

## CHRISTIAN BRÉCHOT

President of the Global Virus Network, Senior Associate Dean for Research in Global Affairs and Associate Vice President for International Partnerships and Innovation at USF Health Morsani College of Medicine, former President of Institut Pasteur

I would like to make four main points.

First, surveillance is the key. Will we face other pandemics: yes. Can we predict novel epidemics? no. this is not a pleasant reality but it is reality. It is about surveillance and surveillance has failed for COVID19, at least in part.

We have been struggling with COVID19 for three years and at the same time we have witnessed the reemergence of monkey pox (now named by WHO as mpox) as well as some burst of Marburg infections and resurgence of Ebola. So the question is not how to predict but how to detect at the very early stages such viral infections and that is surveillance.

So how to survey better in the future? Well first surveillance must be focused on the interface between humans and animals. We are all of us aware that most of these epidemics stem from contamination of humans by infected animals. this is where surveillance must be concentrated, and we should not disperse the efforts. This may sound obvious but in fact this is not at all what has been happening so far in most geographical areas.

Surveillance is important for early detection of the virus but also for evaluating the long-term consequence of a viral infection. In fact in my view the issue of long COVID is really an open question and a potentially major challenge. Now, and this is new, we do have prospective longitudinal studies in a homogeneous environment of infected individuals. The figures are variable but as an average we are talking of around 30 to 50 % of subjects infected by the beta and delta variants who will still have one or another symptom at 6 months and 15 to 20%, one out of five, at 18 months. The good news is that the percentage is lower for Omicron and Omicron-related variants, around 19 % at 6 months but when you think of the huge number of infected individuals this is still very significant. Thus this only emphasizes that surveillance must be connected to the health care local capacities which is by itself a challenge.

Progress in science and technology has and will have no impact if we do not have sufficient local capacities. It is indeed striking that we have in hands all the necessary tools: we can beneficiate of a modern epidemiology based on the combination of molecular biology-and immunology-based diagnostic tests. We have the necessary bioinformatic and biostatistics to collect the data, share them and analyze them. We can analyze the wastewater samples, and this provides excellent information on the occurrence of an epidemics. We have the satellites.



But the reality is, and this has been well explained by the previous speakers, that it is only effective if we have on site, in the geographic areas which are vulnerable, the necessary capacities, and this means human resources, training, equipment and overall facilities.

We need to further foster our capacity to react rapidly. We all know how successful the development of the RNA vaccines against COVID19 have been, less than one year! But we must be even better prepared, in particular for antiviral and diagnostic test development. This implies coalitions and networks between academics and industrial partners, novel rules regarding intellectual property and significant financial incentives. The coalition for epidemic preparedness and innovation has been a progress for vaccines but still not sufficient for several reasons and we lack support for antivirals and diagnostics. In fact, I personally believe that the importance of diagnostics has been very much underappreciated in this COVID19 crisis. The progress in technology, digital applications, artificial intelligence has been tremendous in this area and yet we do not take a full advantage of this progress. Again, this means financial incentives, political will, networking and consortia between academics and industrials.

Also, when we think of pandemics, we need to embrace the whole pattern of contributing factors. It is about global and one health, integrating animal health but also nutrition and its impact on the microbiomes.

We need to think of novel schemes of organization. This will be discussed in the next session but the points I have taken, and others emphasize the need to increase reactivity, the gathering and analysis of information. we also need to foster education and training of the next generation of virologists. This is where networks, science driven and independent from government and politics must be part of the overall organizational scheme. This is what the Global Virus Network offers but there are obviously other networks and coordination between networks will be necessary. This is entirely feasible if sufficient funding is offered for both surveillance but also education and training.

To conclude, yes we will face other pandemics, surveillance and reactivity are keys. the necessary investments are significant but really worth when you take in account the impact of a crisis such as COVID19.

**Michel Kazatchkine, Special Advisor to the World Health Organization Regional Office for Europe, Senior Fellow at the Global Health Centre of the Graduate Institute for International and Development Studies in Geneva**

Thank you very much, Christian. You pointed out this key issue of preparedness and one of the first lessons that we learned from Covid-19 was that the world was not prepared, and that investments in preparedness have been much too low over the years. Then also the way we thought we could measure the preparedness of a country actually proved to be wrong. There is a so called global preparedness index that showed that the US was among the best prepared countries in the world, but then it was one of the countries that failed totally to respond to the pandemic. We not only need to invest strongly in preparedness now, including in the science and industry and other networks that Christian mentioned, but we need to totally revise the way we monitor preparedness and our indicators.