The nature of SARS-CoV-2 and its impact on human society determine that society should make appropriate adjustments to coexist with SARS-CoV-2

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Abstract: SARS-CoV-2 raided human beings, resulting in a global pandemic. In more than a year, the number of infections has exceeded 200 million and many deaths. The virus transmission is still accelerating, and society is confronting an unknown future. The destiny of humanity urgently needs the right choice. Based on the limited understanding of COVID-19 and other known infectious diseases, we can determine what humans are doing today and infer tomorrow's trend. All the information indicates that SARS-CoV-2 will coexist with humans at least for quite a long time. In the recorded history of humankind, pandemic infectious diseases have always been with us. Managing the source of infection, cutting off the route of transmission, and protecting susceptible populations are the best ways to deal with the virus that humanity knows so far. The lively variation and cross-species transmission of SARS-CoV-2 have caused great difficulties in prevention and control. Politics, economy, culture, tradition, habits, and social class result in extreme differences in agreement on countermeasures towards the pandemic. The immense popularity of susceptible people, especially vulnerable groups, is a high-quality medium for SARS-CoV-2. Putting all humanity on an equal interface for rescue is an essential condition for coexistence with SARS-CoV-2. The viruses continuously break through the defense system of humanity, forcing humans to cooperate in political, economic, technological, and other aspects. The methods can be different, but the goal must be consistent. Tolerance, responsibility, self-discipline, and understanding between people are also necessary factors for coexistence with SARS-CoV-2.

1. Introduction

Among the microorganisms that harm humans on a large scale, SARS-CoV-2 is the fastest virus recognized by humans. Although there are more than 200 million infections and millions of deaths, human understanding of SARS-CoV-2 is limited. Among the properties that SARS-CoV-2 has shown, the one that makes humans unable to control and defend most is the unpredictable, lively mutation that can easily break through the established defense of the immune system, causing vaccine failure and repeated infections. Cross-species transmission has increased the uncertainty of SARS-CoV-2 variation. By analyzing the SARS-CoV-2 epidemic period, we found that humans can control the impact and pressure caused by SARS-CoV-2 on human society if taking correct measures. Coexistence with SARS-CoV-2 is not a simple biological concept, nor is it just about vaccine research, manufacturing, and inoculation, but also includes drug development, norms of daily life habits, harmony in human society, political and economic support, and perfection of the public health system and the protection of vulnerable groups. Every person, race, country, social system, ideology, and even species related to SARS-CoV-2 matter a lot to coexistence with SARS-CoV-2. The equality of SARS-CoV-2 to the host also requires that all humanity unite to form a coexistent balance with SARS-CoV-2. Any abandonment, isolation, discrimination, and confrontation between human beings are the breakthrough of SARS-CoV-2. The relationship between human beings and SARS-CoV-2 is the interaction between life and life. In the face of life, politics, economy, interests, and reputation are all infinitely. SARS-CoV-2 challenges human wisdom and technology. How to coexist with SARS-CoV-2 is a crucial issue that all humanity faces. This article carried out exploratory thinking about this topic, focusing on why we should and how we should coexist with SARS-CoV-2.

2. The nature of SARS-CoV-2

To facilitate a clear judgment, we compare some apparent differences between SARS-CoV-2 and the smallpox virus to obtain an explicit understanding. For smallpox (not smallpox virus) is the only infectious disease that has been "eliminated" by human beings in history.

SARS-CoV-2 can be transmitted freely between human to human, animal to human, or animal to animal: chimpanzees, white-tailed deer, minks, dogs, cats. It increases the possibility of antigenic transfer. If SARS-CoV-2 that infects humans mutates in animals and then transmits the variant strains to humans, it increases uncertainty in the future (Smriti, 2021). However, human beings are the only natural host of the smallpox virus. Although we have not found a cure for smallpox, we rely on the smallpox vaccine to "eliminate" smallpox from a certain point of view.

Compared to the very stable smallpox virus, the variations of SARS-CoV-2 are very active: a paper published in Nature Medicine analyzed more than 1300 whole genomes of SARS-CoV-2 isolated in the first six months of the SARS-CoV-2 pandemic in South Africa and found 16 new variants of the virus (Tegally et al., 2021). Russian researchers sequenced the virus and found that SARS-CoV-2 mutated as many as 40 times in the patient S during its 318-day infection (Oksana et al., 2021). Tulio de Oliveira, a geneticist at the University of Natal in South Africa, published on the medRxiv platform as a preprint on 3 Jun., showed that a woman diagnosed with AIDS in 2006 carried SARS-CoV-2 for 216 days. SARS-CoV-2 mutated 32 times in her body during that time, including 13 key spike protein mutations and 19 other genetic changes that could alter the virus's behavior. These include the British variant E484K and the South African variant N510Y (Karim et al., 2021). The discovery has raised concern that the "collision" of SARS-CoV-2 and HIV could complicate the efforts to eradicate the SARS-CoV-2 pandemic.

In December 2020, scientists first discovered the Lambda variant of SARAS-CoV-2 in Peru. Because Lambda variant carries several worrying mutant genes, indicating that the variant may spread faster or be able to escape the effect of the SARS-CoV-2 vaccine, so WHO marked it as the variant of concern (VOC) (Kimura et al., 2021) (2021b). CDC documents in the United States show no difference in viral load between patients infected with Delta mutants after vaccination and those not vaccinated. Patients infected with Delta after vaccination have the same ability to spread the virus as those who are not vaccinated (2021a). However, the smallpox vaccine is highly efficient. It has an extremely high rate of protection after vaccination. People do not need to be vaccinated again in their lifetime.

What is more, it is relatively clear and easy to distinguish whether someone is getting smallpox, and there is almost no subclinical infection, which means there is no asymptomatic infector. However, infectious asymptomatic infectors in SARS-CoV-2 result in the concealment of transmission, the subjectivity of symptoms, and diagnosis limitations.

3. Viruses have always coexisted with and some deeply affected humans

The long-term coexistence with SARS-CoV-2 is a high probability event for human beings because humans never eliminate any virus in history. The smallpox virus has lived with humans for thousands of years, perhaps longer. Apart from successful vaccine defense, humans are still powerless against the smallpox virus itself. The virus is one of the essential parts of the origin of life. No matter in the past or the future, it exists longer than human beings. Human gene fragments contain many traces of viruses. Looking back at the hundreds of millions of years of reproduction of life, we find that viruses can affect human beings but do not destroy them. The viruses did not kill or even eradicate any type of life in nature, similar to asymptomatic SARS-CoV-2 infections in humans. The emergence of asymptomatic infection is likely to be a message transmitted by SARS-CoV-2 to human beings, which humans have not clearly understood. In the recorded history of human society, epidemics often play a dominant role in the direction of social development, such as the Plague of Athens and Anthony, the Black Death, smallpox, cholera, and the Spanish flu. Viruses have been accompanied by human beings all the time.

4. Several patterns of coexistence between humans and viruses

The general principle for human beings to deal with infectious diseases is to manage the source of infection, cut off the transmission route, and protect the vulnerable population. There are a variety of specific changes and implementation methods.

Set boundaries between people and viruses, such as enforce the blockade where the Ebola virus is prevalent. However, with the convenience of modern transportation, it is challenging to maintain absolute local isolation. The over-development of ecosystems and climate change have released the sealed ancient viruses once in nature. It is unknown when, where, and how these viruses will behave and what will happen? What is more, some viruses can not be isolated and culled to hinder their transmission, such as the migration of birds that can spread the avian influenza virus around the world. However, considering that humans and animals could infect each other, timely isolation, vaccination, therapy are still necessary. Prohibit the exchange and conversion of viruses in the region as far as possible to prevent the exchange of various mutations combined with new terrible mutations.

The virus can finally become a component of human genes by natural selection, or our immune system can evolve. While studying the mechanism of SARS-CoV-2's T-cell-mediated immune response, scientists in Russia speculated that the infected SARS-CoV-2 might have evolved to avoid the defense system it had to face. As a result, the accumulated mutations of the virus specifically avoided the antigen presentation of the patient's HLA allele, resulting in an ineffective T cell response. When this mutation occurs, it usually accumulates multiple mutations quickly, just as it evolved in immunosuppressed individuals. It is also possible that all the humans who cannot adapt to the virus are dead, and the remaining humans are passivated to the virus (Oksana et al., 2021).

There has been no sign of virulence weakening for the virus till now, and the viral load still has an increasing trend after infection. Nevertheless, there is significant uncertainty in this expectation. According to CDC documents in the United States, the viral load of patients with Delta mutant is ten times higher than that of patients with Alpha mutant. Furthermore, Delta has a higher risk of repeated infection than Alpha, about 1.46 (95% confidence interval: 1.03-2.05) times. The Alpha mutant is stronger in transmission and lethality than the wild strain, but it lacks immune escape than other mutants (2021a; Fisman and Tuite, 2021).

The UK reported many reasons for the virulence changes, such as antigenic drift and antigenic transfer, which affect the virulence of the virus. Gradual or intermittent accumulation of antigenic variation will eventually invalidate existing vaccines. Antigenic drift and antigenic shift mainly occur on spike proteins, while lethal mutations are more likely to occur inside the virus, such as polymerase proteins or accessory proteins. These genes inside the virus determine the speed of the virus's replication, the acceleration detected by the cell and even affect the cell's resistance to the virus. Antigenic shift means the spike gene sequence from other viruses inserting into the original virus. If the transferred spike gene sequence is brand new, it will have a significant impact on humans. If the inserted spike gene sequence is highly prevalent in humans, maybe many people are already immune to it, and the impact may be more negligible (Scudellari, 2021). The coronavirus, which has a higher prevalence in the population, is the possible source for the spike gene sequence from other coronaviruses inserting into COVID-19. At the same time, the possibility of insertion from a dangerous virus such as MERS is lower because the latter is less prevalent. Another longer-term antigenic shift possibility is that humans transmit the virus to animals, and then the virus mutates in animals and transmits back to humans. The generalized antigenic drift changes less than the antigenic shift. In influenza, the antigenic shift is more likely to cause a pandemic, while the influence of antigenic drift is relatively small. The combination between variant strains might result in higher lethality. For example, one of them has a higher ability of immune escape, while the other is highly lethal and can replicate rapidly in cells. Two variant strains combine to form a new mutation with the characteristics of both sides, which has the feature of immune escape and can be highly lethal.

The worst possibility is that antigenic drift may lead to significant original antigenic sin, making it difficult for humans to re-vaccinate and reproduce effective antibodies. Original antigenic sin means after infection or vaccination eliciting antibodies, the body cannot produce specific antibodies to the

new antigen, the mutated new virus, but only the previous one (Vatti et al., 2017). In that case, the variations will do whatever they want in the body without targeted antibodies, while the body continues to produce useless antibodies to try to fight the virus. Once so, the new vaccine also fails to make the body produce new antibodies (Fierz and Walz, 2020; Henry et al., 2018).

The vaccines create an active defense in the human body, but SARS-CoV-2 is still highly prevalent and lively mutating. The current vaccine mainly protects against severe illness and death, not infection. The more infected people after vaccination, the more likely they will produce variant strains that target the vaccine (Scudellari, 2021). Strengthen the research on vaccines and manufacturing vaccine production lines that can quickly keep up with mutations, speed up popularization, and regularly repeat injections of vaccines to the population may be ways to control the pandemic.

Using drugs to control SARS-CoV-2 is also vital. Israel's Jerusalem Post reported that the new anti-SARS-CoV-2 drug "EXO-CD24" phase II clinical trial developed by Nadir Albert's team at Israel's Ichilov Medical Center achieved positive results again. More than 90% of the severe cases that participated in the research were cured and discharged within five days. Hoarding antiviral drugs and developing new drugs are the most direct means for humans to resist diseases (Tercatin, 2021). However, the research and development of antiviral drugs are far from the level of defeating the virus.

5. Social and political problems that related to COVID-19

While SARS-CoV-2 directly harms human beings, it also indirectly impacts various fields such as politics, economy, and society to varying extent.

From Trump to Biden, the US policy and behavior towards China have been synchronized and coherent. China is still operating stably with its inherent pattern and rhythm, and there is no sign of turmoil and shaking. The economy can prove the stability of the political system. The functioning of major financial markets such as China, the United States, and Europe are all active in their respective standard regions and trends and are hardly affected by SARS-CoV-2. These show that the core political groups and vested interest groups are all normal. The two major camps of the East and the West have entirely different political and economic positions. Their specific goals and intentions are opposed to each other. COVID-19 will not fundamentally change the world, but it will make the already intensified tensions between the two camps tenser and exposed, thereby deepening the current systemic instability.

Humankind has experienced greater shock and pressure than SARS-CoV-2. Only in the 20th century, the Spanish flu, the two World Wars, the reunification of Germany, the disintegration of the Soviet Union, the wave of immigration, the Middle East War, the economic crisis, these milestone events did not prevent the world from positive development, nor did they change the basic parameters of human nature, such as physical and psychological needs. Therefore, SARS-CoV-2 is not a significant factor in the harsh global political and economic environment. However, solving global infectious diseases like SARS-CoV-2 effectively and fundamentally requires extensive international cooperation in politics and the economy.

Regarding the prevention method of the SARS-CoV-2 pandemic, whether to open or isolate is the most appropriate choice in each government’s conceit based on its situation. Science and politics must compromise with each other to maintain a dynamic balance when making policy decisions. It is dangerous to emphasize any policy alone. We must consider factors such as economy, culture, customs, and traditions comprehensively. Entirely different from "herd immunity," once there are signs of proliferation in China, most related cities will choose to quarantine and ensure no cases before opening again. The goal is to clear by implementing a forcible anti-epidemic strategy. Local governments' rigorous and efficient responses are generally successful. They have won precious time and resources for the overall anti-epidemic overall situation. Herd immunity is dangerous. It should be explored at least under the protection of potent vaccines. The purpose is to clear susceptible people. Isolation is also to gain more time and create opportunities for herd immunity before opening up. These methods are fighting for control of SARS-CoV-2 from two different directions. Nevertheless, this kind

of exploratory defense and attack launched by humans against SARS-CoV-2 seems to be used on ulterior motives in other areas and produce a strong stress response.

In the long period of coexistence with SARS-CoV-2, the contradiction based on immediate interests arising from a certain kind of selfish desire will continue to be amplified, divided, distorted, and intensified over time. Seed the devastating tragedies for future generations. These entirely avoidable and unnecessary contradictions have caused a lousy impact far more significant than SARS-CoV-2's harm to human society.

With the continuous mutation of SARS-CoV-2 and the endless extension of the epidemic, human tolerance must get released physically and psychologically. Life urgently needs to return to its inherent trajectory. The pursuit of the normalization of society has prompted the restoration of everything changed by SARS-CoV-2. The threat of death, illness, and SARS-CoV-2 sequelae cannot stop political and economic needs and human impulses. Coexistence with SARS-CoV-2 has become a reality.

SARS-CoV-2 accounts for a small proportion of the root causes of widespread anxiety and panic in society. The ruling class spreads and intensifies panic through the media to maintain its position and interests. Interest groups deliberately created much of the social chaos and confrontation in the name of SARS-COV-2. Stanley Cohen believes that moral panics affect society from time to time. The media tends to report anti-social behavior repeatedly, which makes the public fear and suppress a particular social group (Stanley, 2011). So, what we see, hear, read, is often distorted. Based on the distorted information, the judgments, behaviors, conclusions must have significant deviations or even the opposite. Therefore, it is necessary to review and analyze history. Through the time of precipitation, we can fully understand how the virus affects human society and is used by humans while invading the human body. Yesterday and today are essentially the same. "History matters. It matters not just because we can learn from the past but because the present and the future are connected to the past by the continuity of a society’s institutions. Today’s and tomorrow’s choices are shaped by the past"(North, 1990).

SARS-CoV-2, which is equal to all humanity, has become an excuse for racial discrimination and xenophobia. It has penetrated all areas of society. Many groups have participated in it, including government officials, media, famous people, and ordinary people. Politicians use international public health crisis events to lead and incite racial discrimination and xenophobia, which is one of the main reasons for large-scale civil riots. Coexistence with SARS-CoV-2 requires human solidarity, cooperation, understanding, and tolerance. It needs the international community to share information and exchange experiences to fight the epidemic. Any obstacles come at the cost of lives.

Supposing that the top 10 leaders of various countries, the leadership of the world's top 500 companies, the cabinet, the House of Representatives, the Senate died 20%, although the death toll is small, they will introduce strict anti-pandemic policies and countermeasures. However, these people have been under good protection, and the infection rate is meager. "Openness" or "isolation" has little effect on them. Even if they are infected, they will recover quickly with high-quality medical support. It can be seen from the contrast of the social level that under the protection of high-quality medical support, human beings can coexist with SARS-CoV-2. If the high-quality medical services and protected models that serve the elites are continuously copied and enlarged, the dynamic balance of coexistence between human beings and SARS-CoV-2 will soon appear.

The pandemic is also widening inequality (Mauro, 2021). Vulnerable groups are the most dangerous and helpless and account for the majority of society. SARS-CoV-2 threatens their lives while reducing or cutting off their incomes, facing the choice of death from illness or starvation. Vulnerable groups are dynamically changing, including children, the elderly, the sick, the homeless, and the poor. It is challenging to cope with their financial, mental, and physical crisis, and the outbreak of infectious diseases can create more vulnerable groups. With widespread school closures, education losses in 2020 are estimated at a quarter of the school year in advanced economies and twice as much in emerging market and developing economies. Children from poorer families have been disproportionately affected. IMF’s research estimated that up to 6 million children in emerging markets and developing economies could drop out of school in 2021, with lifelong adverse consequences (Mauro, 2021).

The blockade policy puts the lives of vulnerable groups in a difficult situation. They lose their source of income, accompanied by the threat of debt or loans and the lack of food, housing, sanitation, and other necessities (Mauro, 2021). However, without blockade, the situation will not be better. For work, mobility and gathering will significantly increase the risk of infection, and once infected, it will worsen the situation. What is also fatal to vulnerable groups are the price increases and supply shortages caused by the blockade. The case fatality rate of the elderly after being infected with SARS-CoV-2 is higher than others. The elderly are on the verge of being abandoned due to frailty, economic poverty, increased medical and testing costs, structural deficiencies in pension institutions, and unfavorable responses to the epidemic. Unable to use mobile phones and online shopping can cause severe obstacles for the elderly. During the epidemic, various difficulties are constantly surrounding the disabled. For example, deaf-mutes cannot get timely information through communication because they do not have sign language services and have difficulty communicating with medical staff after the illness. Cancer patients, uremia patients requiring dialysis, homeless people caused by various reasons, and people in isolation do not receive medical services, food supplies, and social assistance. Vulnerable groups are more likely to live in crowded environments, unable to maintain social distance, and have limited access to disinfection items. Even hand sanitizer and clean water may be luxury items to them. People who are uninsured or lose their employer's medical insurance due to unemployment may delay or choose not to seek medical care. Social and economic inequality has caused higher morbidity and mortality.

6. Properly dealing with SARS-CoV-2 requires joint efforts of all humanity

Coexistence with SARS-CoV-2 does not mean giving up the means of elimination, nor does it mean passive endurance. Still, when we cannot eliminate the virus, we will do everything to maintain the balance of coexistence and strive for the initiative. Eliminating SARS-CoV-2 remains the ultimate goal. A simple behavior change can reduce the spread of SARS-CoV-2, such as washing hands frequently, wearing masks, maintaining physical or social distance, avoiding gatherings, and get vaccinated. In a sense, this is what SARS-CoV-2 requires humans to do, but some people take the most fundamental law of preventing infectious diseases as "the blasphemy and ravages of freedom" (Stolle et al., 2020), which generates angry emotions and behaviors and vents them to the same kind. However, these ideologies and behaviors just increase the difficulty and period of controlling the spread of SARS-CoV-2. The vast majority of human beings are rational. The difference between the two is only the choice of active defense of natural selection. It is correct as long as it does not cause mutual harm.

In the face of SARS-COV-2, a sound medical insurance system can prevent patients and suspected patients from delaying or giving up treatment due to worries about the financial burden of medical services. Otherwise, slow or inadequate response and many temporary policies and emergency measures will not prevent people from falling into the trap of overburdened medical care, making the epidemic even more challenging to control.

The infectiousness of SARS-CoV-2 determines that the only way we can face the challenge is through global cooperation. Everyone only needs to contribute a little, such as vaccinations and abiding by the rules, and they can assemble a perfect defense system against SARS-CoV-2. We must stand on a scientific standpoint, not just a political and economic perspective. Decision-makers must also rationally centralize and deploy social resources, technologies, and strengths and care for everyone.
There has been a long history from the beginning of life to today. In the process of human evolution, humans have encountered numerous viruses. SARS-CoV-2 and humans occurred at the same source, and it wants to merge or accompany humans again! Concerning this requirement of SARS-CoV-2, human beings have no right to choose. However, humans can choose the way of "coexistence."

7. Conclusion

From the beginning of life to today, after 4 billion years of reproduction and differentiation, human ancestors and humans have encountered countless viruses in the process of evolution. SARS-CoV-2 is not the first virus encountered by humans, nor is it the last. SARS-CoV-2 has no concept of race, and even the boundaries between species are blurred so that it can infect many animals, including all human beings. SARS-CoV-2 does not have ideological and social contradictions. It has no concepts of country, politics, economy, and age and treats everything indistinguishably. SARS-CoV-2's relationship with its peers is sharing, exchange, and coexistence instead of mutual elimination. All viruses are like this. The way humans coexist with SARS-CoV-2 should include establish a common immunization, medical, and assistance system based on all equality to share vaccines, technology, and experience, and unite all forces to control the dynamic balance of coexistence with SARS-CoV-2. Remove or at least reduce and restrain the impulse to eradicate, enslaves, squeeze, and fight against the same kind. The essential functions of politics and economy have nothing to do with SARS-CoV-2. The competition of ideologies will not resonate with SARS-CoV-2. SARS-CoV-2 has no interest in human social contradictions. Therefore, coexistence with SARS-CoV-2 should completely abandon these worthless interferences. Coexisting with SARS-CoV-2 is very simple. Humans only need to follow the most basic social etiquette, keep a polite distance, appropriate levels of alert, and protection on psychological and physical. Relying on knowledge, technology, and experience, we can make society become order again.

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