

# The next Disease X pandemic will come

Jiaqi Yan

China Pharmaceutical University, Nanjing, China

**Abstract.** The COVID-19 outbreak in 2020 is a serious public health event in human history. It is a viral pneumonia caused by the novel coronavirus, with strong transmission and high concealment, and has caused a global pandemic. At present, the situation of control of COVID-19 tends to be stable. We can finally relax from the intense battle, reflect on the disaster, summarize experience and look forward to the future. COVID-19 has not only brought tens of thousands of deaths, but also promoted the progress and development of human science and technology. Countries have learned valuable management experience from COVID-19, which is beneficial to human development and progress. But we must not take it lightly. We must learn to apply knowledge to prevent the occurrence of the next pandemic. No one knows whether mankind can withstand the next disaster. This paper summarizes the experience and lessons learned from COVID-19, and predicts the occurrence of the next pandemic disease due to glacier melting, aiming to warn people to pay attention to glacier microorganisms and protect the environment.

**Keywords:** COVID-19 pandemic, melting glaciers, the next pandemic, glacier epidemic.

## 1. Introduction

The COVID-19 pandemic, which began in 2020, is an important public health emergency in human history, causing tens of thousands of deaths and bringing enormous challenges and pressures to the medical and health systems of all countries in the world. At the same time, the COVID-19 pandemic has also promoted the progress of human civilization. People have accumulated valuable experience from this epidemic and promoted the progress and development of science and technology. However, we have to guard against the next pandemic. There is a new problem of what the next pandemic will look like resulting from melting glaciers. With the acceleration of human industrialization, global carbon emissions have reached new highs, and the greenhouse effect has become more and more serious. Polar glaciers and permafrost have melted at a visible speed, which makes people think deeply. This paper summarizes the valuable experience in the COVID-19 pandemic, and reasonably predicts the possible "glacier epidemic", aiming at warning people to pay attention to the research and protection of polar glaciers.

## 2. Experience from COVID-19

The COVID-19 epidemic in 2020 was predicted to be "Disease X", but we ignored this warning and were at a loss in the early stage of the COVID-19 pandemic. (Daszak, 2020) At present, the situation of COVID-19 is relatively stable. We should learn from it to cope with the next pandemic.

First, we should do a good job of pathogen monitoring. As early as 2018, some scientific researchers found through serological monitoring that the virus carried by some animals might spillover to humans and cause the pandemic of infectious diseases.(Wang et al., 2018) Now this is regarded as an early warning of COVID-19. Now we should monitor and pay more attention to the pathogens around us, and try our best to prevent the next pandemic. We now have many technologies to monitor pathogens. For example, functional genomics research, serological monitoring of hotspots, genome monitoring of wild viruses, etc. These technologies can enable us to observe the evolution of viruses in nature and their role in humans, so as to predict the occurrence of the next pandemic. The World Health Organization has launched a ten-year global gene serology action plan in 2022, which is a good performance for us to learn from the experience of COVID-19.

Second, we need to develop better methods of diagnosis, treatment and prevention. In the past two years since the COVID-19 pandemic, we have developed many new technologies to resist the

COVID-19 pandemic and reduce losses, but there are still many problems. For example, the sensitivity of antigen detection is not high enough, the cost of nucleic acid detection is high, multiple vaccination of booster vaccines may lead to immune fatigue (Nagarkatti & Nagarkatti, 2022) (Science Unclear Around Fourth COVID-19 Shot, 2022), and it is difficult to develop specific drugs for viruses. Among the pandemics in history, many ended after the emergence of specific drugs, and there was no vaccine. We need more efficient scientific means and drugs, and we need to invest more resources in these areas. The research and development of pan-coronavirus vaccine has set a good example. (Grobben et al., 2021)

Third, it is clear that political and social factors can have a detrimental impact on public health, so we should try and mitigate these factors. A stark example is American social and political landscape. Democrats and Republicans have different ideologies, so they take different measures to deal with the epidemic, and of course, the final results are also different. Some regions oppose science, vaccines and isolation, which keeps the number of confirmed cases high. It is a serious mistake. The government and society should guide people to believe in science and vaccines, and actively respond to the government's public health policies. Public health is always political. (Bias, n.d.) Only when everyone is working hard to end the epidemic, can there be hope for the end of the epidemic.

### 3. Prediction of the next pandemic

We predict that viruses with pandemic potential could have the following characteristics. Firstly, it may be a mutable RNA virus and can host on multiple hosts. RNA viruses have poor spell-checking capacity during replication, they are easy to mutate and produce more virulent or infectious variants. (Duffy, 2018) This will make our vaccines ineffective quickly. The virus causing disease is probably a zoonosis, which may spillover from animals close to human. An assessment report pointed out that the risk level of pathogen transmission from animals to humans is the highest. (Grange et al., 2021) Viruses with high host plasticity (i.e. taxonomically and ecologically diverse host range) were more likely to amplify viral spillover by secondary human-to-human transmission and have broader geographic spread. (Kreuder Johnson et al., 2015) If the virus resides in multiple animals around human, it will be very difficult for us to prevent. Secondly, it can be transmitted to humans through direct or indirect contact, such as animal transmission and droplet transmission. The droplet transmission is an efficient transmission mode. For example, the COVID-19 causing the global pandemic is transmitting by the air. In this way, the virus can infect healthy people without people knowing it, instead of being infected after receiving contaminated blood like Ebola virus. Thirdly, patients infected with the virus have mild symptoms and can transmit the virus to others when they have no symptoms. Mild symptoms can reduce patients' attention to the disease so that they are reluctant to go to the hospital for diagnosis. Transmission before symptoms will make the virus infect more people and make the prevention work difficult to do. These characteristics will lead to uncontrollable spread of virus, resulting in a global pandemic.

Many years ago, when scientists discovered that there were many unknown microorganisms in polar glaciers, experts had warned that melting glaciers might release many ancient viruses. Although the research on microorganisms in polar glaciers has gradually increased in recent years, there is no effective means of prevention and control.

Glaciers hold many microorganisms. A large number of viruses, bacteria, actinomycetes, filamentous fungi, yeasts, algae and other microorganisms have been found on the surface of glaciers and deep ice cores around the world. Most of them are harmless to humans, but some species have viral infection characteristics, indicating that they may be pathogenic. (Xiang, Yao, Chen, Shang, & Pu, 2006) Dead animal carcasses may also be buried in the ice, and viruses may still exist in these carcasses such as anthrax, smallpox virus, influenza virus. If the influenza virus invades the migratory birds that live in the polar regions, the migratory birds can act as a "virus repository" which could enable the spreading of the virus around the world, later the virus could spread through human to human contact, causing a global pandemic.

It is further speculated that the RNA virus genome without correction function is very unstable and prone to mutation. These ancient viruses released from melting glaciers are likely to be genetically recombined with existing viruses in the co infected host and may produce more virulent and infectious super viruses. Humans cannot develop specific drugs or even vaccines to prevent infection in a short time.

We put forward the "carbon peak" and "carbon neutral" initiatives long ago to protect the climate because we know that too high carbon emissions will aggravate global warming and further accelerate glacier melting. Glacier melting will cause the organic carbon contained in it to be converted into methane and other greenhouse gases to be released. The glaciers will melt at an increasingly rapid rate. At the same time, climate change has changed the habitat and activity range of animals, leading to the spread of viruses carried by infected animals to larger areas. The rise of temperature can also reduce the functioning of the immune system, hence making humans more susceptible to the detrimental effects of such viruses. (Liu, 2021).

The anthrax outbreak that broke out briefly in Siberia in 2016 has told us that there is a huge danger hidden in glaciers.

The released pathogens will first invade the animals living near the glacier, and then the animals will infect humans. The pandemic started near the poles, polluted water, and soil along the migration route of animals, infected people living near the migration area, and then expanded to a larger transmission area through human contact. Some of these pathogens are extremely virulent. Animals and humans get sick quickly after infection, and the symptoms are very serious. They die soon after infection. These pathogens will not cause a global pandemic but will cause many deaths and severe patients. Some pathogens are less virulent, more infectious, and can cause a pandemic, which will cause a large number of confirmed cases.

#### 4. What can we do?

If the "glacier epidemic" really happens, what can we do to reduce the damage and losses?

On the basis of summing up the COVID-19 pandemic and actively monitoring, after the outbreak of the pandemic, we need all countries and regions around the world to share research results, share effective public health experience, help each other, oppose slander against other countries, and jointly deal with the new pandemic.

Firstly, if the virus is one we have seen before such as anthrax and smallpox virus, we already have very mature diagnostic methods, vaccines and drugs that can prevent diseases and cure patients.

However, if this is a novel virus different steps may be required in order to effectively mitigate and understand the threat.

For example, we will first study its biological characteristics through determining the gene sequence of the new virus and comparing it with the sequence in the viral database to determine its genetic relationship with other viruses. We should also try to translate its gene sequence to predict what functional proteins it may produce. The biological structure of the virus can be analyzed by means of freezing electron microscopy (perhaps a more advanced microscope) to deduce the life activity form of the virus because knowing oneself and knowing the enemy can ensure victory. Then, according to the biological characteristics of the virus, vaccines and specific drugs are designed and developed. Next animal experiments should be conducted under laboratory conditions to measure the virulence and infectiousness of the virus. Scientists can use this data to predict the number of infected people and analyze and prevent infectious diseases at the social level.

In terms of policy, we should establish a strict prevention and control system. We should also control living animals carrying pathogens, and timely dispose of dead and rotting animals and human corpses. Individuals should also be encouraged not to go out unless there is a necessary reason and restrict their social contact with other people outside their households. Furthermore, governments should carry out comprehensive diagnostic testing and timely screen confirmed cases. It is also important that the public and government give full support to scientific research. The government

also have a responsibility to ensure that patients are well treated, and resources are distributed equally amongst the population. Finally, the media also have a role to play in ensuring that they do not cause excessive social panic or spread misinformation.

## 5. Postscript

Although I have discussed the potential damage melting glaciers can cause, it is also possible that this may not be the case. For example, it may take tens or thousands of years for glaciers to melt, and when they do they may not release any pathogens, or if there are pathogens released they may not be deadly. It may also be possible that we find ways to deal with such viruses before the glaciers melt. However, we should realize that the research and protection of glaciers are very important, and protecting the environment is to protect human beings themselves. We should start protecting the environment to prevent disasters before disasters occur, rather than realizing that the problem is serious after disasters are over. What if the next disaster is unbearable for human beings?

I hope the monsters in the glacier can be buried under the ice all the time.

We live in an ocean of pathogens. In recent years, the interval between the outbreak of global public health events is getting shorter and shorter. Maybe the next epidemic is happening or will happen in a few years. We have no idea. We hope that the next epidemic will not be more serious than COVID-19. However, the evolution and variation of the virus is difficult to predict, and no one knows whether the next virus strain will bring more deaths. We must learn from the valuable experience of COVID-19, use existing science and technology to monitor and prevent it, gradually improve the global public health system, and develop new vaccines and drugs. I believe that if we can do this, we will have a better performance in dealing with the next pandemic.

## References

- [1] Daszak, P. (2020, February 28). Opinion | We Knew Disease X Was Coming. It's Here Now. The New York Times. Retrieved October 4, 2022, from <https://www.nytimes.com/2020/02/27/opinion/coronavirus-pandemics.html>.
- [2] Duffy, S. (2018). Why are RNA virus mutation rates so damn high? *PLoS Biol*, 16 (8), e3000003. doi:10.1371/journal.pbio.3000003.
- [3] Grange, Z. L., Goldstein, T., Johnson, C. K., Anthony, S., Gilardi, K., Daszak, P., University of Edinburgh Epigroup members those who wish to remain, a. (2021). Ranking the risk of animal-to-human spillover for newly discovered viruses. *Proc Natl Acad Sci U S A*, 118(15). doi:10.1073/pnas.2002324118
- [4] Grobden, M., van der Straten, K., Brouwer, P. J., Brinkkemper, M., Maisonnasse, P., Dereuddre-Bosquet, N., . . . van Gils, M. J. (2021). Cross-reactive antibodies after SARS-CoV-2 infection and vaccination. *Elife*, 10. doi:10.7554/eLife.70330.
- [5] Kreuder Johnson, C., Hitchens, P. L., Smiley Evans, T., Goldstein, T., Thomas, K., Clements, A., Mazet, J. K. (2015). Spillover and pandemic properties of zoonotic viruses with high host plasticity. *Sci Rep*, 5, 14830. doi:10.1038/srep14830.
- [6] Liu, Q. (2021). *Climatological problems of diurnal temperature change in the context of global warming and its impact on human health (Doctor)* Nanjing University, Available from Cnki.
- [7] Wang, N., Li, S. Y., Yang, X. L., Huang, H. M., Zhang, Y. J., Guo, H., . . . Shi, Z. L. (2018). Serological Evidence of Bat SARS-Related Coronavirus Infection in Humans, China. *Viol Sin*, 33 (1), 104 - 107. doi:10.1007/s12250 - 018 - 0012 - 7.
- [8] Xiang, S., Yao, T., Chen, Y., Shang, T., & Pu, L. (2006). Research survey and prospect of microbial flora distribution in glaciers *Journal of Ecology* (09), 3098 - 3107.