Navigating AMR with innovative diagnostics

300 years ago, as the European colonial powers vied for influence and trade by sea, naval leaders were grappling with the challenge of determining their ships' east–west position in the absence of accurate instruments. In recognition of the significance of the problem, not just for profits but for sailors' lives, the UK Parliament passed the Longitude Act of 1714, which established a monetary reward of up to £20 000 (£1·5 million today) "for such Person or Persons as shall Discover the Longitude at Sea". Amateur horologist John Harrison notably received more than £10 000 between 1730 and 1770 for his series of portable clocks.

Global health is not short of challenges, most of which are multifaceted, context-dependent, and somewhat amorphous. Yet one clearly defined measurement challenge that is analogous to the longitude problem is that of rapidly, accurately, and affordably detecting whether a patient has a bacterial infection and—if so—which antibiotic would be the most appropriate to treat it. Overuse (including empirical use) or misuse of antibiotics is thought to be the greatest modifiable driver of antimicrobial resistance (AMR) worldwide. In 2014, after a public vote on the choice of focus, the UK innovation agency Nesta launched a new £8 million Longitude Prize for AMR. This month, the winner was finally announced.

The PA-100 AST System (Sysmex Astrego, Uppsala, Sweden) passed all seven mandatory judging criteria (ie, needed, accurate, affordable, rapid, easy-to-use, scalable, and safe) after a 6-year appraisal process, adjudicated by an independent Prize Advisory Panel. The cartridge-based analyser uses phase-contrast microscopy and nanofluidics to detect the presence of bacteria in urine in less than 15 min and susceptibility of the bacteria to five commonly prescribed antibiotics for the treatment of uncomplicated urinary tract infections in 45 min.

Dipstick-based urinalysis tests are on WHO's Essential Diagnostics List, but their sensitivity is typically less than 50%, making just-in-case prescribing of antibiotics likely. Given this problem, and the scarce availability of bacteriological culture testing in many low-income and middle-income country (LMIC) health settings, a highly accurate (sensitivity 84%, specificity 99%) point-of-care diagnostic for urinary tract infections that incorporates antibiotic susceptibility testing could potentially be a game-changer. However, despite its approval by the European Medicines Agency, the stated robustness of the device, and its relatively low need for maintenance, several hurdles lie in the way of roll-out of PA-100 to LMICs, and a presumed resultant decrease in inappropriate antibiotic use and reduced AMR.

Cost is an obvious barrier, and Sysmex Astrego says it will use its prize money to scale up and improve production processes, and potentially to design a different cartridge that is better suited to the pathogen profiles across different regions. Appropriate use is another barrier. As noted in the recent *Lancet* Series on AMR, such is the relative affordability of many antibiotics that, in contexts where out-of-pocket payment is the norm, patients are more likely to opt to pay for a cheap, broad-spectrum antibiotic than for a diagnostic test followed by a potentially more expensive drug. Diagnostics must be brought into wider antibiotic stewardship and universal health coverage efforts, coupled with context-specific awareness campaigns.

In 2021, the *Lancet* Commission on diagnostics concluded that "the over-riding reason for the poor global access to diagnostics has been the relatively low attention and priority given to diagnostics by policy makers and funders". The Longitude Prize for AMR was an innovative means to circumvent this issue, motivating academics to advance nascent research work into full-scale device development. Alongside other prize challenges, Nesta has now announced a new prize, to establish diagnostics for sepsis in neonates in LMICs. Entrants can be working in any country, but they must establish relationships with district hospitals in LMICs. We are particularly encouraged by the emphasis placed on engagement with individuals with lived experience of the problem and the stipulation that the criteria for success will be set by neonatologists working in LMICs.

In September, the UN General Assembly will hold its second High-Level Meeting on AMR. The zero draft of the associated political declaration rightly couples antibiotics with diagnostics in many of its clauses. Let this be a year of diagnostic breakthroughs—in more ways than one. ■ *The Lancet Global Health*

For more on **modifiable drivers of antimicrobial resistance** see **Series** *Lancet* 2016; **387:** 176–87

For the **announcement of the winner of the Longitude Prize for AMR** see https://challengeworks.org/challenge-prizes/longitude-prize/

For **the latest WHO Essential Diagnostics List** see https://iris.who.int/bitstream/handle/10665/373322/9789240081093-eng.pdf

For the **sensitivity and specificity of PA-100** see https://link.springer.com/article/10.1007/s10096-024-04862-3

For the ***Lancet* Series on AMR** see https://www.thelancet.com/series/antibiotic-resistance

For the **Lancet Commission on diagnostics** see **The Lancet Commissions** *Lancet* 2021; **398:** 1997–2050

For the **newborn survival prize** see https://challengeworks.org/challenge-prizes/newborn-survival-prize/

For the **zero draft of the UN political declaration on AMR** see https://www.un.org/pga/wp-content/uploads/sites/108/2024/05/20240520-AMR-Political-Declaration-Zero-Draft_FINAL.pdf