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Perspective

PERSPECTIVE

Sustained research fund and dedicated research center to prepare for the next pandemic

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Abstract

The current COVID-19 pandemic caused by the SARS-CoV-2 virus is imposing a great threat to human lives and international panic the like of which has not been seen since WWII, resulting in financial crisis, disturbance to daily life, transportation shutdown, industry disruption, and country/city lockdown in every corner of the globe. The inability to effectively contain the virus indicates that our investment and attention to research, prevention, and development of treatment for this type of deadly virus are insufficient, considering that it has been 18 years since outbreak of the ”brother” coronavirus, SARS-CoV. The biggest lesson learned from acrimonious past experiences is that humans quickly forget and do not continue to support related research when a pandemic has passed. This is a wake-up call for governments, industry, and private foundations to work together and to take extraordinary measures to sustain research support and establish comprehensive research centers. Only this level of response may give us hope to prepare for the future and adequately deal with the next potential pandemic caused by emerging devastating viral infections.

Key words: investment; pandemic; viral infections; coronavirus; SARS-CoV-2; COVID-19

Introduction

The new coronavirus (SARS-CoV-2) leads to severe lung infection and unique pneumonia disease, namely the COVID-19 that was found first in December 2019 and has quickly spread throughout the world, causing international concern for healthcare and interfering with the normal lives of a large portion of the human population through extensive quarantine and separation. This catastrophic disturbance may serve as a wake-up call for governments, policymakers, philanthropic organizations, healthcare systems, and industries to the reality of extraordinarily dangerous infections caused by emerging pathogens, especially viruses. Admittedly, the government, healthcare institutes, and hospitals as well as medical professionals in China have swiftly taken extraordinary steps and implemented well-coordinated measures to contain the disease by locking down Wuhan city, sharing research results, supplying all emergent materials, and sending medical aids to the hospitals at

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ground zero in Hubei province, particularly Wuhan city. Similar approaches have been applied in Italy, the USA, Spain, the UK, India, etc. However, the measures taken to control this rapidly spreading disease were insufficient in most of these countries, even with intense efforts, resulting in quick dissemination throughout the world. This is a testament that our awareness of, and preparation for, these types of diseases, even in relatively well-prepared countries such as the USA, Italy, the UK, Spain, and Germany, are extremely insufficient.

Over the past few decades, humans have experienced continued attacks by various deadly infectious diseases caused by newly found or evolved viruses, including SARS, MERS, ZIKA, EBOLA, influenza illness, etc. A lack of continuous funding support and other intervention measures means that human societies are stuck in a miserable cycle. When an emergency occurs, there is a knee-jerk response and emergency funding is quickly allocated to reduce the potential spread, alleviate the disease suffering, support research on the pathogenesis, and develop vaccines and drugs for the new pathogen. However, the dramatic urgency to respond to each pandemic has imposed huge costs, damaged our economies, and disrupted routine life, including study, work, business, sports, and music events.

Current problems with pandemic prevention and control

In each instance, we tend to rather quickly forget the pain caused once the disease is relieved. There is no sustained funding available for continued research into the disease pathogenesis and development of tools for diagnosis, prevention, and treatment. As a result, the number of researchers in the field quickly dwindles after the initial enthusiasm at the disease outbreak because of funding shortages, and industries are reluctant to invest in development of effective vaccines and drugs. As there is no way to accurately predict when the next pandemic will occur, such a weak business sector cannot keep profit-driven industries continuing development of drugs and vaccines. Therefore, when a new infectious pathogen emerges, or an old pathogen evolves, such as the current SARS-CoV-2, we are not well prepared in terms of vaccines and drugs.

The lesson learned from bitter past experiences is that we "dropped the ball" in related research after each of the many recent pandemics, such as SARS, EBOLA, MERS, and ZIKA, with the last two still biting us. Around 2007–2009, a series of clinical trials of vaccines against SARS showed some efficacy, although results were not convincing. The trials were abandoned because of a lack of continued funding. To avoid the sudden death of promising research towards diagnostics, vaccines, and treatments for pandemic-causing bugs, we have to do a lot more with an extraordinary, unconventional response from all levels to sustain interest and funding from all sectors, such as government, industry, and philanthropy.

We hope we have now learned enough. People did not realize that the true costs of missing this much research are huge and immeasurable, for example the rescue $2 trillion bills for the current disaster approved by the U.S. Congress in March 2020. If we had only had a tiny fraction of this funding but sustainably, we would have more weapons to combat this type of emerging disease. SARS-CoV virus is a sister to the current SARS-CoV-2, meaning some drugs for SARS-CoV have the potential to be effective for SARS-CoV-2 and have been quickly used as compassionate treatments.[1,2] However, because of the meager funding into research investment, development of many of the potential vaccines has been abandoned,[3,4] and no effective vaccines for mass protection are available. Hence, after 18 years of the outbreak (2002), we are still crying as there are no countermeasures to these horrible viruses.

Furthermore, the current and future economic damage and disruption to human life are enormous, and we all cannot travel and work. Companies are sacking employees. Even our staff who need to work on the research to combat this virus are not allowed access to the laboratories because of some viral phobias/fear or restriction/shutdown/lockdown.

Alarmingly, with trends in viral evolution, growing antibiotic resistance, social-political development, economic pattern transition, and human behavior change (much more frequent global travel, human interactions, and intercontinental economy dependence than 20 years ago), this type of pandemic is highly likely to threaten and slaughter us sooner and/or more often.

Our proposed strategies

To solve this problem, we recommend two major reformations: 1) invest heavily and continuously into development of countermeasures to control emerging pathogens that cause massive population infections, and 2) build multiple international and state-level research centers to deal with the next pandemics. International communities need to thoroughly rethink their policies and allocate sufficient funds even after the initial outbreak to continue for at least 20 years (preferably non-stopping) and sustain research on emerging pathogens and their diagnosis, prevention, and treatment to better control future infections and avoid pandemics. Large-scale infrastructure, resources, and task forces are desperately needed at state, national, and even international levels, to build many dedicated research centers to develop diagnostics, vaccines, and drugs, as well as basic research to understand the molecular and cellular pathogenesis and host–pathogen interactions.

In 2012, the National Institutes of Health (NIH) set up the Office of Emergency Care Research (OECR) to recognize the importance of emergency care. However, this office has no funding to support scientific research, and was not explicitly designed to control rapid and widely spreading infectious diseases. Through the Biodefense & Emerging Infectious Diseases Program, the National

Institute of Allergy and Infectious Diseases (NIAID) has played a vital role in supporting research involving emerging infectious diseases/pathogens in recent years; however, the level of funding and extent of intention is far less than needed to combat these new pandemic diseases effectively. For example, the annual support for coronavirus research—the brother of the current outbreak pathogen, in the USA was a meager $11 million last year, which is small compared to support for many other diseases such as cancer, heart diseases, diabetes, and even different types of infectious diseases.

We suggest that the NIAID or OECR of the U.S. NIH, the Natural Science Foundation (NSF), the NSF of China, European Union (EU), etc., establish a funding branch termed 'Sustained support for emerging infections' with multiple billion-dollar budgets yearly to continuously fund research into the emerging infections caused by viral diseases that have recently emerged, to anticipate new outbreaks. We need to vigorously encourage young and established scientists to join these research frames to strengthen efforts to combat these horrifying diseases. In addition, the government should allocate certain funds or subsidy their costs for industries that work on prevention and therapy. These approaches are recommended to all governments worldwide.

We call to unite governments, industries, private foundations and philanthropic sectors such as the Bill Melinda Foundation, Chan Zuckerberg Initiative, etc., to invest heavily in this emerging viral infection. This has to be a serious and creative input and significant investment, and requires a specific office to devote efforts to quickly develop tools and novel strategies to design and test vaccines, drugs, and diagnostic devices and kits by nurturing creative ideas and innovative technologies.

We call for governments, the World Health Organization (WHO), and the United Nations to rethink the need of a concerted effort to maximally prevent and combat infectious pandemics. We need not only research funding but also infrastructure, hospitals, containments, equipment and medical disposables. All should be prepared and manufactured rapidly to contain the colossal pandemic, including continued stocking in case an unexpected outbreak such as the present one. The preparation also requires all governments to establish universal and standard regulations to reinforce awareness and swift response mechanisms by leaders at every government level, not just the country leaders, to any potential emerging epidemic or pandemic.

When an emerging epidemic or pandemic occurs, the international communities must communicate often, interact, and take a consortium approach to tackle the shortage of prevention and treatment including beds and medical professionals, to unify to combat the disease, which would be much more useful than each country acting alone without others' support and cooperation. Simply banning airlines, distance separation, social distancing, or geographic locking down are helpful, and sometimes may be necessary, but are not the best approach and are causing a substantial economic breakdown and social disturbance.

Conclusions

In summary, the critical lesson learned from past experiences and the new pandemic infection is that we cannot continue to do the same as we have done before. Instead, we genuinely need urgent, radical, and fundamental change for preparedness for next pandemic.

Conflict of interest

None declared.

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