

# CHRISTIAN BRÉCHOT

## President of the Global Virus Network

Thank you very much, Michel and thank you also, Thierry de Montbrial. As Michel mentioned, we are still in the midst of this pandemic and I just want to emphasize that we are facing these waves. We do not really know the fine mechanisms of these natural evolutions but clearly, viral variants, seasonal variation and obviously the various precautions, as well as vaccines, are at stake. There is a huge impact on health and hospitalization, but we should also never forget the pending issue of the long-term medical consequences and the real impact of, for example, what we call long Covid. I believe that this is something where there is still uncertainty.

What will be the future? First, we really always have to remain humble and careful, but for the rich countries we can really foresee a transition to low-grade pandemics due to the combination of vaccine efficacy, natural immunity and precautions. We will have new waves, but we can hope for lower and lower rates of severe disease and death, but we have to pay attention to co-infection. However, obviously what about low- and middle-income countries?. The year 2022 might well be the year of the development of antivirals. There are new direct antiviral therapies such as among others, Molnupiravir, which has recently shown very interesting results. There are others coming into 2022. Also there is a debate around the impact of non-specific antivirals targeting the infected cells. In addition there is the underestimated potential of monoclonal antibodies, not only for therapy but also for prevention in people who have been in contact with infected individuals. Of course, there is also the issue of cost and production. The treatment of severe Covid-19 has improved a lot and so among the related questions, which were addressed by Michel, is really the impact of global versus national strategies and related to this, the potential emergence of new variants.

I am not going to list all the variants, but interestingly the two so-called Beta and Gamma, which show some resistance to vaccines, have remained very minor species. Will we have new variants? Yes, as long as the virus is circulating. Will they be sensitive to vaccines? So far, yes, but we do not really know about the future. A very important point is that we have the tools for real-time genomic investigation of infectious disease, and it is about organizing the onsite capacities worldwide for sequencing, as well as sharing the data, for this pandemic and for the future. This is a really very important issue.

I do not want to discuss all the vaccines, obviously the RNA vaccines are the leaders, and the overall efficacy has been just remarkable. They prevent hospitalization and death, with less than 0.01% of vaccinated people being hospitalized in the US and death from Covid-19 is mostly in unvaccinated people. Do they act on the circulation of the virus? Yes, to some extent but not completely, in other words, vaccines cannot be the only solution and there are major questions for the future duration of immunity. I believe that we will need second-generation

vaccines with longer protection, and we need to distinguish which correlates of protection and which markers. We also need large prospective studies in various geographic and environmental contexts. Will we need to adjust to variants? So far, it has not been necessary, but we will have to be careful.

Vaccine inequality is a key point, and it has already been discussed. I just want to mention a very recent paper in *Science*, which is based on mathematical modeling that really demonstrates the impact of vaccine nationalism on the dynamics and controls of SARS-CoV-2 and the return on investment we can get from a global strategy.

What went wrong? Many things and Michel listed some of them, but I will just focus briefly on the science, medicine and public health. We need to have science-driven questions, which means expertise. It should always be remembered that the virus was actually sequenced as early as January 5, 2020 in China and by the way, that was immediately made public. Then there is the issue of masks and diagnostics. The diagnostics have been seriously underestimated and will be key for future pandemics; indeed we now have in hand rapid tests based on salivary samples, molecular tests, low-cost and very easy to develop in low-income countries. We have apps and we work a lot more on these issues. We also need other organizational schemes. I am the President of the Global Virus Network and there are obviously others, but we really need to merge the centers all over the world to provide real expertise rather than individual-based expertise. It is also about research, education and training, which is key for the future, advocacy communication, expertise, reactivity and partnerships between academics and industry, which have always been at the heart of the Global Virus Network.

We need to embrace this on a more global basis. As Michel mentioned, we will have other pandemics with respiratory viruses, there is the long-term resurgence of Ebola or others. We know that it is about the interface between environment, animal health and human health. 70% of emerging infectious diseases are zoonotic, meaning that they originated from animals. That means that we must work on this ecosystem and when it comes to monitoring, we really want to target the human-animal interface, and this is a very concrete objective. Finally, we also need to incorporate nutrition, food safety and security into this global approach as we need to integrate visions of different fields. It is now clear that the gut microbiota, this population of bacteria in our intestines, play a major role in the risk of Covid-19 and its severity. So it is really about the impact on the environment, the soil, the oceans, microbiomes, in turn on the plants, the food, the nutrition and in turn on humans and viral pandemics. It is really about the need to work on some specific items that have fed on this pandemic and really to embrace this in a global context. I will stop there.

**Michel Kazatchkine, former Executive Director of the Global Fund to fight AIDS, tuberculosis and malaria, Senior Fellow at the Global Health Centre of the Graduate Institute for International and Development Studies, Geneva**

Thank you very much Christian for setting the scene and focusing on transmission, diagnosis and bringing and even broadening the One Health concept.