

Written Evidence Submitted by The Physiological Society

(EMD0004)

Background:

The Physiological Society has a 140 year tradition at the forefront of life sciences. When physiologists collaborate around the world, their research contributes to a better understanding of the complex functions of living organisms. Expanding physiological knowledge helps us to understand how the body works. It also helps us to determine what goes wrong in disease, facilitating the discovery for new diagnostics, treatments and preventative measures. For example, the 2019 Nobel Prize in Physiology or Medicine was awarded to three researchers who discovered how cells sense and respond to changing oxygen levels by switching genes on and off. This discovery has been key in understanding human diseases such as cancer and anaemia because scientists are now able to target this 'switching on and off' mechanism to treat disease.

The Society's activities benefit the public in a variety of charitable ways. Our publications, meetings and educational resources directly benefit people actively involved in physiology such as researchers, teachers, and students. This investment then has a trickle-down effect by improving human health and broadening the public's understanding of how physiology relates to everyday life.

Key submission points:

- Those who are already more functionally limited may suffer the most from future pandemics. The combination of anabolic resistance, where the body is less able to build muscle protein from amino acids (Cuthbertson, et al., 2005), and lack of anabolic stimulus, resulting from inactivity (Breen, et al., 2013), can have dramatic functional consequences, perhaps tilting the balance from being able to do something basic like rise from a chair, and not.
- In the absence of vaccines or cures, physical activity (with tailored exercise or physical activity goals) represents the single most impactful way in which older people can reduce the risk of severe adverse outcomes from future pandemics, improve recovery, and limit deconditioning and frailty from home confinement.
- We also call upon UK public health agencies to focus on building functional resilience among the UK population as a whole, but with a particular focus on those most at-risk of poorer health outcomes from any future pandemic (for example older people, people with existing health conditions and those with sedentary lifestyles). This would encourage appropriate exercise and physical activity; support optimal nutrition; enhance mental health and wellbeing and support behaviour change to embed these behaviours.
- Physiology has made an important and positive contribution to many aspects of the COVID-19 outbreak, including:
 - Supporting frontline clinicians with their evolving understanding of the nature of the disease and best treatment protocols
 - Assessing claims and correcting misunderstandings about the best way to treat the virus
 - Identifying those at most risk
 - Assisting in the development and assessment on new equipment for the treatment of patients with COVID-19
 - Helping determine policies for the return to work in specialist facilities as well as other more public areas.

Response:

How the Government is applying lessons from the COVID-19 pandemic?

Physiological research has been at the heart of the science community's response to COVID-19 and will be in the response to future pandemics. The novel nature of COVID-19 was one of the major challenges of finding vaccines or treatment that could mitigate the different ways that the virus affects the body. Physiology helps to not only

better understand new viruses but also how they impact on the different systems of the body such as sensory loss as a symptom, through to 'insidious hypoxia'.

In response to the COVID-19 crisis, The Physiological Society mobilised physiologists around the world to provide operational support to frontline healthcare workers in the fight against COVID-19. In collaboration with the Intensive Care Society, it established a website called 'Questions from the Front Line' (<https://www.physoc.org/covid19/questions/>). This response allowed an expert advisory panel to offer the most up-to-date physiological insight to answer questions and observations posed by medics treating people who were first infected with the COVID-19 virus, as well as offering links to the most relevant physiological research. The Society also worked to explain and dispel rumours about how the public can respond to the coronavirus to protect their health from erroneous or unproven approaches (such as the use of ibuprofen and Vitamin C). This demonstrates the need to foster and encourage a direct link between clinical teams, who can report symptoms, prescribe treatments and outcomes, and medical researchers including physiologists who can add capacity and provide an understanding at the fundamental level.

Advice sought from frontline healthcare professionals during the COVID-19 pandemic include areas such as shielding during pregnancy, gastrointestinal symptoms, intubation and hypoxaemia and co-morbidities such as diabetes. In addition, physiologists' advice has been sought for PPE research and development. As such, the advice has been applied and practical, not just mechanistic and theoretical. This support demonstrates the crucial role that physiology has in underpinning how healthcare professionals treat disease, respond to emerging health threats and support people to live better, for longer in both health and disease. Additionally, The Society has also engaged with wider stakeholders to understand and respond to the emergence and impact of Long COVID.

The capacity and capability of the UK research base in providing a response to the outbreak, in terms of advice to government, public bodies and others on managing the outbreak;

While epidemiological data are important to recognise who is at highest risk and to reduce the risk of transmission when little is known about a disease beyond similarities with other similar diseases, understanding the mechanisms of new pandemic diseases and how they affect human physiology is crucial both for decision-making during the initial phases of the pandemic and to maximise learnings afterwards and rapidly developing targeted treatments.

Similarly, COVID-19 challenged healthcare professionals and academics because of the unique patterns of symptoms presented. Only through continued integrated thinking across specialties and disciplines and applying what we already know about systems physiology will we discover how to successfully treat new pandemic threats in their acute and chronic phases. Examples of this include addressing so called 'insidious hypoxia' where COVID-19 patients are lucid, talking and not in distress, but have oxygen levels in the blood significantly lower than those seen in health, and enough to typically cause unconsciousness or even death.

Finally, more opportunity could be made available for the scientific community to feed research and experience into the Government's thinking on easing lockdown restrictions, particularly in specialist environments such as laboratories and universities. For example, The Physiological Society worked with one of its journal Editor's, Professor Mike Tipton from the University of Portsmouth, to organise a webinar to discuss concerns and challenges related to returning to human-based trials in laboratories while maintaining an evidence-based approach to minimising the risk of transmission of COVID-19. This webinar was joined by over 650 scientists from over 30 countries. In the absence of treatment options or a vaccine, these measures to return scientists to work in close contact with human volunteers serve as vital demonstrations of the measures that are likely to be required at a general public health level to protect workers and the public as they return to work.

The extent of UK preparedness for an emerging disease outbreak with pandemic potential, and how this could be enhanced, including an assessment of recent policy announcements such as the refresh of the UK Biological Security Strategy?

Additional policy initiatives and solutions needed in the UK and internationally to reduce the risk of the future spread of emerging diseases with pandemic potential?

A National Covid-19 Resilience Programme

In the absence of vaccines or cures, physical activity (with tailored exercise or physical activity goals) represents the single most impactful way in which older people can reduce the risk of adverse outcomes from emerging pandemic diseases, improve recovery, and limit deconditioning and frailty from home confinement.

Following the initial phase of the COVID-19 pandemic, The Society, along with the Centre for Ageing Better, called upon UK public health agencies to launch a National Covid-19 Resilience Programme to support older people to improve their resilience to pandemic diseases through appropriate exercise and physical activity; supporting optimal nutrition; enhancing mental health and wellbeing and supporting behaviour change to embed these behaviours.

More systemic approach to building scientific partnerships and networks to respond to emerging pandemics

In addition, The Physiological Society also supported sector and industry wide efforts to respond to the UK Government's stated priorities around increasing the availability of ventilators, testing and staffing new diagnostic laboratories. Working as part of cross-disciplinary teams, a number of The Physiological Society's members have been involved with projects to increase the number of ventilators available including Professor Federico Formenti's work at UCL as part of OxVent, a rapidly deployable ventilator for COVID-19 patients that build on existing readily available, off-the-shelf components that can be easily manufactured at scale once approved within 3 months. Similarly, Professor Mike Tipton and his team have been involved in an international project to 3D print facemasks and develop a new CPAP device for UCH Whittington hospitals. These initiatives have been piecemeal however and it was left to trade associations, such as the BIA, to promote these opportunities to hear directly from the Secretary of State for Health as to how the science community could best support the Government's ambitions and priorities.

The importance of physiological insight into emerging and novel health threats

COVID-19 has made it clear that physiology is crucial in dealing with novel diseases. In order to be prepared for the future outbreaks we need to learn as much as we can about how this particular coronavirus is structured, replicates and affects the human body. It also shows the importance of embedding physiological understanding into clinical environments, so we need to ensure we have the capacity to connect physiologists, responsible for discovering more about the human body, and healthcare professionals, responsible for treating patients in the future, for the next outbreak.

Beyond the UK's strategic response to future outbreaks, the Government should also give considerable thought to the long-term physical and mental consequences of both the coronavirus and the UK's lockdown response and how it can better prepare the population to respond to future outbreaks and pandemics. Age remains the single best indicator of likely mortality from COVID-19. As the ONS notes; 'The age-specific mortality rate due to the coronavirus (COVID-19) increased significantly in each age group, starting from ages 35 to 39 years in males and ages 40 to 44 years in females.' Mortality in those aged 90+ is twenty-two times higher than the population as a whole. Similarly, the most common pre-existing conditions recorded for those dying of COVID-19 were dementia, frailty, pneumonia, diabetes, hypertension, COPD and urinary tract system diseases, all diseases that are associated with age-related decline. As such, insuring that the whole of the UK is encouraged and empowered to take control of their health to improve their healthy life expectancy will not only help to fight future pandemics, it will have the added benefit of furthering the Government's ambitions through the *Life Sciences Vision*.

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