HOUSE OF COMMONS

Science, Innovation and Technology Committee

Oral evidence: Emerging diseases and learnings from covid-19, HC 506

Wednesday 24 January 2024

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Watch the meeting

Members present: Greg Clark (Chair); Dawn Butler; Tracey Crouch; Dr James Davies; Katherine Fletcher; Rebecca Long Bailey; Stephen Metcalfe; Carol Monaghan; Graham Stringer.

Questions 197 - 225

Witnesses

Dr Sergio Carmona, Chief Medical Officer and Interim CEO, FIND; and Dr In-Kyn Yoon, Acting Executive Director of Vaccine Research & Development, CEPI.

Examination of witnesses

Witnesses: Dr Carmona and Dr In-Kyn Yoon.

Q197 **Chair:** The Science, Innovation and Technology Committee continues its inquiry into emerging diseases and learnings from covid-19, in particular looking at the 100 Days Mission and the legacy of some of the covid interventions that were taken during the pandemic.

To help us do that, I welcome our first two witnesses this morning. I am pleased to see in the room Dr In-Kyn Yoon, acting executive director of Vaccine Research and Development at CEPI—the Coalition for Epidemic Preparedness Innovations—where he has worked since 2020.

Joining us online is Dr Sergio Carmona, who was appointed chief medical officer of FIND—the Foundation for Innovative New Diagnostics—in 2021.

I thank you both for joining us today.

Dr Yoon, will you describe CEPI's role in the 100 Days Mission and its antecedents and give your assessment of where we are with it?

Dr In-Kyn Yoon: CEPI was formed in 2017 in response to the Ebola epidemic in west Africa at that time. Its role originally was to fill the gap in the vaccine development area, which we call the valley of death; vaccine development was not quite ready to respond quickly to some of the outbreaks.

The 100 Days Mission, which was further refined during the covid pandemic, aims to accelerate as much as possible, with access, vaccine and biologics development in response to epidemic and pandemic threats. CEPI has championed this ambition and mission over the past few years.

Q198 **Chair:** Although 100 days is a round and compelling number, is it a realistic target or an aspirational pole to which one might move towards?

Dr In-Kyn Yoon: I think it is both, but it depends on the scenario and situation of the outbreak. If we have an outbreak caused by a familiar pathogen, and we have already done a lot of background research and preparation, that is attainable.

If it is completely new, it may be a little more difficult, but the whole point of the 100 Days Mission is that it is directional—we need to accelerate in that direction. The biggest part is focusing on preparedness to allow that acceleration in an emergency.

Q199 **Chair:** I ask Dr Carmona to comment on FIND's role in achieving a more rapid response to future pandemics.

Dr Carmona: FIND—the Foundation for Innovative New Diagnostics—is about 20 years old and is based in Switzerland. We are a WHO collaborating centre.

We started 20 years ago by focusing mostly on diseases such as TB, malaria and neglected tropical diseases. We were also part of the Ebola response and were critical to the covid one.

For diagnostics, the target is much more achievable and realistic. I would like to quote a few things. It took about 64 days from the announcement for the first PCR molecular diagnostic tool to become available. It took about 236 days for the first rapid test—the lateral flow—to be available, with over 200 commercialised covid tests independently evaluated.

Scale is important—understanding what genetic material Disease X could be. It is important that molecular diagnostic tools can achieve that. It is a pretty challenging timeline. We need to look into interventions to produce them at scale and be regulatory approved.

The UK and other G7 countries have supported the local production of tests, but decentralisation needs to be taken into account so that it is not kept within a region.

On diagnostics, it is achievable. We need to be well prepared with libraries and so on, but I can elaborate on that.

Chair: I turn to my colleagues to go into a bit more detail in these questions.

Q200 **Rebecca Long Bailey:** Your organisations were established before the covid-19 pandemic. What major lessons were learned from the global response?

Dr In-Kyn Yoon: One of the lessons that was known before the pandemic but that I would like to emphasise is the preparedness piece. Not much was started de novo during the pandemic that was hugely successful; everything was based on things that had been done, with the groundwork being laid before it. That further emphasised the importance of preparedness.

The pandemic demonstrated a lot of things that were critical—for example, the scale of manufacturing, which previously perhaps was not as up front in CEPI's mission. We have expanded to go broader in that respect.

There is also the required diversity of some of the knowledge and capabilities and capacities. To achieve global equable access, it will be important to make sure that different regions have increased capabilities and capacity so that, in a timely way, they can serve their own region in an emergency.

Dr Carmona: Lessons learned? Definitely, co-ordination and global leadership. Without partners such as CEPI, WHO, the Global Fund and UNITAID, which had prior structures, we would definitely not have been able to respond. Early leadership from the global south would have expedited our response and made it more effective and timely.

The decentralisation of manufacturing, testing and diagnostics took CEPI a while, but in lockdowns moving commodities and the supply chain issues of which we were all fairly aware I would highlight as a lesson learned.

My colleague from CEPI alluded to the Ebola outbreak, where epidemics were kept within regions. We need to be aware that sometimes that is the most effective method.

Social measures need to be well thought through and understood beyond health sectors. What do they do to the economies of low-income countries?

There are many others, but I would highlight those.

Q201 **Rebecca Long Bailey:** You mentioned that it took 236 days to roll out the first rapid test. Was that good? Should it have happened more quickly? More generally, what went well in vaccine and diagnostic development for covid-19, and what didn't?

Dr Carmona: That's a really good question. We have had HIV since the '80s. Today, we do not have a vaccine for it, but we have excellent, good-quality rapid tests that are available for self-testing, for professional use and for molecular tests.

We definitely could do better than 236 days if we were better co-ordinated. With regulatory authorities within the G7 and the European community, we can reduce the time for evidence generation by having well-co-ordinated clinical trials and by having regulatory authorities prepared to review the dossiers faster. Port authorities and others in-country could be made aware of how to move tests in a scalable and geographically diverse manner.

We could definitely shorten some of the timelines for the diagnostic community or manufacturers.

Q202 **Rebecca Long Bailey:** Dr Yoon, I ask you the same question. Was 236 days a good sign, or do we need to do more? What went well in vaccine development and diagnostics?

Dr In-Kyn Yoon: Diagnosis took that much time. Vaccines took about 100 days more, which, comparing historical standards, was outstanding. Typically, vaccine development to authorisation would take 10 years or more.

It was a great achievement, and that was partly due to some of the work that had been done in coronavirus research, such as MERS-Cov and SARS-Cov-1, which laid the groundwork for that fast development, as well as a lot of the work that was done in mRNA research.

That was a great achievement, but, as the 100 Days Mission implies, we want to do it faster. We need a paradigm shift. It is not just about the

technology, as Dr Carmona alluded to. It is also about the supporting systems—the regulatory systems and networks, the clinical trial networks and the laboratory networks. They all need to be built out, and that needs to be a global effort expanding to the global south in addition to the global north.

Q203 **Rebecca Long Bailey:** The 100 Days Mission is a global target. You highlighted the critical issue of preparedness. How prepared is the world for Disease X, and what more can countries such as the UK do in achieving the 100 Days Mission?

Dr In-Kyn Yoon: The UK has already been incredibly important. It held the presidency of the G7 a couple of years ago and pushed forward the concept of the 100 Days Mission. That proponency is already a huge contribution. It is, as you said, a global effort. Leadership in that area, in championing the message and resources, with UK constitutions that can lead on some of that, is incredibly important.

Q204 **Rebecca Long Bailey:** Are we prepared for Disease X? How far away are we from being prepared?

Dr In-Kyn Yoon: We are better prepared now than we were before the pandemic, which caused a lot of revolutionary thinking. Despite the tragedy of the covid pandemic, it pushed us forward in a big way.

We still have a lot to do in preparedness. In some ways, we may have been fortunate in the covid-19 pandemic because a lot of our interventions were quite successful, and we had some research preparations under way.

We do not know what the next pandemic will be. We are trying to prioritise the most likely ones and focus our efforts, but, depending on the nature and characteristics of that outbreak, we may be more or less prepared. We have to keep pushing towards being more prepared for unexpected pathogens.

Q205 **Rebecca Long Bailey:** Dr Carmona, how prepared are we for Disease X, and what can countries such as the UK do to achieve the 100 Days Mission?

Dr Carmona: That's a very good question.

I certainly agree with my colleague from CEPI that we are much better prepared today than we were four years ago. However, we could do better.

Today, I am in Rome for the launch of the 100 Days Mission's third report. The role of the G7 and G20 in preparedness is critical. Good co-ordination and use of the intellectual and other powers that exist in the G20 and G7 are important.

On the technical side, we now have a footprint of academic and clinical trial technologies such as next generation sequencing. We must maintain that base, and ensuring that it is well co-ordinated and funded is critical.

What has the UK done, and what could it continue to do? There are platforms. Mologic has produced good-quality tests and should be supported. UK firms are able to transfer some of their knowledge and know-how to countries such as Senegal, ensuring decentralisation and a geopolitically well-distributed capability to produce tests elsewhere.

The UK has incredible intellectual power with its universities and the funding that supports innovation, which has led platforms such as mRNA technology to produce good vaccines. The same applies to diagnostics, so, as I see it, the UK has done a fantastic job in advancing regulatory and harmonisation thinking and in the use of intellectual powers and innovation.

Q206 **Dr Davies:** This might be going over some of the ground you have already covered, but what are the main challenges in developing diagnostics or vaccines in preparation for the next pandemic?

Dr Carmona: Some of it comes from understanding the disease itself. Some of it has been covered by having more sentinel sites. In challenging misunderstanding, how can we use prior knowledge to be more responsive or to be able to respond within the target and understand the diseases—are they viruses, are they bacteria?—by using that learning and those platforms? If you present with flu-like symptoms, do we have a test that can check for coronaviruses, flu A and B and other families of respiratory viruses that can all look the same?

Those things will remain challenging to produce at scale, but it is certainly doable.

There are two other things, one of which is around how we communicate and advocate for preparedness and integrated medical countermeasures that will not have a negative, catastrophic or apocalyptic response from the public.

The other challenge is funding. We know that vaccines and therapeutics are understood as an effective tool, but diagnostics is what is between the doctor and the patient. Finance Ministers in many countries do not allow an items that says, "These are diagnostics versus vaccines or therapeutics." We could better understand the value of that tool.

Dr In-Kyn Yoon: I echo a little of what Dr Carmona mentioned. Global co-operation, making the whole system work well globally, is critical. Individual pieces might be developed, but we have to ensure that they are all co-ordinated.

There are a lot of challenges to vaccine development. I shall quickly mention the five pillars of the 100 Days Mission: vaccine libraries, targeting different viral families to be as expansive as possible with the

next pathogen that causes the outbreak; extending as much as possible our network of laboratories and clinical infrastructure; trying to promote immune markers, instead of relying just on field efficacy studies, that can be used much more quickly to correlate the effectiveness of vaccines; diversification and democratisation of manufacturing; and, finally, early warning surveillance systems.

Those are five pillars that address some of the component challenges, but, overriding that, global co-ordination is critical.

Q207 **Dr Davies:** May we move on to vaccine technologies and platforms? Is there a vaccine technology platform that is best suited to target Disease X compared with others?

Dr In-Kyn Yoon: We are using a term that is relatively new and not completely harmonised across all audiences: rapid-response platforms. Essentially, they are platforms or vaccine technologies for which different pathogen targets can be joined as a plug-and-play format. Rapid response indicates that it can be rapidly. Rapid-response platforms are, in general, ideal technologies.

mRNA has probably been shown already to have a lot of characteristics that would support the role of that rapid-response platform. Further improvements are being investigated, but those platforms are critical.

The adenoviral virus vector platform was produced at Oxford and developed by AstraZeneca. CEPI recently signed a strategic partnership with Oxford to try to apply that for Disease X purposes as another option to RNAs. We are looking for other technologies in addition. We should not be dependent on one technology.

Q208 **Dr Davies:** And for diagnostics?

Dr Carmona: The principle is the same. We are developing molecular platforms on test—it is quicker and achievable within that time. At principle level, we are abandoning technologies that worked in the past—immunoassays, for example. This is equivalent to the adenovirus or AstraZeneca example. They have proven to be effective, depending on the use key.

You will remember the line that used to say whether you were covid-positive or negative, and understanding whether it is influenza A or B or RSV. We are trying to make the new technologies address individuals in a syndromic way. In other words, for someone presenting with flu-like symptoms, it is not good enough to say it is covid-negative; it could be influenza or another of the diseases that can affect us detrimentally.

Q209 **Dr Davies:** We referenced the need for international co-operation. How can co-operation between Governments, academia and business best be achieved?

Dr Carmona: Let me start at a global level.

The role of WHO, the G7 and G20 in leading is critical. There is a pandemic treaty that we hope will be understood and addressed. The value of being able to develop globally with a tool like a pandemic treaty is essential.

Industry is key. AstraZeneca, for example, understands well the delivery of family healthcare in countries that were better prepared to address covid because of MERS—South Korea, for example. Indonesia is transforming the family healthcare system. The role of non-state players in that space comes from understanding that there is a return on investment. The private sector can contribute not just in the social corporate responsibility type of approach, but in understanding industry in terms of manufacturing and the transportation of goods. There are also other sectors such as education.

Going back to lessons learned, this should be understood not just as a health problem but in other sectors of our daily lives.

Q210 **Dr Davies:** Dr Yoon, do you have any thoughts on that?

Dr In-Kyn Yoon: We have to recognise that different sectors in different types of organisations have different motivations and different roles to play—different strengths, different weaknesses.

Academia has a role in great research, exploratory technology and development. Industry has a role. It is very good at certain things but it is also motivated by certain things in order to sustain itself. Governments have a role. They sometimes need to fill the gaps when other groups do not have the same capability or incentive. WHO and other international organisations have to playing a convening policy role in providing guidance.

It is necessary to understand that not everybody has the same point of view, and to come to it from all the different points of view and bring it all together.

Q211 **Dr Davies:** You, Dr Carmona, mentioned that the importance of diagnostics is sometimes overlooked. Do you feel that sufficient focus and resources are going into diagnostics to achieve the 100 Days Mission?

Dr Carmona: Going into diagnostics?

Q212 **Dr Davies:** Funding and general attention.

Dr Carmona: We could definitely do better on both. The value of diagnostics not just in pandemics but in epidemics or diseases—malaria or dengue—needs to be well understood.

How do we communicate the value? It needs to be understood in different sectors. We understand what, say, a pregnancy test can do and the value and use case.

It gets a little more complicated with diseases—screening, for example—and also what we understood from covid as social scientists. Even if they tested completely free from the disease, the willingness of human behaviour to understand the consequences of that result—I am sorry I didn't mention it earlier—needs to be better understood. If we do not communicate the importance and value of this, even when they are accessible and not used, it becomes a problem. It is equivalent to vaccine hesitancy, perhaps.

Funding? For sure. Being better prepared for Disease X requires funding of the innovative sector, academia, family healthcare services and foundations that are driving this agenda forward.

Q213 **Tracey Crouch:** Dr Yoon, your comments on new technologies reinforce some of the interesting evidence we have received. I am curious. What should be the balance between equitability, the efficacy of new vaccines, speed, cost and ease of use?

Dr In-Kyn Yoon: All those things are necessary and without any one of them we will fall short—in particular, in providing the new products in an urgent situation in an equitably distributed fashion. If we are very quick but provide it to only a certain segment of the globe, it is not just not equitable but not beneficial as a response to a pandemic. As we are all aware, pandemics and epidemics do not respect national borders.

All those are necessary, so I will not point out one that is more important.

One thing that sometimes is misunderstood is that the 100 Days Mission is all about speed. That is not the case. It is about speed, scale—acceleration and equitable access. That is what I would point out about all the characteristics that you mention.

Q214 **Tracey Crouch:** Dr Carmona, I appreciate that I am asking you to pick your favourite child, but is there a ranking system in your mind as to the importance of the various factors?

Dr Carmona: May I make a comment around the 100 Days Mission? I think it might help. I see preparedness as the marathon before the 100-metre sprint. That marathon is important. It brings us together and gives us time to get the various sectors better co-ordinated. The 100 days is the final sprint. An announcement about a pathogen, such as happened in 2020, would then set off the sprint. I just want to highlight that.

You asked me about my "favourite child". Is that a pathogen, or what do you mean by that?

Q215 **Tracey Crouch:** Can you possibly rank accuracy over cost?

Dr Carmona: I do not have a figure to give you now, but there is a cost to inaccuracy and giving a false negative result; there are severe consequences. We have data from HIV, for example. There could be a

once-in-a-lifetime chance to get it right for a woman—to see whether she is HIV-positive or negative. If she is pregnant and HIV-positive and you get it wrong, you may have lost the ability to treat her and reduce her viral load and transmission to her child. Getting it wrong, whether because the test is complicated to perform, or because it is inaccurate because it does not perform at a certain temperature, is a negative, and a loss of funds and value. Is that what you were alluding to?

Q216 **Tracey Crouch:** Yes, thank you.

Dr Yoon, you have been talking about equitable distribution and the importance of global access. Do you think that the measures currently in place to address disparities in global access are adequate? Could more be done? What role do you see policymakers having in ensuring that equitable distribution?

Dr In-Kyn Yoon: Currently, I do not think it is adequate. Some of the issues have been highlighted by the covid-19 pandemic and there is recognition that more needs to be done. In particular, know-how and capacity need to expand.

One of the highlights is manufacturing capacity, but that is not the only one. There are also infrastructure and technical expertise, and the people resources in diverse areas to support some of that development effort.

One of the other things I would highlight is that, as I mentioned, surveillance early warning is key. Obviously, diagnostics are critical to that, but that needs to happen early, at the point of the outbreaks. There have to be appropriate resources and technical know-how globally to maximise the benefit of early warning and trigger some of the other things that can happen.

Q217 **Stephen Metcalfe:** The UN pandemic accords propose that, as patent holders develop vaccines, they waive their royalties. Do you think that that is an important factor in the effectiveness of the 100 Days Mission?

Dr In-Kyn Yoon: I think it is an issue that needs to be addressed, and it may contribute, but I emphasise that, in an emergency or an outbreak, that, in itself, will not be the main impactful factor to determine the speed, scale and access of the response. It is really during the preparedness phase, which has been emphasised multiple times, that know-how and technology transfer will allow speed.

I alluded to the fact that for preparedness we need sufficient incentivisation across the board. CEPI is completely in favour of trying to push forward those discussions, to try to see where the best balance is on intellectual property issues, but that is not the magic bullet. There have to be other things—and maybe those are the majority of what must happen to allow that kind of rapid response.

Q218 **Stephen Metcalfe:** So if you are going to move away from what might be described as the traditional intellectual property-based innovation

model—you create something and you reap the rewards for it—what alternative frameworks are there that would help, after a discovery, in the scale-up phase of a pandemic, to incentivise people?

Dr In-Kyn Yoon: Sure, I think a lot of that has to have been done before an outbreak occurs. The knowledge, know-how and technical capabilities to do the scale-up, based on platforms or what have you, have to be set up, and there will have to have been some discussion beforehand.

To deal with it urgently during an outbreak is probably not sufficient. What kinds of things can be done to move it forward? That is currently a complicated discussion that we think requires further back and forth. However, certain things could perhaps be emphasised. For example, efforts that are largely publicly funded, or majority publicly funded, may be required to have certain equitable access features built in to them. CEPI itself does not hold intellectual property, but we encourage our partners to think about those access issues when they are dealing with the sharing of intellectual property with organisations in, let's say, the global south, for potential technology transfer.

Q219 **Stephen Metcalfe:** Dr Carmona, do you want to comment on that?

Dr Carmona: Sure. Intellectual property—holding the IP—is not the same for diagnostics as for therapeutics or vaccines. For diagnostics, it is a bit more about know-how. It is not just the recipe; it is how to put it all together, so it is less of a deal breaker.

It is of course important. However, the notion of technology transfer—how some of the patent holders can make sure that their technology is transferred to the global south and that it helps with scaling—is key. I think that you referred to that already. Scaling also requires access to some of the raw materials. After the pandemic, we realised that nanocellulose is mostly produced and accessible in two countries, and that if those were not able to distribute it we would be in trouble.

Our understanding of raw materials—where they are, and how accessible they are for scaling—and the innovative engineering platforms that have been developed because of covid need to be kept warm. A way of doing that might be to address some other epidemics that are still not under control.

Q220 **Stephen Metcalfe:** There is obviously, therefore, a plan for what needs to happen. How far along are the discussions that would make that happen, so that the 100 Days Mission, taken as a whole, could be delivered?

Dr Carmona: Maybe I will share the report, because of the detail. There are 11 areas of action for diagnostics. There is also a score card so we are comfortable in measuring how ready and prepared we are.

Regulatory harmonisation for diagnostics is a key component that certainly can be worked out during peacetime—non-pandemic time. There are founder members; a reciprocity exists through jurisdictions—the UK, the EU, Health Canada, the FDA, Japan and Australia need to be well prepared so that, if one authority approves something, the others with access to the dossiers can quickly do the same and save time.

The same applies to technology transfer and access; it is related to cost—understanding how we will ensure that these tools are distributed, and provide, in some way, a stockpile for countries in the global south. It is key. That is a part of what we are getting ready.

We have concentrated a lot on the technology and the academic and R&D side, but we are not neglecting the co-ordination required for evidence generation in different parts—chasing the epidemic, if you like, in the north and the south and sharing that data, which is critical. I come from South Africa so I know what happened with omicron. We are ensuring that data systems that give early warnings even to countries in the global north are well understood. So, yes, we are addressing this in its entirety.

Q221 **Stephen Metcalfe:** Dr Yoon, you mentioned that discussions of a new model are needed. Are they taking place? When will it be delivered?

Dr In-Kyn Yoon: I do not have a prediction about when it will be delivered. There is no finish line. It is a journey, as they say. Progress has already been made during the covid pandemic. Obviously, some IP progress was made—the TRIPS waiver and things of that sort. There is a directional journey, which needs to continue, and from our standpoint that needs to be a global discussion. It just cannot be a very focused, limited discussion: it has to be done at the pandemic treaty level, for example, or the pandemic accords level.

Q222 **Graham Stringer:** You mentioned at the very beginning, Dr Yoon, that the regulatory structure around the quick development of vaccines was a problem. We all want very quick development of vaccines in an emergency, but does that mean greater risk? Does it mean a lack of legal redress against the pharmaceutical companies? What exactly do you mean by better regulatory structure?

Dr In-Kyn Yoon: Regulatory decisions always depend on good science and evidence. There will not be any pathway that will overlook that. Our focus is to try to maximise the amount of evidence available for making those decisions when the time comes. It is not about taking unsafe risks. It is about providing enough data points to be able to make those judgments.

This is why, for example, platforms are important. We want to get experience with certain products in, for example, vaccines that use the same platform, but for multiple products that we have experience with. Experience with that platform may allow better judgments about what we want to approve for a different pathogen target in a more urgent

situation. That is an example of trying to maximise the amount of data that can be used without compromising safety in a future situation.

Another example that I have mentioned is using immune markers that correlate with efficacy in the field, so that we can use those to measure the likelihood—the high likelihood—that it is effective. At the same time, we do some safety studies and have a history of safety with that platform that can then feed into the discussion about how beneficial and useful it would be for a future outbreak.

If I have to summarise, basically regulators make decisions based on data, no matter what kind of pathway it is. The data just needs to be substantive and reassuring.

Q223 **Graham Stringer:** The question is, if everybody is of good will and you use the best data possible, and there is still damage to people who receive the vaccine, who is liable? What do you have, under the regulatory framework, for liability in that situation? Is it the pharmaceutical companies, the researchers or Governments?

Dr In-Kyn Yoon: Regulators are not responsible for liability issues. They make the judgment about whether there is sufficient information to give approval from a regulatory standpoint. There are different ways to do that.

From a liability standpoint, that may be a broader issue. It is a public health issue and a policy issue. An advance, or progress, that was made during the covid-19 pandemic was that under COVAX there was a liability indemnification type of understanding, particularly for lower and middle-income countries, that allowed some of this to be done rapidly.

This, again, is not that dissimilar from the IP issue. Perhaps it was not thought of deeply, but the pandemic pushed it to the forefront and moved that ball forward. We have to keep moving it forward, but in a global sense. It cannot just be one country that makes that decision—or perhaps, for their own country, it can; but I think there is a need for this global discussion in the context of, for example, discussions that surround the pandemic accords, moving whatever progress there is forward. It has already moved forward, but there is a need for further, granular solutions.

Q224 **Graham Stringer:** In an ideal world, if there was a new disease out there, you would want a vaccine everywhere in the world as quickly as possible; but that is not a real-world situation, is it? We had the unseemly argument between the United Kingdom and the European Union during covid, when this country had bought a lot of vaccines on the expectation that they would be developed, and, not unreasonably, the Government thought we should use them first. You can never get past that point, can you? There will always be the owners and the place where the vaccines are produced, however much good will there is on getting the vaccines distributed as quickly as possible.

Dr In-Kyn Yoon: I think that that is true. We cannot predict how countries and regions will respond in a future emergency. That is a compelling reason why we feel that democratisation of those capabilities is critical. It is not just you in the UK. It was, for example, the US, India and China. We cannot predict what will happen and we cannot rely completely on good will. Therefore, the dispersal or geodiversification of those capabilities is a critical piece of CEPI's mission.

Q225 **Chair:** Thank you, Dr Yoon and Dr Carmona, for your evidence today. It is very good to have both international organisations here, with their complementary missions, and we are very grateful.