Some Thoughts on the Development of Biomedical Engineering Technology and industry in China

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Abstract: This paper briefly introduces the development status of domestic biomedical engineering, summarizes the current mainstream biomedical engineering technology, and analyzes the development of nanomedicine, genetic drugs and regenerative medicine. Combined with the current medical development in China, it puts forward strategies such as realizing the development of the whole industrial chain, perfecting the patent support and establishing the industrial development road combining "production, learning and research", with a view to helping the relevant units to better understand the development direction of China's biomedical engineering technology and industry, and providing references to further promote the development of this field.

Keywords: Biomedical Engineering Technology; Industrial Development; Whole Industry Chain

1. State of development of domestic biomedical engineering

The 21st century is the century of vigorous development of biotechnology and biomedicine, which are closely related to human life and widely used in the fields of food, medicine, bioenergy, biocatalysis, etc., and have become one of the most rapidly developing high-tech industries today. In order to promote the construction of a healthy China, the Central Committee of the Communist Party of China and the State Council issued the "Healthy China 2030 Planning Outline", which explicitly proposes to accelerate the development of biopharmaceuticals and the health industry, cultivate high-tech health enterprises, promote the in-depth fusion of medical and research enterprises, build up a complete health industry system, and develop large-scale, independently-innovative large enterprises with international competitive advantages, so as to make them become the pillar industries of the national economy. Pillar industries. It is expected that by 2030, the size of the health service industry will reach 16 trillion dollars, accounting for about 10% of GDP. However, at present, the proportion of complex biomedical talents required by the biomedical and health care industry is less than 10%, which poses a major limitation to the development of biomedical engineering in China[1] .

2. Overview of current mainstream biomedical engineering technologies

2.1 Nanomedicine

Nanomedicine is an important part of today's biomedical field, which originated from nano-biopharmaceuticals and has been widely used in the treatment of tumors and cardiovascular diseases. The importance of nanomedicine is becoming more and more prominent with the emergence of new nanomaterials and technologies. For example, with the help of nanomedicine technology, tiny diagnostic and therapeutic devices can be implanted in the patient's body, which will move with the blood flow and thus accurately transmit information about the disease; at the same time, nanotechnology is also able to treat ordinary drugs to reduce side effects and improve the efficacy of the drugs. Therefore, through the in-depth exploration of nanomedicine projects, the goal of multidisciplinary intersection of living organism behavior, disease pathogenesis, early diagnosis and treatment of diseases will be realized.

Although nanomedicine plays an important role in this regard, there are still some problems to be solved. At present, only a few nanoparticles can be directly applied to the clinic, and they are mainly used for tumor cell killing, and a large number of them have not been fully applied. Therefore, the relevant units should further develop medical nanoparticles that are easy to be applied clinically, durable and have therapeutic functions, or process drugs through the composite structure of nanoparticles to achieve rapid and broad-spectrum therapeutic effects. At the same time, the combination of gene therapy and nanotechnology can effectively reduce the possibility of rejection caused by gene carriers. In addition, more research is needed on whether the long-term use of nanomaterials will have a negative impact on humans.

2.2 Gene drugs

With advances in biotechnology, researchers have found that some diseases are associated with genetic defects, so that when treating diseases, single-target therapeutic drugs with high specificity and selectivity can be developed against the disease-causing genes, in order to reduce drug toxicity and improve drug efficacy. In the current situation, research on gene drugs needs to pay more attention to their selectivity, because there are differences in the genes of different regions and ethnic groups, so the same gene drugs cannot simply be applied. For example, the types of tumors that are more common in China may be different from those in the United States, and thus the need for genetic drugs is different. Generic foreign genetic drugs may lose their efficacy or even aggravate the condition due to genetic differences, so it is crucial to conduct selective research on genetic drugs[2] .

In addition to selective research, there is a need to improve the concepts and strategies for the development of genetic drugs. Over-emphasizing the target specificity of a drug may lead to the loss of normal function of the target, resulting in long-term toxic side effects. In addition, when developing a single gene drug, the lack of effective regulatory measures, including network regulation and pathway regulation, may affect the clinical efficacy of the drug. Therefore, in promoting the development of gene drugs, it is important to think deeply about existing R&D strategies and develop optimal R&D strategies based on the needs of the healthcare industry.

2.3 Regenerative medicine

Regenerative medicine is a new type of biomedicine based on cellular self-repair and regeneration, in addition to surgery and drug therapy. Important progress has been made in the fields of sweat gland regeneration, iPSCs and sub-totipotent stem cells, providing new ideas for organ replacement, tissue replacement, joint replacement, repair of soft tissues and muscles, skin transplantation and other treatments. However, the current development of regenerative medicine in China has yet to be realized. In the current development of regenerative medicine need to first solve the key issues of tissue regeneration and repair theory, such as the mechanism of tissue regeneration and repair, the role of adult and embryonic stem cells in tissue regeneration and repair induction and differentiation.

In addition, it is necessary to break through the existing tissue regeneration and repair technologies, use regenerative medicine technologies for peripheral nerves, central nerves, cardiac muscles, corneas, livers and skins for clinical applications, and establish stem cell databases to effectively protect and verify the regenerative functions of stem cells. This will provide the theoretical basis and technical support for the treatment of difficult-to-treat diseases in the clinic and promote the application process of regenerative medicine. In addition endogenous regeneration technology utilizes biomaterials similar to the grid structure of the human body, which can be quickly identified and effectively connected with body tissues, thus realizing simultaneous tissue regeneration and material degradation, which is expected to bring important breakthroughs and progress in the field of regenerative medicine.

3. Biomedical industry development path analysis

3.1 Realization of the development of the whole industrial chain of the biomedical engineering industry

Realizing the development of the whole industrial chain of the biomedical engineering industry is an important goal for the development of China's biomedical field. To realize the development of the whole industry chain, it is first necessary to strengthen scientific research and innovation and promote technological breakthroughs. Through continuous investment and support, promote the integration of basic research and applied research, and cultivate more excellent research teams and talents. At the same time, enterprises are encouraged to increase R&D investment, strengthen technological innovation, promote the transformation and application of technological achievements, and build a perfect biomedical engineering industry chain. From basic research to applied research, to technology development and product manufacturing, it is necessary to form a complete industrial chain and realize the layout of the whole chain from upstream to downstream.

3.2 Encouraging the establishment of an industrial development path combining "production, learning and research"

Encouraging the establishment of an industrial development path combining "industry, academia and research" can promote in-depth cooperation and synergistic innovation among industries, institutions of higher learning and scientific research institutes, realize the complementary advantages of resources, promote the transformation of scientific and technological achievements into market-competitive actual products, and promote industrial upgrading and innovation. At the same time, enterprises can sign cooperation agreements with institutions of higher learning and scientific research institutions to establish joint R&D teams to jointly carry out scientific and technological research and technology development. At the same time, enterprises can also cooperate with colleges and universities and scientific research institutions to cultivate composite talents and establish an integrated talent training system of industry, academia and research[3] . At the same time, they can also actively introduce excellent scientific research talents and technical experts to inject new vitality and power for industrial development.

3.3 Strengthening patent management in the biomedical industry and protecting the interests of relevant researchers

Through patent protection, researchers can legally authorize and license their achievements and thus receive reasonable remuneration. On the one hand, this protects the researchers' rights and interests in innovation and enhances their motivation to innovate; on the other hand, this prevents others from using others' patents without authorization and protects a level playing field in the biomedical industry. Meanwhile, under the environment of patent protection, enterprises can also be more assured of investing a lot of money and resources in research and development, and since their research and development results will not be easily copied by others, they will participate more actively in the development of the biomedical industry, leading to the rapid growth of the industry.

Conclusion

In the wave of rapid development of global science and technology, biomedical engineering in China has made remarkable achievements, showing great potential and competitive advantages. However, we should also recognize that while technological breakthroughs have been made, there are also many important issues such as ethics and safety. Therefore, in the future development of biomedical engineering technology, the relevant research and development units still need to be cautious, and adhere to the concept of openness and cooperation, with international standards, and absorb the advanced experience, in order to realize the sustainable development of China's biomedical engineering technology and industry.

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