

# The effects of Covid 19 on the globe — discovering the development trend of biotechnology

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**Abstract.** Global development has been forced to a halt since the COVID-19 pandemic, but a few sectors, such as biotechnology, have received high attention and attracted investment as a result, leading to its rise against the wind to become the fastest-growing industry since the pandemic. This study is based on the analysis of the current situation of biotechnology-related companies, laboratories, and related industries and structures, and is supported by their influence and importance to today's society. The study found that despite the serious impact of the pandemic on world development, the structure of related industries such as biotechnology has been optimized and played a role in promoting its development due to the impact of vaccine research and development and increased investment. It can be seen from the results that people pay more and more attention to biotechnology, and at the same time, the industry chain related to biotechnology has also seized the opportunity to transform and upgrade, not only successfully maintaining growth in the current economic downturn but also laying a good foundation for its further development in the future.

**Keywords:** Biotechnology, Supply Chain, Pandemic, COVID-19, Development Trend.

## 1. Introduction

Since 2019, the COVID-19 pandemic has swept the world, resulting in 616,951,418 infections and 6530,281 deaths as of 6 October 2020. The United States is the country with the largest number of infections in the world, with more than 9,519,679 infections and 1,049,469 deaths [1]. Due to the rapid outbreak, many people lost their lives without receiving adequate medical help, while those who were not infected had to protect themselves by wearing masks and social distancing. The development of biotechnology-based COVID-19 vaccines is particularly important in this context. Vaccination can effectively protect people from severe disease, hospitalization, and death, reduce family stress, help family members safely participate in work and other social activities, and reduce hospitalization costs caused by COVID-19 infection [2]. Hence, biotechnology and its related industrial chain are particularly important in the pandemic. Biotechnology is a discipline that uses biology to solve problems and manufacture products [3]. The industrial chain involved is extremely complex, covering almost all industries, from theory to laboratory experiments, production, processing, and transportation of raw materials. Its high complexity shows its importance. Since every link from vaccine production to processing to vaccination coincides with biotechnology and its related industrial chain, the attention paid by the government and the people to vaccines has led to the development of a biotechnology industrial chain. This study analyzed and predicted the biotechnology industry chain under the pandemic, analyzed its current situation from the aspects of knowledge base construction, raw material development and reserve, scientific and technological innovation and talent introduction, international cooperation, and industrial chain construction, and made predictions for the future.

## 2. Construction of a knowledge base

COVID-19 has infected hundreds of millions of people and killed millions since it broke out in China in 2019 and spread globally. At the same time, its impact on the global supply chain is also huge. To prevent the entry of people and goods infected by the virus, many countries have imposed

entry restrictions to restrict the entry of people and goods, which leads to the interruption of the international supply chain. But because of the explosive demand for vaccines, the biotechnology sector and its supply chain have instead grown. Biotechnology refers to the use of biology to solve problems and produce useful products [3], which is represented by vaccines. In recent years, the investment of various countries in biotechnology has shown a significant growth trend, especially China, the United States, and the European Union, which are at the forefront of the world in the support of biotechnology, and the construction of related supporting supply chains. Amongst them, the construction of a knowledge base is the beginning of the development of biotechnology in each country.

Countries have shown an increasing trend in building knowledge bases during the pandemic, leading to the result that the pandemic has had a positive effect on methods such as biobanks used in scientific institutes. At the beginning of the pandemic, the speed of research on the virus was limited due to a lack of data and relevant legal support. However, in the following year, the number of people affected by the epidemic showed an explosive increase and several mutations occurred, resulting in a strong demand for researchers to set up a sample bank of the COVID-19 virus. The construction of the virus knowledge base has brought great convenience to people who study, learn and find ways to fight against the virus. In the knowledge base, we have almost all the information about the virus, from vaccines, vaccine formulations, publications, articles, and adverse reports [4]. But in the other database, there is no right covid - 19 collected enough data, and the researchers could not benefit from it, then through the autonomous learning machine, the computer automatic identification of the available scientific literature, automatic supplement the information needed for another database, through the use of advanced processing algorithm, this approach can help enterprise rapid screening of the available information database, Thus, the knowledge base can be expanded in a short time. The data can be collected in a short time to help vaccine manufacturers need information, researchers, and government officials to specify further action and provide sufficient information to support the plan, and the process of establishing a knowledge base for the establishment and perfection of the future information provide strong help in the next pandemic can react quickly, and providing researchers with adequate information and resources to save more lives.

The establishment and upgrading of a knowledge base can help researchers to study viruses at the present stage, and also plays a key role in the construction of a knowledge base in the future. The establishment and upgrading of the knowledge base are inseparable from scientific and technological innovation, especially for core technologies and personnel. COVID-19 has played a positive role in increasing the research of core technologies and the cultivation and introduction of high-end talents. Due to the investment of various countries in vaccine research and development during the pandemic, various new methods and technologies have emerged in an endless order to shorten the vaccine development cycle as much as possible, various new research methods, such as the use of animal models [5], can help experimental complete the tedious steps that require a long-term demonstration and experiment in the shortest possible time. For example, in the early stage of the emergence of many variants of COVID-19, researchers developed a large number of animal experimental models to predict and judge the infectivity and lethality of the mutated virus. When the Omicron variant appeared, animal models, especially mouse models and hamster models, helped researchers determine the high transmissibility and low lethality of Omicron in a short time [5]. At the same time, the development of animal models not only saves research time, and can obtain important results early, but also has the advantage of low cost. However, due to the limitations of the physiological structure of mice and hamsters used in the mouse model, many steps cannot be achieved, for example, it can only cause lung infection, the symptoms are incomplete, and it cannot represent mild and asymptomatic infection [5]. Hence, further development of animal models has become another goal of researchers. Now, the use of ferrets and nonhuman primates as animal models can better simulate the symptoms of Omicron and other diseases, such as direct contact and aerosol transmission routes. Owing to the high similarity between nonhuman primates and humans, almost all transmission processes and symptoms can be simulated [5]. However, due to the scarcity and high price, and other

factors, the frequency of its use is generally smaller than that of the mouse, hamster, and other animal models. The research, development, and application of such animal models are now vital means to help people achieve the goal of eliminating the pandemic. At the same time, the benefits it brings, such as reducing the number of infections, hospitalizations, and deaths, also play a positive role in helping society to reduce the negative impact caused by COVID-19 and its variants. And further, improve the existing medical and research systems to prepare for the next outbreak or the arrival of severe disease.

The integration of current research can lay a solid foundation for future research, while cooperation can achieve higher efficiency, and international cooperation can achieve its peak efficiency. The global impact of COVID-19 has also played a positive role in international cooperation in biotechnology, the construction of regional alliances, and the avoidance of political alliances from affecting global pandemic response and cooperation. At the end of 2019, the pandemic first broke out in Wuhan, Hubei, China, and then the virus was transmitted through air and aerosols, and spread to almost every country in the world, causing hundreds of millions of people to be infected. However, within a year after the outbreak of the pandemic, countries quickly organized defense forces and imposed restrictions on customs, goods, and other imports and exports of people and articles, trying to delay the spread of the pandemic. In this process, the importance of international cooperation is self-evident. Regional alliances, such as the OECD. OECD's assistance to developing countries includes but is not limited to providing vaccines, supplies, and humanitarian assistance [6]. From 2015 to 2019, the total amount of OECD aid to developing countries was concentrated between \$140 billion and \$160 billion per year, but due to disruptions in global supply chains caused by the pandemic, normal food, and medical supplies could not be delivered, since 2020, the OECD has increased material and financial support to these countries, and specifically provided funds to deal with the costs caused by covid-19, making the financial aid amount in 2020 exceed \$160 billion. Compared with the expenses of covid-19 in 2020, the expenses of COVID-19 in 2021 have increased. Additional help has also been provided for vaccines for covid-19, and the total amount of aid has also increased compared to 2020 [6]. These measures fundamentally meet the needs of developing countries, and play a role in promoting, solving, and developing the construction of regional alliances, and many problems caused by political alliances. At the same time, in the field of medicine, the cooperation, and development between biotechnology companies are increasingly close. Wuxi Biologics is a biotechnology-focused Chinese company with factories and manufacturing facilities in China, Singapore, Europe, and the United States. Its Biomanufacturing Facility located in Cranbury, New Jersey, USA has obtained a GMP license [7], which means that it provides more production capacity for clinical manufacturing businesses in the United States and the world, produces more instruments and drugs for clinical needs, and thus helps more people in need. In addition, at the present stage, Chinese companies building Biomanufacturing Facilities in the United States and meet the GMP standard, which can promote more Chinese and other countries enterprises to build facilities and factories in countries other than their own, and help countries in need to solve the employment problem and upgrade the industrial chain. At the same time, due to the considerable profits [8], it can also enable more companies to join in international cooperation, which has played a great role in encouraging and promoting international cooperation in biotechnology, the construction of regional alliances, and the avoidance of political alliances from affecting the global pandemic response and cooperation.

### 3. International cooperation

International cooperation has greatly strengthened the existing scientific research capacity, and its management and discipline through international organizations can better exert its potential and make it serve the people more effectively. COVID-19 has also played a positive role in the operation and development of international organizations, laying a solid foundation for building a community with a shared future for health. During the pandemic, adolescents, and children have a higher level of

morbidity and mortality compared with adults, which may be due to the interaction of the immune system and other diseases. What's more, since adolescents and children gather in schools, changing teaching methods and places have become an important way to prevent the spread of the pandemic in young age groups. 90% of countries adopted distance learning solutions during COVID-19-related school shutdowns [9]. To help students or poverty areas in developing countries, the United Nations educational, scientific, and cultural organization, the United Nations children's fund through various channels to help these urgently needed supplies, and humanitarian aid to women and children, to avoid being lagged because of the outbreak, which the social economy have long-term health and the negative impact of uncontrolled [9]. At the same time, the United Nations itself has extended a helping hand to countries and regions affected by covid, and has made efforts in many fields, such as mental health, human rights, education, and food security [10], and put forward what the United Nations can and must do. As "Deliver a global response that leaves no one behind, reduce our vulnerability to future pandemics, build resilience to future shocks - above all climate change, Overcome the severe and systemic inequalities exposed by the pandemic. [10] "and provide a coordinated response of sufficient scale to slow down and recover from the damage caused by the pandemic. In a video address, UN Secretary-General Antonio Guterres said that the clear role the UN should play in the fight against the pandemic is to put people and their rights first [11]. Due to the emergence of racism during the pandemic, many people in need of help cannot get enough attention. Due to the influence of racism and other factors, infected people will be treated differently and even discriminated against. This issue can lead to the collapse of an already fragile protection system. By uniting governments and organizations around the world, through advocacy and scientific reports, the United Nations is fighting racism and discrimination, and doing its best to help those affected by the pandemic receive the fairest and just treatment. As UN Secretary-General Antonio Guterres pointed out at the end of his speech, "The virus threatens everyone. Human rights uplift everyone. [11]". The COVID-19 pandemic has made people pay more attention to the development and health of people at the edge of society and has played a positive role in promoting the operation and development of the community of shared future for ship health and international organizations.

Supply chain disruptions due to the pandemic have also been addressed by promoting international collaboration among research institutions and enabling international organizations to coordinate and manage their activities. The impact of the pandemic on global supply chains was significant, resulting in supply chain disruptions. However, due to the effectiveness of the global response to the pandemic, the pandemic has had a positive impact on the supply chain. In the first two years after the outbreak of the pandemic, due to the influence of blockade and customs, the number of imported goods from China in the United States showed a cliff-like decline at the beginning of 2020, with the ratio once falling below 0 and reaching a minimum of -30%, which also led to a slump in the industrial output value of the United States at the same time, reaching -15% in mid-2020 [12]. But more policies and laws help countries, including China and the United States, import and export goods in more ways. Thus, at the end of 2020, the ratio of imported goods from China returned to above 0, and at the beginning of 2021, it experienced a large increase, returning to about 20% of that before the pandemic [12]. As can be seen from the statistics, U.S. industrial production index is influenced by the number of imported goods, and the reaction of the relative lag so we can predict that in the mid - 2021 or at the end of 2021, America's industrial production will return to normal levels, and due to the increase in imports, industrial production ratio is even higher than the past. For enterprises, supply chain disruption will have a great impact, especially in industries sensitive to population mobility, such as tourism, aviation logistics, and other enterprises. More than 90% of the 1000 surveyed enterprises have been negatively affected by the pandemic [13]. Optimistically, the supply chain affected by the pandemic will be interrupted in the short term, but the supply chain that adjusts to the new environment will instead be streamlined by removing redundant and complex structures. New structures, such as sustainable and elastic blockchain technology, as well as to the existing industry chain to diversify, agile, optimize and upgrade [13] collaboration, etc. and can help the industrial chain in the future can more quickly respond to special cases such as the outbreak, that affected by

the outbreak after the adjustment of industry chain compared with before the outbreak has greater flexibility, This fact also provides a valuable opportunity to narrow the gap between industries [14].

#### 4. Conclusion

Through research, this paper found that under the influence of the pandemic, biotechnology and other related supply chains in the case of getting more attention and funding will continue for a while, it provides a good environment for its, in the case of fading in other industries, biotechnology and its related supply chain under the influence of the pandemic have gained positive momentum. Under this opportunity, the practitioners of the industry optimized their structure, made adjustments to the structure that had previously limited their development, and combined international resources to help them expand outwards. For this kind of result, government agencies and organizations should provide more for its rapid development, but moderate regulations and more stringent specifications shall also be taken into account, any endless development will eventually backfire, only make the limitations and constraints, to make the development of biotechnology and its relevant industry chain healthier. The results of this paper predict the future development of biotechnology and affirm its future development capability, which provides a good background and theoretical support for the following development. This fact provides a new idea for other researchers, and provides a good example for other industries to plan, and help more industries to escape the decline caused by the pandemic by learning about their development process and seizing opportunities. Current research is still inadequate, such as the analysis of specific data, etc., and the recent development due to internal data is not published or publicly, this issue caused by using the non-latest data to forecast may produce a deviation and the actual situation, this paper in the future research should pay more attention to newest trends, and then make a fine forecast.

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