

## **Response from the Royal Society of Biology (RSB) to the House of Commons Science and Technology Committee inquiry into emerging diseases and learnings from covid-19**

March 2023

The Royal Society of Biology (RSB) is a single unified voice, representing a diverse membership of individuals, learned societies and other organisations. Our world-leading biosciences sector contributes strongly to the economy, and to society. We are committed to ensuring that we provide Government and other policymakers, including funders of biological education and research, with a distinct point of access to authoritative, independent, and evidence-based opinion, representative of the widest range of bioscience disciplines.

The RSB welcomes the committee's call for evidence on the matter of emerging diseases and learnings from covid-19. We are pleased to provide comments informed by our membership of individuals and organisations with expert interests across the biosciences. Our Member Organisations are listed in Appendix 1.

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### **Summary**

As evidenced by the COVID-19 pandemic, the threats posed by zoonoses are a serious risk to both the UK and the international community. Over recent decades, the increasing impact of human society on our ecosystems, either indirectly, through chemical and waste pollution and climate change, or directly via habitat destruction and biodiversity loss, has led to an increasing risk of emerging infectious diseases (EIDs) and 'spillover' events (where an emergent pathogen has crossed the species barrier to infect humans, effectively becoming zoonotic). What is key to note is that zoonoses affect both human and vertebrate animal populations, thus our activities to prevent and control disease in either population are directly related. It must also be noted that EIDs in plant populations also have the power to greatly affect food security and thus human health, while our actions – such as introduction of invasive species and limited genetic diversity in major crop species – also contribute to heightened risk of disease outbreaks with pandemic potential in these species (and others).

Improper practices such as excessive and inappropriate use of antimicrobials, and insufficient biosecurity measures, have also increased the risk of pandemics across species – including the current 'silent' pandemic of antimicrobial resistance - as well as hampering the treatment of current and emerging infectious diseases (EIDs).

The COVID-19 pandemic had a significant effect across multiple areas of UK society, and further highlighted (in addition to previous outbreak preparedness reviews) how the UK was, at the time at least, ill prepared to deal with outbreaks of disease with pandemic potential. The successes of the COVID-19 response, such as rapid vaccine distribution and effective genomic surveillance, should be built upon as a platform for future response protocols. However, there were of course also failures, which led to high morbidity and mortality, particularly in more vulnerable and underrepresented groups in our society. Lessons must be learnt and immediately integrated into current systems, future preparatory exercises and real-time outbreak prevention, identification and response strategies. One key area for improvement relevant across the bioscience community concerns the full integration of One Health principles and practice into these strategies, encompassing a broad range of factors and organisms, including, but not limited to, animal and human health. An example of this could be veterinary public health, wildlife

surveillance and outbreak response intelligence, which can be integrated with and inform public health planning and responses early, ongoing and in real-time, in particular where zoonoses are concerned.

It is fundamental that the UK invests in areas across the biosecurity sector. Increased investment is vital – for example in adequate personnel training and standards development for research facilities working on infectious diseases (in human, animal and plant populations), in the mechanisms for sharing of research outcomes, surveillance data and population datasets, intervention strategies, and of course in the preventative, response, control and healthcare systems treating those affected. The UK must encourage a clear pathway into this sector to empower a highly skilled, integrated, interdisciplinary and motivated workforce. A systems thinking approach is critical, which promotes effective coordination and funding distribution across sectors.

## **Main response**

### Causes and implications of zoonotic disease emergence

- SARS-CoV-2 is a virus in the coronavirus family. Some sources describe it as zoonotic, while others describe it as an emerging infectious disease (EID) of probable animal origin<sup>1</sup>. Some members of the coronavirus family are zoonotic. A zoonosis is any disease or infection that is naturally transmissible from vertebrate animals to humans<sup>2</sup>. An EID is a disease that either has appeared and affected a population for the first time, or has existed previously but has re-emerged and is rapidly spreading. Many EIDs are zoonotic in origin<sup>3</sup>.
- Habitat destruction is a key cause of zoonotic disease emergence. A smaller and more fragmented habitat, encroached upon by human activity, leads to greater interaction between humans, domesticated animal populations and wild animals, with the potential for pathogen transfer and host shift events, which in turn can act to increase the likelihood and primary rate of infection in humans and the subsequent possibilities of an outbreak<sup>4</sup>.
- The issue of climate change is a key facilitator in the spread and expansion of infectious diseases. Increased global temperatures can increase the suitability for transmission of tropical diseases such as dengue virus through their associated vectors<sup>5</sup>, and climate change is seen as one of the key emerging drivers of infectious disease in Europe<sup>6</sup>.
- The role of biodiversity loss is also key. Biodiversity loss in ecological communities is more likely to exhibit as a reduction of large-bodied animal species with slower life histories, which indirectly leads to proliferation of smaller-bodied species whose life histories are comparatively faster. These species appear to be more likely vectors of zoonotic disease transmission to humans<sup>7</sup>. Thus, biodiversity loss in ecological systems is likely to lead to increases in the abundance of zoonotic reservoirs. In many cases, this issue goes hand in hand with habitat loss, therefore it is imperative that the UK and the international community both adhere to and build on the proposals agreed in the recent COP15 summit in Montreal<sup>8</sup>, and ensure that remediation of these issues is a top priority.

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<sup>1</sup> Frontiers in Public Health, 2020: [COVID-19—Zoonosis or Emerging Infectious Disease?](#)

<sup>2</sup> World Health Organisation (WHO), Zoonoses Key Facts, URL: <https://www.who.int/news-room/fact-sheets/detail/zoonoses>

<sup>3</sup> Cell, 2020: [Emerging Pandemic Diseases: How We Got to COVID-19](#)

<sup>4</sup> Elsevier Public Health Emergency Collection, 2021: [Habitat loss and the risk of disease outbreak](#)

<sup>5</sup> British Medical Journal, 2020: [Emerging arboviruses in the urbanized Amazon rainforest](#)

<sup>6</sup> Wiley Public Health Emergency Collection, 2016: [Observed and projected drivers of emerging infectious diseases in Europe](#)

<sup>7</sup> PNAS, 2021: [Impacts of biodiversity and biodiversity loss on zoonotic diseases](#)

<sup>8</sup> CBD Press Release, 2022: [COP15: Nations adopt four goals, 23 targets for 2030 in landmark UN biodiversity agreement](#)

- Although already listed as a significant risk in the UK's Biosecurity Strategy<sup>9</sup>, the risk posed from the generation and subsequent spread of antimicrobial resistance (AMR) must be highlighted. This increases the risk of the spread of pathogens across species and ecosystems. Additionally, AMR could lead to ineffective treatment of both new and current diseases, which could then potentially lead to significant pressure on health services. The threat from AMR is only going to increase over time unless action is taken to remedy this<sup>10</sup>.
- Chemical and waste pollution poses a risk in terms of both disease emergence and its spread. Chemical pollution can facilitate AMR<sup>11</sup>, whilst inadequate waste treatment and disposal can act as a vector for spreading disease, facilitating both its geographic spread whilst also bringing it into closer contact with the general population.
- It is often a combination of these factors that allow disease transmission to human hosts. For example, the issues of climate change and habitat loss both facilitate the migration of animal populations, and the accompanying diseases they may host<sup>12</sup>. Additionally, many conflicting factors need to be considered when attempting to reduce the risk of spillover infections. A clear example of this is seen in the agriculture industry, where the conflicting pressures of increased global population and subsequent food demand, must be balanced by the increased risk of zoonotic disease transmission associated with removal of natural habitat for food production<sup>13</sup>. In addition, the need for more efficient, productive agricultural processes must be managed alongside the risks of inappropriate intensive agricultural techniques such as excessive, inappropriate drug use, and the risk of AMR this may entail<sup>14</sup>.
- The escape of pathogens from facilities working on zoonotic diseases also poses a risk of disease emergence and outbreak. As seen in the 2007 foot and mouth outbreak<sup>15</sup> it is possible for zoonotic diseases to emerge via accidental release from laboratory settings or vaccine manufacturing facilities. As mentioned later in the response, it is crucial that these facilities are maintained properly through investment, effective biosecurity policy and procedures, and staff training, to minimise the risk of this as much as possible. This support must extend internationally, particularly to low-and middle-income countries (LMICs), where these processes may be less accessible<sup>16</sup>.
- Whilst unlikely, the risk of these pathogens being spread deliberately should also be considered<sup>17</sup>, as should forms of dual-use research of concern (DURC)<sup>18</sup>, and/or research with inherent ethical

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<sup>9</sup> HM Government, 2018: [UK Biological Security Strategy](#)

<sup>10</sup>Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_publication.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_publication.pdf)

<sup>11</sup> Environmental Pollution, 2022: [Effects of heavy metals pollution on the co-selection of metal and antibiotic resistance in urban rivers in UK and India](#)

<sup>12</sup> British Actuarial Journal, 2022 [The importance of biodiversity risks: Link to zoonotic diseases](#)

<sup>13</sup> Nature Sustainability, 2019 [Emerging human infectious diseases and the links to global food production](#)

<sup>14</sup> PNAS, 2013: [Zoonosis emergence linked to agricultural intensification and environmental change](#)

<sup>15</sup> Defra, 2007: [Foot and mouth disease 2007: a review and lessons learned](#)

<sup>16</sup> Biosafety and Health, 2022: [Biobanking in LMIC settings for infectious diseases: Challenges and enablers](#)

<sup>17</sup>Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_publication.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_publication.pdf)

<sup>18</sup> World Health Organisation, 2020: [What is dual-use research of concern?](#)

implications, such as gain of function research<sup>19</sup>. As highlighted by the World Health Organisation Global Guidance Framework, there is a lack of awareness that work in this field could be misused, as well as a lack of incentives to mitigate against this occurring<sup>20</sup>. The Government should consider this framework when developing future UK biological security policy. Additionally, as one of the three depositaries of the Biological Weapons Convention<sup>21</sup>, the UK has an important role to play in making sure this treaty is strengthened and maintained through future rounds of review. Strong international governance and cooperation, coupled with careful scrutiny of research and effective deterrents for its misuse, are fundamental in facilitating greater international biosecurity.

- Whilst every effort must be made by the UK and the international community to tackle these aforementioned issues, it is also important that well integrated surveillance, scenario and contingency planning, and infrastructure to prepare for, early-identify and rapidly control disease outbreaks remains current and sustainably resourced long term<sup>22</sup>.
- The global implications of another zoonotic disease outbreak cannot be overstated. The economic impact arising from the COVID-19 morbidity and mortality burden in the UK led to an unprecedented drop in GDP<sup>23</sup>, a pattern seen in many other countries across the globe. Global poverty increased for the first time in a generation, with disadvantaged populations being disproportionately affected<sup>24</sup>. This pandemic also had a significant global social effect, particularly on the most vulnerable members of society, due to restricted movement, social isolation, and the risk of increased xenophobia<sup>25</sup>. Although lessons have been learnt since the emergence of COVID-19, another zoonotic disease outbreak of this scale or greater, could cause incredible damage across multiple aspects of society.
- Future outbreaks can also have a detrimental effect on the education sector. During the recent COVID-19 lockdowns, many pupils throughout all areas of study had to resort to online learning. Factors such as limited space and intermittent internet access made learning difficult for many students. In some instances, this curtailed momentum and enthusiasm for studying the biosciences.
- In addition to exacerbating existing educational and social inequalities across age groups<sup>26</sup>, this can result in students missing key skills that are most effectively taught through practical sessions or fieldwork. We expect the impact of disrupted teaching and learning during COVID-19 to have a long term impact in terms of attainment, progression and aspiration to continue studying the sciences, as we know from ASPIRES research that students make up their minds about whether science is for them towards the end of primary school<sup>27</sup>. The Association for Science Education found that almost 60% of science leader and teacher respondents were not satisfied with their school or college practical work during lockdown, and 30% didn't plan for any field work or outdoor science work in

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<sup>19</sup> Board on Life Sciences; Division on Earth and Life Studies; Committee on Science, Technology, and Law; Policy and Global Affairs; Board on Health Sciences Policy; National Research Council; Institute of Medicine, 2015. [Potential Risks and Benefits of Gain-of-Function Research: Summary of a Workshop.](#)

<sup>20</sup> World Health Organisation, 2022: [Global guidance framework for the responsible use of the life sciences](#)

<sup>21</sup> United Nations: Office for Disarmament Affairs: [Biological Weapons Convention](#)

<sup>22</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's Biological Security Strategy, 2022:

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<sup>23</sup> House of Commons Library, 2022: [Economic impact of covid-19 lockdowns.](#)

<sup>24</sup> World Development Report 2022: [Chapter 1. The economic impacts of the COVID-19 crisis](#)

<sup>25</sup> United Nations, Department of Economic and Social Affairs: [Everyone Included: Social Impact of COVID-19](#)

<sup>26</sup> Education Policy Institute, 2022: [Covid-19 and Disadvantage gaps in England 2020](#)

<sup>27</sup> UCL, 2020: [ASPIRES 2 Young people's science and career aspirations, age 10-19](#)

2021/22<sup>28</sup>. The Royal Society of Chemistry also reported that 78% of teacher trainees and first year teachers surveyed felt that the impact of COVID-19 had a negative impact on their school placement experience<sup>29</sup>.

- The COVID-19 pandemic also had a significant effect on academic research and publishing. Gender inequality was exacerbated in academic publishing<sup>30</sup>, and there was a significant negative effect on researcher's ability to conduct research, as well as impacting their mental health<sup>31</sup>.
- The COVID-19 pandemic also had a significant economic impact on the UK research workforce. Funding uncertainties, research setbacks and employment uncertainty were all exacerbated during the pandemic<sup>32</sup>, and many researchers had enforced career breaks due to care responsibilities, lack of funding, or sickness. Committed research funding is essential to prevent these issues happening in future, as well as Government support for professional bodies focusing on career re-entry schemes.
- The redirection of funding towards COVID-19 research undoubtedly facilitated progress in this field. It is vital that this work is built on in the STEM research base, to enable better monitoring, prediction, and treatment of future pandemics. This is not to suggest that funding should be redirected from other research initiatives, but rather overall funding is increased.
- The lack of effective public education and communication during zoonotic disease outbreaks can cause distrust and disbelief in areas of society towards professionals and academics in this field. As mentioned later in our response, the benefits that vaccines provide to both the individual and the wider public must be shown through clear, accurate communication<sup>33</sup>. Failure to do this effectively could lead to government and scientific mistrust, the spread of disinformation, as well as reduced vaccine uptake and subsequent inadequate disease control and treatment. In November 2021, RSB published *Evolving 5-19 Biology: recommendations and framework for 5-19 biology curricula*<sup>34</sup>, which is intended to inform future curriculum reform and specification design in the UK. "How do organisms stay healthy?" is one of 7 big questions used to frame the curriculum, with vaccination, spread of communicable disease, prevention and treatment all included as a vital part of science education to ensure scientifically literate citizens and workforce in the future, as well as prepare students for further study of the sciences post-16. Implementing these framework recommendations can facilitate greater awareness and education in this area in future generations.

#### The UK's preparedness for an emerging infectious disease outbreak

- A key lesson from the COVID-19 pandemic is how veterinary public health and wildlife surveillance and outbreak response intelligence must be integrated with and inform public health planning and responses early, ongoing and in real-time, in particular where zoonoses are concerned. For example, considering the expertise honed by the veterinary epidemiological and public health community in tackling outbreaks such as Foot and Mouth Disease in ungulates in 2001 and 2007, and in tackling annual outbreaks of avian influenza, Government should have approached these fields earlier in the COVID-19 pandemic timeline, for their expertise and assistance. International public health professionals, and research groups specifically studying coronaviruses, should also

<sup>28</sup> The Association for Science Education, 2020: [Good Practical Science - making it happen post-Covid 19](#)

<sup>29</sup> Royal Society of Chemistry, 2021: [The future of practical science lessons](#)

<sup>30</sup> Elsevier Public Health Emergency Collection, 2020: [The impact of COVID-19 on research](#)

<sup>31</sup> UKRI : [Survey findings of the impact of COVID-19 on researchers](#)

<sup>32</sup> Higher Education, 2022: [The impact of the first COVID-19 lockdown in the UK for doctoral and early career researchers](#)

<sup>33</sup> Frontiers in Political Science, 2021: [Encouraging COVID-19 Vaccine Uptake Through Effective Health Communication](#)

<sup>34</sup> Royal Society of Biology, 2021: [Evolving 5-19 Biology: recommendations and framework for 5-19 biology curricula](#).

both have been approached early on. Collaboration and cooperation between these fields, and across Government and non-Government sector research capabilities, is a necessity. The importance of organised research and innovation sector stakeholders and their effective engagement with relevant Government departments and regulators, via groups such as the UK Bioscience Sector Coalition facilitated by the Royal Society of Biology, has been one of the lessons learned from the pandemic. A functioning relationship and two-way communication between the science sector and Government helped with the overall response to the pandemic (e.g. building testing capacity, vaccine development and rollout) but also with raising science-specific issues that needed tackling in order for excellent, ethically sound research to continue. We would encourage more of this coordinated and strategic engagement moving forward, via a continued receptive and supportive culture in Government and the civil service.

- The 2018 Biological Security Strategy's acknowledgment of a One Health (OH) approach is welcomed, and should be expanded across government policy, in addition to surveillance, research development, innovation and communication across relevant sectors. We welcome the commitments made by UK and international ministers at G7 meetings in 2021. Government must coordinate with funders and other stakeholders to enhance and incentivise OH research and education; and integrate the OH evidence base, approaches and principles into policymaking, as part of systems-based and long-term strategies to tackle current and future threats<sup>35</sup>. OH policy must not be solely human and animal focused, but should encompass as broad a range of aspects as possible, including plants and other organisms, environmental factors and the interactions between these.
- A fast vaccine response is essential to limit both the effects and spread of future disease outbreaks. As shown by the COVID-19 vaccine rollout, vectored vaccines and subsequently mRNA vaccines provided a relatively quick response to pandemic outbreaks, and upscaling the production, distribution, and development of these through increased investment can help mitigate the impact of future diseases. The Government must establish an effective model for future surge vaccine manufacture in the UK, implementing good manufacturing practice, or more clearly define the pathway where UK vaccine research can be effectively transitioned from development to large scale production. This could be done through facilities such as The National Biologics Manufacturing Centre. Where possible, seed stocks for future predicted zoonotic pathogens must also be put in place.
- Programmes such as the COVID-19 Genomics UK (COG-UK) Consortium are an example of successful projects aimed at informing public health choices in this area, having generated over 1.5 million publicly available viral genomes to help identify and track COVID-19 variants<sup>36,37</sup>. Although EID's often emerge without warning and from a variety of different settings, the surveillance and subsequent rapid sequencing and analysis through these projects is vital in understanding and preparing for future potential disease emergences. These projects must be supported and maintained both during and in-between major outbreaks, so that they can be utilised in inevitable future incidences.

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<sup>35</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's Biological Security Strategy, 2022:

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<sup>36</sup> COVID-19 Genomics UK (COG-UK) Consortium [COVID-19 Genomics UK \(COG-UK\) Consortium – Wellcome Sanger Institute](#)

<sup>37</sup> COVID-19 Genomics UK (COG-UK) Consortium: [COG-UK Impact](#)

- In addition to this, careful genomic surveillance of cell lines used in disease study and clinical trials is vital to ensure that the appropriate strain of disease is being used. Careful consideration of vaccine stocks in research is critical to developing effective therapeutic outputs<sup>38</sup>.
- Similarly, investment should go into other aspects of the disease prevention and treatment pathway, such as improving diagnostic tests, and understanding points of origin. Close collaboration between research institutes and government bodies, via projects such as the UK MPox consortium<sup>39</sup>, allow clear and rapid knowledge exchange, leading to effective, science-based outputs.
- During the COVID-19 pandemic, close working of scientists with the regulators (MHRA) led to accelerated development pathways to the clinic for vaccines and therapeutics. This momentum should be exploited in response to other emerging and current pathogens for which there are no effective vaccines currently and which could pose a future threat e.g. Nipah virus, whilst also maintaining a high standard of independent regulatory review and maintaining the UK vaccine network to support this interaction<sup>40</sup>. The use of emerging technologies such as Biofoundries should also be considered in this approach<sup>41</sup>. However, it is important to remember that developing these vaccine technologies does not necessarily reduce the risk posed by future diseases, and that factors such as rate of pathogen mutation, funding for vaccine trials and materials, and the logistics of vaccine delivery and accessibility on a global scale are all variable and can affect potential outbreak mitigation and treatment<sup>42</sup>.
- It is vital that the Government both maintains and expands the UK's network of agencies focused on disease outbreak and prevention. The findings from the recent House of Commons Committee of Public Accounts report into the Redevelopment of Defra's animal health infrastructure show that the UK's main animal health facility at Weybridge has been left to deteriorate alarmingly through a combination of inadequate management and underinvestment<sup>43</sup>. The comment that the centre would struggle to respond to a high category outbreak should be a major concern for the government, and it must be an immediate priority that both the issues of management and investment are addressed. This should apply to animal health facilities across the UK. This highlights both the ill-preparedness of the UK and that the significant threat posed by future disease outbreaks is not prioritised at the level it should be, by the current government.
- The RSB has previously highlighted concerns over lack of pandemic preparedness and in particular a lack of full implementation of the recommendations of exercise Cygnus in a timely manner, which could have improved the outcomes of control of COVID-19 in the UK and overseas<sup>44</sup>. The

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<sup>38</sup> *The Biologist*, 2021: [Are defective stocks of SARS-CoV-2 being used in COVID studies and clinical trials?](#)

<sup>39</sup> University of Cambridge press release, 2022: [Cambridge researchers join new £2 million UK consortium to tackle monkeypox outbreak](#)

<sup>40</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_public\\_atiion.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_public_atiion.pdf)

<sup>41</sup> Nature Communications, 2022: [Pandemic preparedness: synthetic biology and publicly funded biofoundries can rapidly accelerate response time](#)

<sup>42</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_public\\_atiion.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_public_atiion.pdf)

<sup>43</sup> House of Commons Committee of Public Accounts, 2022: [Redevelopment of Defra's animal health infrastructure](#)

<sup>44</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

Government should carefully review the situation to assess where these recommendations remain relevant and ensure that they have now been taken on board. This is also the case for other exercises simulating infectious disease outbreaks, such as Exercise Winter Willow<sup>45</sup>. The Government should look to reconsider and implement (in line with the current evidence base) the recommendations from these, as soon as is reasonably possible. Consideration of the need for near-future additional exercises, including information exchange and collaboration with international governments and relevant sectors, with defined review and repeat assessments at appropriate intervals, is strongly advised, as is the implementation of the recommendations of future exercises as an imperative for immediate action.

- Whilst it is good that the Government has recently called for evidence on a review of the 2018 Biological Security Strategy, it is important that this cycle of review continues more frequently. As noted in our response to the aforementioned call for evidence, the RSB believes that the strategy should undergo an annual system of rapid and efficient re-review against any changes to threats and risks identified e.g. through the National Risk Register (NRR), and to ensure that any decline in the UK's capabilities to predict, early-detect and respond are immediately acted upon<sup>46</sup>. It is vital that the UK has strategies tailored for different sources of disease outbreak (E.g. plant, animal or fungal in origin), as these require different, personalised responses. These should be subject to the same timescales of review.
- The UK must make sure it has rapid access to safe and effective prophylaxis, treatment, diagnostics and other related equipment (such as PPE) for prevention, early-detection, mitigation and control of EIDs at an individual and population level. There must be contingency so that endemic and pre-existing infectious and non-infectious diseases and conditions in the population are appropriately managed during periods of EID mitigation such as lockdowns. Recent research<sup>47</sup> has found that almost 500,000 people missed out on vital starting medication to lower their blood pressure during the pandemic. Whilst this information will not help prevent a pandemic, these lessons from the COVID-19 pandemic must be taken into account and acted upon so the same mistakes are prevented during future pandemics<sup>48</sup>.

#### Government coordination and communication

- As noted in the recent inquiry by the Public Accounts Committee, prior to the COVID-19 outbreak there was lack of agreed tolerance of risk across Government departments, in relation to acceptable and non-acceptable consequences of a pandemic. Central leadership and accountability is crucial to ensure the government is better prepared for future outbreaks<sup>49</sup>.

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Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_public\\_ation.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_public_ation.pdf)

<sup>45</sup> National Audit Office, 2021: [The government's preparedness for the COVID-19 pandemic: lessons for government on risk management](#)

<sup>46</sup>Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

Biological Security Strategy, 2022:

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<sup>47</sup> Nature Medicine, 2023: [The impact of the COVID-19 pandemic on cardiovascular disease prevention and management](#)

<sup>48</sup> British Pharmacological Society response to the call for evidence on emerging diseases and learnings from Covid-19

<sup>49</sup> House of Commons Committee of Public Accounts, 2022: [Government preparedness for the COVID-19 Pandemic: Lessons for government on risk](#)



- The RSB has previously stated that this idea of clarity and coordination should extend externally to allow effective information exchange, knowledge flow, and early international warning from expert stakeholders<sup>50</sup>. The Government should look to involve these parties as soon as possible, and promote a clear and consistent line of communication. Scientific advice and information from these relevant bodies should be treated with appropriate value and priority by Government.
- The RSB has previously stated that it would support an approach where there is a single governing body accountable for meeting the full range of biological threats. A single body could hold departments accountable for their core roles, which would link-into the overarching aforementioned body. However, the four nations have different geographical and social landscapes, so flexibility and excellent connectivity and communication will be required<sup>51</sup>.

#### Government prioritisation of the threat from animal and other diseases

- As mentioned earlier in our response, it is deeply concerning that the UK's main animal health centre has been left to deteriorate due to inadequate management and under investment. It is critical that these issues are addressed as soon as possible, across all UK animal health facilities, given the unpredictability of when new diseases will emerge and how quickly they will spread<sup>52</sup>.
- It is vital that funding and prioritisation for zoonotic diseases does not detract from resources focused on the threat of other pandemics affecting plants and other organisms. EID's in plant populations can seriously jeopardise food security, biodiversity, and the natural environment, with serious health and economic consequences. Increasing the capacity and professionalization of the plant health workforce, alongside greater public awareness and communication in this subject, is vital in preventing future disease outbreaks<sup>53</sup>.
- Previous cuts to funds such as Official Development Assistance (ODA), which includes the Global Challenges Research Fund, poses risks to the work undertaken as part of many important and long-standing projects focusing on issues including neglected tropical disease (NTDs) research. Cutting funding schemes such as this not only reduces the visibility, leadership, power and standing of the UK abroad, but also hinders international collaboration on issues of pandemic research and surveillance, which is fundamental in both pre and post disease emergence. Similarly, as a third country (non-member of the European Union), the UK is excluded from funding for recent EU surveillance for zoonotic pathogens. The UK can join the surveillance network, but cannot receive funding for related research and data sharing. To benefit from this important scheme, and similar such schemes internationally, Government need to input funding for UK participants. It is important that UK, EU and international surveillance are joined up, since pathogens do not respect political

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[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_public\\_ation.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_public_ation.pdf)

<sup>51</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_public\\_ation.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_public_ation.pdf)

<sup>52</sup> House of Commons Committee of Public Accounts, 2022: [Redevelopment of Defra's animal health infrastructure](#)

<sup>53</sup> Response from the Royal Society of Biology to the Defra consultation on a Plant Biosecurity Strategy for Great Britain, 2021  
[https://www.rsb.org.uk/images/RSB\\_response\\_to\\_GB\\_plant\\_biosecurity\\_strategy\\_consultation-submitted.pdf](https://www.rsb.org.uk/images/RSB_response_to_GB_plant_biosecurity_strategy_consultation-submitted.pdf)

boundaries. Funding cuts or geographic gaps in funding conceivably act to indirectly increase the risk of disease emergence, subsequent spread, and morbidity and mortality in our society<sup>54,55</sup>.

- In the wake of the pandemic, several different taskforces were created by the Department of Health and Social Care. One of these was the COVID-19 Antivirals and Therapeutics Taskforce<sup>56</sup>. This coordinates the end-to-end provision of treatments for COVID-19 in the UK, so that patients have access to effective and safe medicines. The most recent publication, from December 2022, is an evaluation of preventative Covid-19 medicines<sup>57</sup>, which also highlights the COVID-19 Prophylaxis Oversight Group (POG) and how preventative medicines should play a key role in EID outbreak control strategies. Guidance like this is of great importance, and continued and ongoing action in this area is required<sup>58</sup>, adapting to different outbreaks and diseases as appropriate.

#### Additional policy initiatives and solutions

- It is imperative that the Government invests in the infrastructure, connectedness and workforce involved in facilities researching zoonotic diseases, and the healthcare systems in place to manage them, with a focus on One Health principles and practice. Facilitating effective protection of veterinary and human public health, the national health system and the health workers within it, can offer a substantial return on investment<sup>59</sup>. Effective practical and educational infrastructure focused on infection prevention must be considered to mitigate the spread of diseases within health and social care facilities.
- Approaches to address staff departing the healthcare profession should also be considered. The high number of skilled and experienced staff departing this area of the workforce could lead to ill-prepared and ineffective healthcare infrastructure during future pandemics. A fast tracked visa scheme for skilled healthcare workers, and other professionals with relevant expertise, could be considered for implementation to facilitate the demands of a future pandemic.
- The Government must invest in the workforce across the fields of biosecurity, biomedical and wider biological research. This should encompass all areas including animal, plant and fungal biology and pathology, and should allow career development into specific areas of expertise as appropriate. This could be done through creating a clear pathway into this area, through apprenticeship opportunities, promotion of careers across relevant bodies, and implementing a clear pathway of career progression within roles, including continuing professional development and maintenance of standards in involved and related professions<sup>60</sup>. An example of this would be the RSB's professional registers, which already include areas such as toxicology and plant health, with the RSB also investigating the development of a newly proposed biorisk and bio-containment professionals register with relevant partners<sup>61</sup>.

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<sup>54</sup> RSB, 2021: [RSB urges PM to reconsider research funding cuts: reduction could “leave a lasting scar on UK science”](#)

<sup>55</sup> UKRI, 2022: [ODA review](#)

<sup>56</sup> HM Government [The COVID-19 Antivirals and Therapeutics Taskforce](#)

<sup>57</sup> HM Government, 2022: [Evaluation of medicines to prevent COVID-19](#)

<sup>58</sup> British Pharmacological Society response to the call for evidence on emerging diseases and learnings from Covid-19

<sup>59</sup> OECD, 2022: [Investing in health systems to protect society and boost the economy: Priority investments and order-of-magnitude cost estimates \(abridged version\)](#)

<sup>60</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_publication.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_publication.pdf)

<sup>61</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

- Specific areas of research which our members tell us have been previously neglected in the UK research sector should be developed and supported. These include areas such as virology, medical entomology, epidemiological surveillance and microbial pathogenesis.
- The move from many journals to provide open access for COVID-19 related papers has been useful in improving understanding and treatment of the virus. This model should be supported and encouraged so that it can be used as a template for future rapid information sharing in the case of global emergencies.
- Whilst EID's can emerge unexpectedly from a wide range of settings, surveillance still plays a vital role. This should be risk-based. Government must take care not to undervalue surveillance despite the difficulty in quantifying the benefits of avoiding negative impacts through surveillance and response activity. Surveillance and health systems should be set up with the appropriate data flows to enable sharing and real time monitoring, insights and responses across disciplines, sectors and national and international borders<sup>62,63</sup>. Surveillance must encompass a wide range of factors, including monitoring diseases themselves but also events like natural disasters which could facilitate disease transmission. Increased surveillance of currently monitored diseases with pandemic potential, such as avian influenza, is also critical. The current spread of avian influenza strain H5N1 within wild bird populations is unprecedented and linked to outbreaks in domestic poultry flocks, it has recently been detected in otters and foxes in the UK: close monitoring of this pathogen's progression is vital to ensure early warning of public health risk and an effective continuing veterinary public health response.
- The UK should establish a framework for a therapeutics strategy. This would be a joined-up strategy and would include considerations regarding both prophylaxis and treatment of established disease<sup>64</sup>. This should be considered in the context of strategies to conserve antimicrobials by reducing inappropriate use, to reduce the emergence and spread of antimicrobial resistance. Effective Antimicrobial Stewardship Plans (ASPs) should be incorporated into future pandemic prevention plans, to prevent inappropriate prescription and mismanagement of antibiotics during future outbreaks<sup>65</sup>.
- The UK must adopt a more rigorous biosecurity protocol at its borders. This needs to be a risk-based approach, using relevant expertise and up to date, innovative technologies to identify the greatest points of risk<sup>66</sup>. The infrastructure and appropriately trained workforce to manage this

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Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_publication.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_publication.pdf)

<sup>62</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_publication.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_publication.pdf)

<sup>63</sup> UK Bioindustry Association (BIA), 2022: [BIA response to Biological Security Strategy call for evidence 2022](#)

<sup>64</sup> British Pharmacological Society response to the Governments call for evidence on emerging diseases and learnings from Covid-19

<sup>65</sup> Infection Control & Hospital Epidemiology, 2020: [Involving antimicrobial stewardship programs in COVID-19 response efforts: All hands on deck](#)

<sup>66</sup> Response from the Royal Society of Biology (RSB) to the call for evidence on the UK's

Biological Security Strategy, 2022:

[https://www.rsb.org.uk/images/Policy/RSB\\_response\\_CO\\_biological\\_security\\_strategy\\_submitted\\_and\\_summarised\\_for\\_publication.pdf](https://www.rsb.org.uk/images/Policy/RSB_response_CO_biological_security_strategy_submitted_and_summarised_for_publication.pdf)

requires focused support and funding, with tailored training specific to different areas of biosecurity (E.g. plant, fungal, and animal based risks).

- In order to enable effective prevention and control of emerging diseases through prophylaxis such as vaccines, and treatments for disease, the UK must ensure that development through research and clinical trials are encompassing a wide range of demographics in study populations, factoring in characteristics such as sex, race and ethnicity, pregnancy and pre-existing conditions to ensure that treatments are effective for the entire population<sup>67</sup>. It is also important that international vaccine development and deployment is supported both financially and logistically, to address issues in vaccine inequity and accessibility in different geographic and economic regions<sup>68</sup>.
- Effective information campaigns can encourage the general public to adopt better biosecurity practises in day-to-day activities, and projects like Observatree can help early detection and monitoring of new pest and diseases to UK plants through public recording and participation<sup>69</sup>.
- Effective communication and dialogue between policymakers, the public and interdisciplinary scientific community across the One Health landscape is crucial. Mis- and dis- information must be appropriately tackled through evidence-based and accessible information campaigns and consultation with diverse communities. Vaccines are often vital in controlling disease outbreaks, and it is important that the benefits these provide to both the individual and the wider public is shown through clear, accurate communication<sup>70</sup>. Addressing the disparity in vaccine uptake between different communities is fundamental in ensuring overall reach and success of vaccine programmes.

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<sup>67</sup> British Pharmacological Society: [What do we currently know about who is benefiting from pharmacology research?](#)

<sup>68</sup> PLOS Global Public Health, 2021: [Five steps to solving the vaccine inequity crisis](#)

<sup>69</sup> [Observatree home page](#)

<sup>70</sup> Frontiers in Political Science, 2021: [Encouraging COVID-19 Vaccine Uptake Through Effective Health Communication](#)

## Appendix 1: Member Organisations of the Royal Society of Biology

### Full Organisational Members

Agriculture and Horticulture Development Board  
 Anatomical Society  
 Applied Microbiology International  
 Association for the Study of Animal Behaviour  
 Association of Applied Biologists  
 Association of Reproductive and Clinical Scientists (ARCS)  
 Biochemical Society  
 British Association for Lung Research  
 British Association for Psychopharmacology  
 British Biophysical Society  
 British Ecological Society  
 British Lichen Society  
 British Microcirculation and Vascular Biology Society  
 British Mycological Society  
 British Neuroscience Association  
 British Pharmacological Society  
 British Phycological Society  
 British Society for Cell Biology  
 British Society for Developmental Biology  
 British Society for Gene and Cell Therapy  
 British Society for Immunology  
 British Society for Matrix Biology  
 British Society for Neuroendocrinology  
 British Society for Parasitology  
 British Society for Plant Pathology  
 British Society for Proteome Research  
 British Society for Research on Ageing  
 British Society of Animal Science  
 British Society of Soil Science  
 British Society of Toxicological Pathology  
 British Toxicology Society  
 Daphne Jackson Trust  
 Field Studies Council  
 Fisheries Society of the British Isles  
 Fondazione Guido Bernardini  
 GARNet  
 Gatsby Plant Science Education Programme (incl. Science and Plants for Schools)  
 Genetics Society

Heads of University Centres of Biomedical Science  
 Institute of Animal Technology  
 Laboratory Animal Science Association  
 Linnean Society of London  
 Marine Biological Association  
 Microbiology Society  
 MONOGRAM – Cereal and Grasses Research Community  
 Network of Researchers on the Chemical Evolution of Life  
 The Nutrition Society  
 Society for Experimental Biology  
 Society for Reproduction and Fertility  
 Society for the Study of Human Biology  
 The Physiological Society  
 UK Environmental Mutagen Society  
 United Kingdom Society for Extracellular Vesicles  
 Universities Federation for Animal Welfare  
 University Bioscience Managers' Association  
 Zoological Society of London

### Supporting Organisational Members

Animal & Plant Health Agency (APHA)  
 Association of the British Pharmaceutical Industry (ABPI)  
 AstraZeneca  
 BioIndustry Association  
 Biotechnology and Biological Sciences Research Council (BBSRC)  
 British Science Association  
 Ecological Continuity Trust  
 Ethical Medicines Industry Group  
 Fera  
 Institute of Physics  
 Medical Research Council (MRC)  
 NNEdPro Global Institute for Food, Nutrition and Health  
 Northern Ireland Water  
 Royal Society for Public Health  
 Severn Trent Water  
 Syngenta  
 Understanding Animal Research  
 Unilever UK Ltd  
 United Kingdom Science Park Association  
 Wellcome  
 Wessex Water  
 Wiley Blackwell

