Science and Technology Committee: UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks

Submission by the Society for Applied Microbiology

Introduction

1. The Society for Applied Microbiology (SfAM) welcomes the opportunity to respond to the Science and Technology Committee's call for evidence on UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks.

2. SfAM's response draws upon evidence from members from all fields of microbiology, to highlight areas that UK research has addressed in the global response to COVID-19 and areas that will enable better preparation for future epidemics.

3. One of the most significant challenges to the research community's response to COVID-19 has been the UK's limited testing capacity. Vast evidence collection is critical for understanding the nature of the virus, which better informs modelling, containment strategies, and further research, including the development of vaccines and therapeutics.

4. Not only has the amount of testing been limited, but the types of that testing have been insufficient. As limited test supplies have been prioritised to identify those who are currently infected, vital evidence and research on other areas, such as antibody production and immunity, have been under procured.

5. Even if one of the various research groups around the world develop a safe vaccine soon, the UK's pharmaceutical system is currently insufficient to scale up, manufacture, and distribute vaccinations on a mass scale. Future outbreak management will require long-term investment now in the establishment of vaccine research and manufacturing facilities.

The contribution of research and development in understanding, modelling and predicting the nature and spread of the virus

6. Based on previous emerging infectious disease outbreaks (e.g. HIV, Ebola), it is highly likely that an animal will be the source of the next pandemic. To implement effective outbreak prevention measures, there needs to be more research on pathogen ecology. While much is known about pathogen:host interactions, more information is needed on the ecology of infectious diseases such as where pathogens are and how they are evolving.

7. Public policy responses to COVID-19 have overly relied on modelling. While modelling has been important for providing predictions, without sufficient high-quality data to test the models, the assumptions they are based on can be limiting, misinterpreted, and misdirect policy responses.[1] For example, an initial strategy for herd immunity was quickly replaced by lockdown measures as evidence from other countries exposed the fragility of healthcare facilities and rates of infections. The limitations of modelling stress the need for more

[1] Ian Sample, Coronavirus exposes the problems and pitfalls of modelling. *The Guardian*, 25 March 2020. https://www.theguardian.com/science/2020/mar/25/coronavirus-exposes-the-problems-and-pitfalls-of-modelling.

evidence and, particularly in the case of COVID-19, more testing to provide that needed data.

The capacity to manufacture and distribute testing, diagnostics, therapeutics and vaccines:

8. There was a limited supply of swab testing and diagnostics at the outset of COVID-19 which has had numerous and long-lasting repercussions including, hampering the effectiveness of isolation measures; delaying information gathering on who has immunity and for how long; and limiting development of vaccine and antibody therapies.

9. Early and widespread testing is vital for research because such testing determines the rate of transmission, the groups within the population who are responsible for transmission (whether symptomatic or asymptomatic) and identifies mortality trends. Test data provides the scientific evidence that validates the predictions of mathematical models and underpins policy decisions (e.g. who to immunise first to maximise the impact of vaccination).

10. It is also crucial that testing is not limited to viral RNA testing but also anti-viral antibodies. PCR tests identify if a person currently has the virus, ensuring isolation measures are effective. Antibody assays identify those persons who have been infected, which provides additional information on infection rates and epidemiology, and, more importantly, on probable population immunity that is needed to inform policy for easing lockdown measures. Confirming if someone has mounted a protective antibody response may also inform vaccine development and antibody therapy approaches.[2]

11. Due to limited supplies of swab testing during the current outbreak, most swab tests have been directed to the NHS frontline as part of a centralised procurement of PPE. While this testing is essential for reducing the spread of infection via frontline carers, this has meant that most evidence gathering, particularly COVID-19 research, has been limited and delayed. Without diverse and adequate testing, it is difficult to develop vaccinations and therapies as well as assess asymptomatic carriers, and if the presence of antibodies indicates immunity and how long that immunity lasts.

12. As early testing is critical, it is imperative that strategies for future pandemics include a means to rapidly scale up testing. At the onset of the outbreak, many facilities (whose research programmes were suspended) could have contributed to testing but did not, due to unclear infrastructure and strategies which prohibited them from becoming authorised facilities.

The capacity and capability of the UK research base in providing a response to the outbreak in terms of the development and testing of vaccines and therapeutics

13. The WHO has been warning for many years of the potential for a new pandemic, so-called Disease-X. However, only a few select philanthropic organisations, such as the Gates

[2] Professor Kenneth Timmis, The COVID -19 pandemic: some lessons learned about crisis preparedness and management, and the need for international benchmarking to reduce deficits. *Environmental Microbiology*, 22: June 2020. https://doi.org/10.1111/1462-2920.15029.

Foundation, currently fund the early search and development of vaccines because industrial organisations require profitable returns.

14. To ensure adequate research and preparation of vaccination production for future outbreaks, the pharmaceutical industry will need to be incentivised to develop vaccines and antibiotics at an earlier stage of research. Without incentives such as tax credits or advance market purchase commitments, industry players are less likely to develop vaccines on a speculative basis, e.g. emerging diseases, because of the considerable economic and time costs of vaccine research, development, and regulatory approval process.[3] Restoring research discovery in the UK will take years to reinstitute as antiviral compound libraries will need to be amassed and the facilities and production processes must be safe and approved by UK regulations.

15. Likewise, the UK has for many years relied on imported vaccines for its immunisation programme (apart from the vaccine Fluenz (AstraZeneca). This means that when a vaccination becomes available, the UK will not have the capacity to produce the large quantities of vaccines required and will rely on importing, which may be delayed and in shortage due to lockdowns in the global supply chain. This shortage is further exacerbated by the continuously decreasing number of companies producing vaccinations as a result of company mergers and withdrawal from vaccine research as mentioned above.[4]

About the Society for Applied Microbiology

The Society for Applied Microbiology (SfAM) is the oldest microbiology society in the UK, representing a global scientific community that is passionate about the application of microbiology for the benefit of the public. Our members work to address issues spanning the environment, human and animal health, agriculture and industry. www.sfam.org.uk

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[3] Parliamentary Office of Science and Technology, UK Vaccine Capacity. *Postnote,* 314: August 2008. https://post.parliament.uk/research-briefings/post-pn-314/.

[4] Parliamentary Office of Science and Technology, UK Vaccine Capacity. *Postnote*, 314: August 2008. https://post.parliament.uk/research-briefings/post-pn-314/.