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Module 2 of the UK Covid-19 Public Inquiry
Request for Evidence under Rule 9 of the Inquiry Rules 2006
Reference for Request - M2/SAGE/01/WB

Dear Mr Suter,

Thank you for your letter of 2 September on behalf of Baroness Hallett, Chair of the UK Covid-19 Inquiry. I understand similar requests have been made of academics within, or connected to, Imperial College and it would be helpful to consider my response alongside these to put my role and matters into context. Taking the questions in turn:

1. A brief overview of your qualifications, career history, professional expertise and major publications.

   https://www.imperial.ac.uk/people/w.barclay

   Qualifications: I have a MA (BA Hons) from University of Cambridge in Natural Sciences awarded 1985, and PhD in Virology from University of Reading awarded in 1988. The subject of my PhD thesis was The immune response to infection with the common cold virus, rhinovirus type 2. The studies were carried out at the Common Cold Unit in Salisbury where human volunteers were inoculated experimentally with cold viruses, in conjunction with Burroughs Wellcome who were considering developing vaccines against cold viruses.

   Career history: I spent a postdoctoral period 1988-1992 at the University of Reading learning molecular virology skills under the mentorship of Professor Jeffrey Almond where we studied RNA motifs that controlled the replication of picornaviruses including common colds and poliovirus. I spent a second postdoctoral appointment 1992-1995 at Mount Sinai Medical Centre New York under mentorship of Peter Palese learning the molecular virology of influenza viruses. I returned to the UK in 1996 to a junior lectureship at University of Reading to establish my own research group studying replication of influenza viruses. This developed into a focus on their pandemic potential and I moved my group to Imperial College London in 2007 to pursue those interests. I was appointed to a Chair in Influenza Virology in 2007 and took up the Action Medical Research Chair in Virology in 2015. I became Head of Department of Infectious Disease in 2019.

   Professional Expertise: I am an expert in RNA viruses especially those that transmit through the air and infect the respiratory tract. I oversee a programme of wet biological research, using a combination of in vitro and in vivo models that include human challenge studies and animal experiments. I am known for work in the area of assessing influenza pandemic potential, and have also published on antiviral drugs and resistance to them, vaccines, and the innate immune response to virus infection.

   Major publications:
   A total of 143 peer reviewed original papers.

Those I consider most significant are:

Peacock TP, Goldhill DH, Zhou J, Baillon L, Frise R, Swann OC, Kugathasan R, Penn R, Brown JC, Sanchez-David RY, Luca Braga, Maia Kavanagh Williamson, Jack A. Hassard, Ecco Staller, Brian Hanley, Michael Osborn, Mauro Giacca, Andrew D. Davidson, David A. Matthews and **W S Barclay**. **The furin cleavage site in the SARS-CoV-2 spike protein is required for transmission in ferrets.** **Nature Microbiology.** 2021 doi: 10.1038/s41564-021-00908-w.

The second most highly cited Nature Microbiology paper of 2021. We propose that the SARS-CoV-2 pandemic emerged as a result of the 4 amino acid insertion in the Spike protein that confers enhanced furin cleavage, activating the virus for cell surface entry. We show that this insertion enhances transmission in vivo and replication in primary human airway epithelium. The paper was a team effort by all members of my group who chose to keep working during COVID lock down to further our knowledge of the new coronavirus. The paper was featured on the Virology podcast, TWIV and is frequently cited in opinion pieces addressing the nature of SARS-CoV-2 emergence.

Long JS, Giotis ES, Moncorgé O, Frise R, Mistry B, James J, Morisson M, Iqbal M, Vignal A, Skinner MA, **Barclay WS**. **Species difference in ANP32A underlies influenza A virus polymerase host restriction.** **Nature.** 2016; 529(7584):101-4. doi: 10.1038/nature16474. PMID: 26738596

The big breakthrough of my career. We and others had been searching for decades for the host factor that accounted for the restriction of avian influenza viruses in mammals. Using a unique screen, we discovered it to be ANP32A. This discovery is now a classic text book inclusion. It paved the way for a Wellcome Trust Investigator Award to further investigate how the host factor supports Influenza virus polymerase activity. In collaboration with the Roslin Institute we have developed gene-edited chickens altered in this protein that may be resistant to influenza infection, as a novel means to prevent future bird flu outbreaks and future pandemics. I presented this concept at the World Economic Forum, Davos 2019. The paper identifying ANP32A was featured in Nature News and Views and on the Virology podcast TWIV.

W.S. Barclay and P. Palese. 1995. **Influenza B viruses with site-specific mutations introduced into the HA gene.** **Journal of Virology** 69: 1275-1279.

Working with my postdoctoral mentor, I developed the first system to generate recombinant influenza B viruses. Such systems are used today to generate the Live Attenuated Influenza Vaccines given to children in UK, and to understand the molecular genetics of these seasonal human respiratory pathogens.

2. A list of the groups (i.e. SAGE and/or any of its sub-groups) in which you have been a participant, and the relevant time periods.

Between January 2020 and February 2022, I was a member of SAGE, NERVTAG and a sometime guest/co-opted to SPI-M. I chaired the Vaccine Science Coordination subgroup of SAGE, and also chaired the Vaccine Effectiveness Expert Panel for the Cabinet Office. I attended some meetings of the Vaccine Task Force group, VUEAG, between January and March 2021.

From January 2020 to April 2020 I was a member of PHE Serology Working Group. This group was disbanded in April 2020 and is now part of the UKHSA's general surveillance programme for COVID-19.

3. An overview of your involvement with those groups between January 2020 and February 2022, including:

    a. When and how you came to be a participant;

I was a member of NERVTAG since its inception in 2013. To be a member of NERVTAG I had to apply and interview with the then chair Jonathan Van Tam. Members of NERVTAG all underwent an annual appraisal with the chair. My membership was renewed, but will finish in 2023.

I was invited by an email from GO SCIENCE to join a SAGE call in late January 2020. After that I received regular invitations to attend SAGE meetings.

I was asked personally by Patrick Vallance to chair the Vaccine Science subgroup for SAGE in November 2020.

b. The number of meetings you attended, and your contributions to those meetings;

Between January 2020 and February 2022 I attended the following groups:

- *SAGE - 83 times*
- *NERVTAG - 64 times*
- *SPI-M-O - fewer than 5 times*
- *PHE Serology - 4 times*

I attended these meetings to provide advice around the virological aspects of the discussions. I contributed knowledge, for example background knowledge I have of other respiratory viruses and their behaviour and evolution, to discussions. I also co-authored papers as described below and presented them to the rest of the group and answered clarifying questions.

c. Your role in providing research, information and advice.

I was an active participant in discussions.

4. A summary of any documents to which you contributed for the purpose of advising SAGE and/or its related subgroups on the Covid-19 pandemic. Please include links to those documents where possible.

SAGE: The dynamics of humoral immune response following SARS-CoV-2 infection and the potential for reinfection, 16 April 2020
SAGE: Update on Immunology of SARS-CoV-2, 3 June 2020
SAGE: Tests for antibodies against SARS-CoV-2, 2 July 2020
SAGE: Update on immunity to SARS-CoV-2, 2 September 2020
SAGE: Considerations on when and how to update SARS-CoV-2 vaccines, 11 March 2021
SAGE: Setting up medium- and long-term vaccine strain selection and immunity management for SARS-CoV-2, 19 May 2021
SAGE: Imperial College London: Omicron vs Delta replication, 19 December 2021
SAGE: How long will vaccines continue to protect against COVID-19? 30 July 2021
SPI-M-O: REACT-1 round 12 report: resurgence of SARS-CoV-2infections in England associated with increased frequency of the Delta variant, 23/06/2021
NERVTAG: View on SARS-CoV-2 protective immunity, 27 April 2020
NERVTAG: NT-SARS-CoV-2 variants, 13 May 2020
NERVTAG: Viral dynamics of infectiousness, 3 June 2020
NERVTAG: Viral dynamics of infectiousness, 8 June 2020
NERVTAG: Is there evidence for genetic change in SARS-CoV-2 and if so, do mutations affect virus phenotype? 30 September 2020
NERVTAG: Risk assessment of SARS-CoV-2 variants that have been selected in mink, 12 November 2020
NERVTAG: Immunity certification, 9 December 2020
NERVTAG: Brief note on SARS-CoV-2 variants, 13 January 2021

NERVTAG: Update note on variants of concern, 21 January 2021
NERVTAG: Brief note on SARS CoV-2 B.1.351, 27 January 2021
NERVTAG: Note on variant P.1, 27 January 2021
NERVTAG: Immunity certification update, 4 February 2021
NERVTAG: note on growth rate of SARS-CoV-2 B.1.1.7, 22 April 2021
NERVTAG: Update note on immunity to SARS-CoV-2 after natural infection, 27 May 2021
NERVTAG: Respiratory infections, their interactions with SARS-CoV-2 and implications for winter 2021 to 2022, 20 September 2021

5. A summary of any articles you have written, interviews and/or evidence you have given regarding the work of the above-mentioned groups and/or the UK's response to the Covid-19 pandemic. Please include links to those documents where possible.

   I gave various interviews and evidence but do not have a record of each. Main examples are:

   - *House of Commons Science and Technology Committee emergency evidence session to explore scientific evidence regarding the new variant of covid-19 on 23 December 2020*
   - *House of Commons Science and Technology Committee on UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks on 24 February 2021 and 16 June 2021.*
   - *Science Media Centre: Latest results from the REACT-2 study on coronavirus antibody prevalence in England on 27 Oct 2020.*
   - *Science Media Centre: NERVTAG Q&A on the new variant on 21 Dec 2020*
   - *Science Media Centre: Meet the scientists involved in the new national consortium to study effects of emerging mutations in SARS-CoV-2 on 15 Jan 2021*
   - *Science Media Centre: Q&A on the B.1.617.2 delta variant: what do and don't we know? on 09 June 2021.*
   - *Science Media Centre: B.1.1.529 variant Q&A on 26 Nov 2021.*
   - *Science Media Centre: Results from the COVID-19 human challenge study on 02 Feb 2022.*
   - *Coronavirus All Party Parliamentary Group session on impact of omicron variant on 14 December 2021.*
   - *Zoe COVID study panel (The Omicron variant: what does it mean for the future of COVID?) on 03 February 2022*
   - *Cited as interviewee and peer reviewer for POSTnote Addressing COVID-19 in the long-term – the role of immunisation (Parliamentary Office for Science and Technology)*
   - *Vaccines: a double dose with Professor Brian Cox (Royal Society)*

6. Your views as to whether the work of the above-mentioned groups in responding to the Covid-19 pandemic (or the UK's response more generally) succeeded in its aims. This may include, but is not limited to, your views on:

   a. The composition of the groups and/or their diversity of expertise;

      SAGE, NERVTAG and the Vaccine Science coordination group were comprised of scientists with a diverse mixture of expertise. For example, as well people like myself who were experts in viruses, there were clinicians, immunologists, epidemiologists and behaviour scientist. I think it was the diverse nature of the group that helped us consider the balances, to prepare documents that were accessible, and this was totally appropriate.

The vaccine effectiveness expert panel was not diverse, our job was to delve into specific literature and information about vaccine effectiveness and interpret it together, and this required a certain specific experience and training.

To be a member of NERVTAG I had had to apply and interview and underwent annual appraisal with the chair. I think this is important and useful but perhaps not a priority in a time of crisis.

b. The way in which the groups were commissioned to work on the relevant issues;
The SAGE coordination group which was comprised of chairs and deputies from the various subcommittees met online weekly to review commissions and allocate timings for papers to be presented. This was extremely useful to get the big picture of what was going on.

Other meetings were sometimes called at shorter notice, for example small group meetings to discuss variants or vaccines.

c. The resources and support that were available;

As chair of VSC and VEEP I was well supported by the GO-Science or Cabinet Office teams. I received briefings ahead of meetings, they prepared paperwork and worked with me to set agendas and circulate minutes. For the papers we wrote for SAGE or NERVTAG there was less support, they were our own product although for NERVTAG there was an individual recruited in 2021 Catherine Huntley from DHSC who helped us pull the papers together and contributed to the writing. Imperial College received some funds to cover costs of my time lost from other duties such as administrative and teaching - this was fairly nominal.

d. The advice given and/or recommendations that were made;

I'm not really aware of exactly what advice was given and to exactly who. At the end of SAGE meetings Patrick Valance would sum up what he'd heard and we would agree or not. I then believe he told that to ministers but I never saw anything written other than SAGE minutes. For example, I was aware that SAGE members were in agreement about an urgency to act with further social distancing measures in Autumn 2021, but the action took much longer at a political level.

I was involved in some small focussed meetings around vaccines with VUEAG (a subsection of the VTF) where advice was more focussed on particular questions. Again, I felt that the chairs of those meetings made sure the invited members were in agreement, and there was a very clear decision to be made and acted upon.

e. The extent to which the groups worked effectively together;

There was good liaison between groups. I was invited as a guest virologist to sit on SPI-M meetings several times for sense checking. Several members of NERVTAG also sat on SPI-M or other committees and that ensured a consistency. I think there was less transparency about membership and activities for certain groups for example the vaccine task force. The VSC that I chaired was set up to make sure no gaps were left in the research area that could have informed use and evaluation of vaccines.

f. The extent to which applicable structures and policies were utilised and/or complied with and their effectiveness.

UKHSA representatives were present at most if not all SAGE and NERVTAG meetings and conveyed state of the minute information that was essential.

The UKHSA response to measure vaccine effectiveness was outstanding. This was headed by Jamie Lopez Bernal and weekly meetings engaged may stakeholders and people producing the data on the ground.

The variant technical group that risk assessed variants chaired by Meera Chand was a privilege to be part of. Never before have I encountered such productive interaction between government scientist and academics who all met weekly to provide unpublished data and models. The technical briefings that resulted were world class and often mentioned by my international colleagues as a tremendous source.

7. Your views as to any lessons that can be learned from the UK's response to the Covid-19 pandemic, in particular relating to the work of the above-mentioned groups. Please describe any changes that have already been made, and set out any recommendations for further changes that you think the Inquiry should consider making.

   I think the methods for collecting and conveying scientific advice worked well. Where an expertise was not available additional people were co-opted onto groups but having standing committees that worked together over a period of time was really important. Core NERVTAG members had already developed a working relationship and this helped early on.

   The variant technical group convened by UKHSA to risk assess variants was an outstanding example of liaison between government scientists and academics. It was quite breath-taking to be a part of with academics dialling in from all over the country to share their data in real time. I understand that we cannot work like this all the time, but there might be some lessons about how to capitalize on this willingness of academics to offer their services to address the pressing issues that face our country.

8. A brief description of documentation relating to these matters that you hold (including soft copy material held electronically). Please retain all such material. I am not asking for you to provide us with this material at this stage, but I may request that you do so in due course.

   Documents and emails are with the secretariats for SAGE, NERVTAG and SPI-M-O. I also have emails and document drafts.

The questions and answers above span over two years of work which was undertaken at pace. The responses are as accurate and complete as possible but if you require further details or there are inadvertent omissions, please do not hesitate to let me know.

Yours sincerely,

PD

Wendy Barclay

Head of Department of Infectious Disease