Antimicrobial resistance research: learning lessons from the COVID-19 pandemic

Summary note

Background

The COVID-19 pandemic triggered an unprecedented global public health response. Antimicrobial resistance (AMR) is another public health crisis that also requires urgent action. Much has been achieved during the COVID-19 pandemic, including the rapid development of safe and effective vaccines and identification of treatments for severe disease. The UK has played a leading role in these developments. Conversely, the pandemic has also exposed shortcomings in some areas.

On 15 December 2021, the Academy of Medical Sciences' FORUM, the Department of Health and Social Care, and the National Institute for Health Research convened a multistakeholder workshop to consider the lessons that could be learned from the scientific and policy response to the COVID-19 pandemic. The workshop focused on two key areas of relevance to AMR – **diagnostics and surveillance**, and **therapeutics and vaccines** – which were identified through discussion with experts working on AMR or COVID-19 across a range of disciplines.

Key themes

COVID-19 and AMR have much in common, but also some key differences: Both are major public health challenges, requiring coordinated global action. However, AMR, to a greater extent, could be considered a complex systems problem, with the potential for it to evolve in multiple organisms via multiple mechanisms in various environments. AMR is likely to have longer-term implications and, given the need for urgent prospective action across multiple disciplines and sectors, could be considered a challenge more similar to climate change.

Multiple research communities came together to combat the COVID-19 pandemic: The research response to the pandemic has been based on unprecedented levels of coordination and collaboration across disciplines. This approach should not be lost, and the response to AMR needs to be similarly multidisciplinary and focused.

COVID-19 responses were strongest where the UK was already strong: The UK had existing strengths in areas such as vaccine research, clinical research within the NHS, and genomics across the academic and public health sectors, which could swiftly pivot to work on COVID-19. Rapid success was based on these 'deep roots', the result of substantial past investment in research. Responses were more mixed in areas that lacked such firm foundations, such as diagnostics. Although the UK has many research strengths relevant to AMR, some need nurturing to provide a more solid basis for future responses, including a strengthening of the AMR research workforce and career progression pathways.

COVID-19 responses were rapid, focused and well-funded, and drove innovation and new ways of working: There is a need to capture this focus and energy in the response to AMR. If the COVID-19 pandemic could be considered a tsunami, AMR is more akin to sea-level rise – unfolding over longer timescales but still a public health crisis that needs addressing.

Patients and the public have a critical role to play in the AMR response: Patient and public involvement is essential at multiple levels, from the design and prioritisation of strategies to tackle AMR, to the identification of effective ways to communicate with different audiences. Specific examples given were the design and communication of policies surrounding data use and sharing and vaccines, to ensure public acceptability. Securing public support for action to address AMR will also be vital, as it has been for COVID-19 and will be for climate change.

Diagnostics and surveillance are crucial aspects of the AMR response and can draw on the COVID-19 experience

- **The testing infrastructure developed for COVID-19 could be repurposed to support AMR surveillance**: This could extend to wastewater and other environmental monitoring as well as surveillance in veterinary medicine. Linkage of data across sectors would need to be a key priority.

- **Engagement with industry needs to be strengthened**: The diagnostics sector is more fragmented than the pharmaceutical industry and was not sufficiently prioritised early in the pandemic. Stronger and earlier engagement would ensure that industry is better able to support public health responses to AMR. Mechanisms are also needed to provide access to clinical samples and curated collections of resistant microorganisms to accelerate diagnostic development.

- **Regulatory pathways for diagnostics need to be reviewed**: Such pathways are complex and often slow, problems which need to be addressed through dialogue between regulators, developers and other stakeholders.

- **Technological innovation and public adoption of testing are opening up new opportunities**: Multiple diagnostic platforms have been developed for COVID-19, covering a range of uses for testing. This burst of innovation could be harnessed to deliver more tools to support AMR responses and infection prevention interventions. In addition, the widespread public uptake of testing during the pandemic offers opportunities to capture AMR-relevant data directly from communities and to integrate AMR screening in the community into patient admission pathways. Patient and public engagement would be essential to secure support for new approaches and data sharing, and to ensure that the implications of test results are fully understood.

- **An end-to-end focus is needed for diagnostic development, with multistakeholder engagement:** Diagnostic development takes place in a complex environment, requiring input from multiple stakeholders, including researchers, product developers, funders, clinicians, public health professionals, patients and the public. Technical innovations will not succeed unless an integrated view is taken of the needs and interests of these different players, with cross-sectoral collaborations at the heart of product development.

Rapid development and approval of COVID-19 therapeutics and vaccines also offers opportunities for AMR research

- **Innovations in regulatory practice were crucial to the rapid but rigorous evaluation of COVID-19 vaccines and could be applied to AMR therapeutics**: Regulatory bodies such as the MHRA have been willing to consider innovative trial designs and closer dialogue with medicine and vaccine developers. There is a need to embed this model of working, with regulators acting as flexible facilitators rather than just as enforcers of regulation.

- **Capture and analysis of real-world and pragmatic trial data were crucial to inform COVID-19 care:** Studies such as the RECOVERY trial drew on existing research infrastructure and NHS systems and were able to rapidly initiate research. For AMR, major opportunities exist to collect real-world data to understand links between antimicrobial use and resistance and to inform dosing and prescribing, for example to optimise prescribing based on type of infection or patient demographic (e.g. children, or people with co-morbidities).

- **Innovations in vaccine technology could offer a way to reduce antibiotic use**: Several COVID-19 vaccines have been based on novel platforms that could potentially be adapted to combat priority bacterial pathogens. Vaccines against viral pathogens could also reduce unnecessary antibiotic use, while additional vaccines for veterinary use could also be developed. Global structures such as the Coalition for Epidemic Preparedness Innovations (CEPI) have been critical for accelerating development of vaccines and a similar model could be developed for AMR-related vaccine priorities.

The COVID-19 response has been imaginative and characterised by a willingness to think outside the box

This may be a unique 'teachable moment' when radical new ideas could be considered to address another public health crisis in the making. Possibilities include:
- **An overarching national cross-sectoral research agenda could be developed**: This could encompass all levels from basic biology through to implementation and policy research, and with a one-health focus, incorporating fields such as veterinary and environmental science.
- **Given the lack of progress in antibiotic development, an end-to-end public sector-based system driven by public health needs could be considered**: Despite some progress, the antibiotic pipeline is not well stocked and a sustainable business model has yet to be identified. By building on existing global research and development infrastructure, a clinical trial system entirely within the public domain could be envisaged, with integrated activities to ensure equitable and sustainable access following approval.
- **AMR could be 'rebranded' to capture political and public attention better**: Through extensive advocacy, AMR is now on the global political agenda, but may not yet be considered a priority by national governments and the general public. Thought could be given to how AMR is conceived and communicated to support stronger advocacy and to achieve greater political and public buy-in.

Antimicrobial resistance is a 'slow burn' public health crisis that could ultimately have an impact far exceeding that of COVID-19. Combating AMR will require, at the very least, the same degree of national and international focus and coordinated action, political commitment and public engagement, with a sustainable, longer-term approach. The response to the COVID-19 pandemic proves that things can be done differently when circumstances demand – the challenge now is to achieve something similar for AMR.