provided a framework for evaluating point-of-care (POC) devices for resource-limited settings using the ASSURED criteria (Affordable, Sensitive, Specific, User-friendly, Rapid and robust, Equipment-free and Deliverable to end users). Technological advances such as miniaturization of computer hardware and microfluidic devices, have enabled diagnostic kits to become increasingly portable. For example, the Muse® cell analyzer, developed by the Global Health branch of Merck, can quickly and accurately monitor T cells in blood from individuals suffering from HIV/AIDS. With a footprint of just 20 cm × 25 cm, this device is truly transportable, making it ideal for clinics serving patients living in remote areas.

POC assays are also benefitting from improvements in molecular diagnostics. Engineering heat-stable enzymes has enabled assays to be performed in diverse environments without the need for costly refrigeration. Traditional PCR assays are being superseded by advancements in isothermal nucleic acid-based amplification techniques that allow detection of extremely small amounts of DNA or RNA directly from a pathogen at ambient temperature and without the need of a thermocycler. Utilizing emerging technologies, such as nanoparticles, are also offering new assay innovations. Iconi Diagnostics Ltd. (Norwich, UK) is leveraging this technology by conjugating carbohydrate moieties to nanoparticles that, in the presence of specific viral particles, aggregate to form a colored product. An ongoing challenge is to create multi-disease platforms that multiplex assays to detect numerous analytes from a single specimen. This will enable the rapid diagnosis of multiple diseases in parallel, helping individuals to get the correct treatment quickly.

A lack of investment is the largest impediment to ID control, and tackling them in low resource settings requires committed partnerships from public, private and philanthropic entities. Governments of economically-developed countries have a responsibility to allocate money towards ID management, help to ensure decisions are based on accurate information, broker the best commercial deals, and help streamline regulatory processes. Many pharmaceutical companies are rising to the challenge by increasing investments in medical diagnostics for low- and middle-income countries. Their efforts are published yearly in the ‘Access to Medicine Index’, ranking the contribution industrial partners play in strengthening health systems in poorer countries.

Incentivizing the process of diagnostic development is another strategy. The Bill & Melinda Gates Foundation has recently invited ‘Innovations for Integrated Diagnostics Systems’ as part of their Global Grand Challenges, with awardees receiving up to 1 million USD for projects with truly exceptional potential. To promote antibiotic stewardship, the UK-based Longitude Prize is a 10 million GBP prize fund that will be awarded to a competitor who devises a POC diagnostic test for bacterial infections. In the US, the National Institutes of Health and Department of Health and Human Services have launched the ‘Antimicrobial Resistance Diagnostic Challenge’, awarding 20 million USD for state-of-the-art, rapid POC diagnostic tests. Collectively, these efforts are hoped to drive smarter healthcare diagnostics.
EBioMedicine aims to facilitate diagnostics development by expanding our understanding of IDs through the articles we publish. These include, but are not limited to, studies that test innovative diagnostic platforms to detect infectious agents; studies that define novel biomarkers and gene signatures in response to infection, and studies that help to integrate and improve data communication through electronic health applications and network analysis strategies. We hope to stimulate a dialogue within the ID community, bringing experts together to inform and innovate. EBioMedicine echoes Ghebreyesus’ ambitions to reduce healthcare inequity, and providing better diagnostics for all will help to close this gap. We wish the WHO success under his leadership.

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