

Development Predicament and Countermeasures of Anti-tumor Biosimilar Industry in China

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Abstract: Biosimilar has the advantages of precise efficacy, high safety and stable quality, and occupy an important position in the field of anti-tumor therapy. In order to reduce the expenditure of drugs, the research and development of biosimilar drugs has attracted much attention. Compared with European and American countries in the development of the anti-tumor biosimilar industry, there are still some shortcomings and parts that need improvement in China. According to the current development status of China, analyzed the reasons for the development dilemma of my country's anti-tumor biosimilar industry, and put forward suggestions for the development of this industry.

Keywords: Biosimilar; Anti-tumor; Industry; Development; Countermeasure

1. Development overview

With the gradual expiration of patent protection of biosimilar drugs, the expansion of domestic market demand and the development of research and evolution technology, the improvement of biosimilar drugs has become a hot spot for medical institutions, companies and cancer patients. In recent years, due to the accurate efficacy of biosimilar, it has played an important role in the field of tumor treatment. In the field of tumor treatment, the research and development of monoclonal antibody biosimilar drugs is in full swing, which is expected to optimize clinical decision-making and patient treatment options in the future^[1]. Currently, biopharmaceuticals are still doing follow-up and imitation research in China, and will occupy a leading position in the market for a long time in the future^[2]. Especially in low- and middle-income countries, biosimilars have gradual-

ly become the main method of anti-malignant drug over-priced^[3].

2. Existing difficulties

2.1 Technical problems of production equipment

For biosimilars to be “highly similar” to proved biotech drugs, developers must not only use the most advanced technology to demonstrate that their products are produced with consistent quality standards, but they must also be sufficiently similar to reference drugs. This not only places higher requirements on the professional competence of researchers, but also has corresponding requirements on the advanced nature of production equipment and the ability to operate equipment. Although many biosimilar companies in my country have introduced a large number of production lines

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with advanced technology in order to improve the efficiency and quality of biosimilars, some companies have not established modern operation and management models, and only position biopharmaceuticals as machinery for products. Processing, resulting in increased equipment failure problems. Therefore, technical personnel who understand and use advanced production equipment are needed to assist.

2.2 Brand awareness issues

Because according to the Pharmaceutical Advertising Management Law some drugs cannot be advertised in mass media other than professional journals. Except for professionals and those who often pay attention to this aspect, they know a little more lar brands, and others don't know much about biosimilar brands. Due to the limited channels for obtaining relevant news, some people do not know how to get the latest news. There are also patients who pay less attention to the brand. For example, one of the anti-tumor biosimilar drugs approved for marketing in China is bevacizumab. There are three types of bevacizumab, which are under the three manufacturers of Beta Pharmaceuticals, Bio-Thera and Innovent Biologics. The patient may know that I want to use bevacizumab, but it is not clear which manufacturer it is.

2.3 Reference listed drug selection problem

We lack a comprehensive database. At present, there are 3 kinds of orange books that are most widely used in the world. They are the orange books promulgated by the WHO, the US (FDA) and the JPN (PMDA). The Orange Book of various countries has clear regulations on reference listed drug and has established a detailed catalog of reference listed drug. In order to better promote the research and development of biosimilars in my country, the former China Food and Drug Administration (CFDA) issued the Guiding Principles for the Development and Evaluation of Biosimilar Drugs (Trial) in March 2015^[4]. In order to standardize the reference listed drug and other indicators of generic drugs, my country will officially release the China Listed Drug Catalogue similar to the Orange Book database on December 29, 2017. Compared with the establishment of databases in other countries, the consistency evaluation system is still in the process of development and growth.

2.4 The problem of industrial clusters

As a typical high-tech industry, biopharmaceuticals have their own distinctive industrial characteristics. Biopharmaceutical industry has a long industrial chain, each node requires professional technology to be realized. The closeness of each link of this industry is higher than that of other traditional industries and even some high-tech industries^[5]. In 2016–2020 China's biomedical industry cluster development model in-depth analysis and development strategy research report, it issued that my country has initially formed a fast-growing industrial cluster with the Yangtze River Delta and Bohai Rim as the core, and the Pearl River Delta, northeast and other eastern regions. However, the problem of regional unbalanced development has also been further revealed. For research and development, there is a trend of further gathering in Shanghai and Beijing, and accelerating the gathering of manufacturing links in Jiangsu and Shandong. Although the overall growth of my country's biopharmaceutical companies is relatively fast, these companies have problems such as small scale, weak anti-risk ability, weak research and development capabilities, and single varieties. Most of the same varieties have multiple manufacturers, leading to serious homogeneity competition. For example, some new biomedical companies such as Da An Gene and Ke Hua Biology focus on the fields of gene kits and blood products, which makes the degree of diversification low. Due to the short history of my country's industrial cluster construction, there are still shortcomings such as imperfect industrial chain layout and blind construction.

2.5 Talent construction issues

China has fewer high-level talents in the field of biotechnology drugs. The backwardness of talents will lead to backward research and development and products, backward marketing management, etc., which will make the domestic pharmaceutical industry completely backward. This is because the cultivation of biopharmaceutical talents in my country ranges from junior college to doctor, with a huge vertical span. Although it seems that there are a large number of people studying biopharmaceuticals, due to various reasons such as employment situation, job demand and so on, and when they arrive at a master's degree or doctor degree, their majors are more refined, which will make the few num-

ber of people who will eventually study anti-tumor biosimilar. Compared with European and American countries, China's education level still has some differences, such as the backwardness of teaching data and the scarcity of professional equipment. There is also a lack of relevant talents engaged in basic research and development talents.

3. Counterplan

3.1 Establish a talent introduction system

The development of the industry is inseparable from the training and introduction of professional talents. Senior professionals are the driving force for the development of the anti-tumor biosimilar industry. Under the situation of industrial development, focus on the construction of professional teams and strengthen the standardization and institutionalization of talent introduction. Second, build a carrier that is conducive to the growth of talents, such as the establishment of new technology training bases, and the construction of related scientific research workstations to provide a strong growth environment for the development of professional talents. Furthermore, China's talent development environment is weaker than European and American countries. Therefore, the country and the governments must implement the talent introduction policy and improve the legal system that respects knowledge achievements and knowledge technology. Attract more high-quality, highly sophisticated talents to stay in China.

3.2 Technological innovation

A complete and advanced technology in anti-tumor biosimilars is inseparable from academic research and accumulation. China's research results in this area are still relatively lacking. The country can arrange for professional and senior talents to go to technologically powerful countries to exchange and study, broaden our knowledge reserves, and improve my country's technological level and innovation capabilities. It also needs to strengthen technologies such as large-scale and high-throughput gene cloning and protein expression, antibody humanization and human antibody preparation, new vaccine adjuvants, large-scale cell culture and protein purification. Innovate in key paths such as biological activity, impurity control, stability, toxic and side effects

control, evaluation methods, and clinical research to develop high-precision biosimilar.

3.3 Enhance cognitive level

At present, all anti-tumor biosimilars that have been marketed in China are monoclonal antibody biosimilars. However, the clinical data of biosimilars before the market is limited, and some potential rare or serious safety problems have not been fully exposed. The differences in immunogenic responses of populations with different indications may bring potential safety hazards to patients with biosimilar indications^[6]. Therefore, for companies, keep abreast of the latest developments and get cutting-edge news in time to improve their core competitiveness. For personnel in the medical industry, participate in more relevant training to improve their awareness. As far as patients and their families are concerned, they usually pay more attention to anti-tumor biosimilar-related news in case of unexpected needs.

3.4 Improve quality standards

With the introduction of standards for biosimilar, the current domestic production standards for anti-tumor biosimilar are mainly based on the Chinese Pharmacopoeia (2015 Edition). Most companies aim to meet the pharmacopoeial quality requirements, and rarely can in-depth quality analysis. For instance, the purity of the product, the immunogenicity of recombinant human growth hormone and insulin, plenty of creatures believe that it has a great relationship with the impurities in the drug. Recombinant human interferon is easier to polymerize under certain conditions, and the polymerized polymers can produce a more powerful immune response, which can directly illustrate the important connection between active products and impurities^[7]. Therefore, my country needs to make further improvements under the current quality standards, which is very necessary.

3.5 Strengthen inter-regional communication

The technical strength, equipment production conditions, and information channels possessed by an enterprise are limited. If there is more communication and cooperation between enterprises and between regions and regions, the effective sharing of resources can be realized, and joint efforts will be made to promote the

progress of China anti-tumor biosimilar and technology, and accelerate the improvement of product quality in this industry. Furthermore, the government can strengthen the relationship between the government and introduce relevant development plans based on economic and policy factors in various regions to jointly guide the development of the industry.

4. Conclusion

Anti-tumor biosimilars have the advantages of definite curative effect, high safety and stable quality, and its wide clinical application is an inevitable trend. Due to the impact of the patent protection of biosimilars, there are not many companies that develop biosimilars, and technical exchanges in this area are relatively lacking, and it is difficult to form specific mature technical standards. This article analyzes some of the problems of anti-tumor biosimilars in China, and finally puts forward some countermeasures from the five perspectives of establishing a talent introduction system, technological innovation, enhancing cognition, improving quality standards, and enhancing inter-regional communication. Provide assistance in the development and implementation of biosimilars. I hope that one day in the future, anti-tumor biosimilars can benefit cancer patients and im-

prove their quality of life.

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