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Application Risk Supervision Mechanism of Gene Editing Technology

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Abstract: *The emergence and application of gene editing technology is one of the important symbols of human social progress, which also means that human beings can gradually treat diseases, eliminate poverty and prolong life by changing genes. However, the application of gold editing technology is in the exploratory stage. In this stage, if we can not establish a sound legislative model and relevant laws and regulations, it will inevitably lead to a series of risks. Therefore, from the perspective of the current application and development of gene editing technology in China, combined with China's basic national conditions, this paper discusses the application risk of gene editing technology in detail, and then puts forward its own views and suggestions on the construction of risk management mechanism of gene editing technology.*

Keywords: *Gene editing technology; Genetic engineering; Risk supervision; Ethics*

1. Introduction

At present, with the rapid development of science and technology, people have more understanding of life. At the same time, in the process of exploring the essence of life, people begin to understand the concept of gene, and put forward a new generation of gene editing technology. There is no doubt that the emergence and application of a new generation of gene editing technology makes it possible to locate and modify genes. Moreover, with the application and development of the new generation of gene editing technology in many fields, such as agriculture, medical treatment and environment, a series of problems, especially moral and ethical problems, have been exposed. There is no doubt that the application and development of the new generation of gene editing technology is accompanied by uncertainty, which also leads to a series of unknown risks in the related gene editing work. Compared with western developed countries, China is still in the exploratory stage for the new generation of gene editing technology, and China's existing laws and regulations are not enough to support China's further development and application of gene editing technology. Therefore, starting from the application and development of gene editing technology in China, combined with China's current basic national conditions and China's existing laws and regulations, this paper puts forward the application risk management mechanism of gene editing technology in China from the perspective of ethics and law.

2. Gene Editing Technology

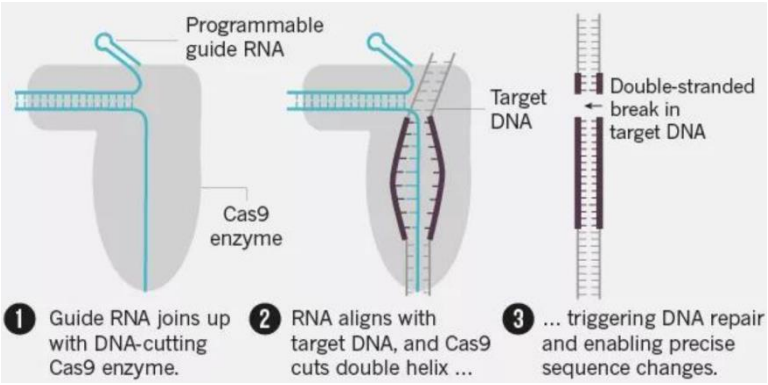

Fig. 1 Three steps of gene editing

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Gene editing technology, also known as genome editing technology, is also known as genome engineering technology. In essence, editing technology is an emerging technology that can accurately modify specific target genes in the organism genome [1]. Fig. 1 demonstrates in detail the three steps of gene editing.

The new generation of gene editing technology can efficiently and accurately locate the target genes that need to be modified. It shows great potential in human gene research, human gene therapy, human genetic improvement and so on [2]. However, in the application of gene editing technology, it is inevitable to talk about relevant moral and ethical issues, which also makes it necessary to build a sound application supervision mechanism of human gene editing technology. Fig.2 illustrates two main methods of gene editing technology

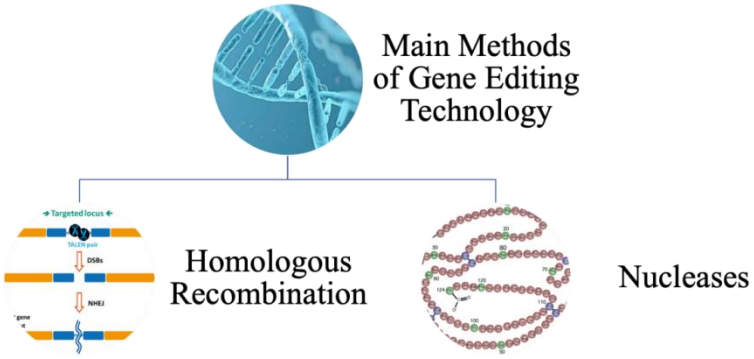

Fig. 2 Two main methods of gene editing technology

3. Application Risk and Benefit Demand of Gene Editing Technology

3.1 Potential Risks

From the perspective of application risk, gene editing technology has three potential risks. Firstly, the application of gene editing technology is still in the exploratory stage, so the application of gene editing technology is likely to lead to changes in additional gene fragments that do not need to be modified. This is the off target effect in bio-medical field, which will threaten human life and health. Secondly, human beings are still in the stage of exploring the genetic mechanism, and now the genetic material is very complex, which makes the application of gene editing technology bring some unknown risks [3]. Finally, from the perspective of ecosystem, the application of gene editing technology is likely to affect other species and threaten the stability of ecosystem. Fig. 3 illustrates three gene editing systems applied to mammals.

Fig. 3 Three gene editing systems applied to mammals

In short, the use of gene editing technology has uncertainty risks not only in the technical level, but also in biology, individuals, ecosystems and human ethics, and these uncertainty risks will bring irreparable serious consequences to the whole human living environment and human individuals.

3.2 Interest Demands

There is no doubt that the interest needs of gene editing technology promote the further development of gene editing technology, which is also the reason for its rapid development in clinical application and crop breeding. Since the first gene editing baby incident, gene editing technology has been questioned and concerned by all walks of life. At the same time, gene editing technology has also been introduced

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into the process of giving birth. Even at present, editing technology has been introduced into the treatment of diseases, especially some chronic diseases. There is no doubt that for human society, gene editing technology is a double-edged sword. This technology can change human genes in a low-cost way, so as to improve human survival level, make human not easy to get sick and obtain a longer life [4]. This is also the most important and core benefit that gene editing technology can bring to human beings in the application process. Fig. 4 illustrates the relationship between human diseases and genes, and points out that more than 37000 diseases are related to gene mutations.

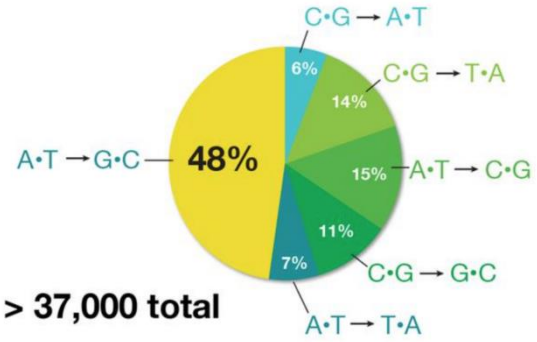

Fig. 4 Human diseases and genes

4. The Discussion in the Application of Gene Editing Technology and the Construction of Risk Supervision Mechanism in China from the Perspective of Law

4.1 Establishment of A Product-oriented Legislative Model

At present, gene editing technology is in a vigorous development stage. With the development and application of gene editing technology, the previously used technology-oriented legislative model has been difficult to apply to the current regulatory needs of biotechnology products. In other words, the traditional technology-oriented legislative model has exposed its limitations. If we continue to use this legislative model, it will hinder the healthy development of biotechnology industry [5].

According to China's national conditions, this paper believes that China should change the existing technology-oriented legislative model, and adopt a new product-oriented legislative model according to the current development of biotechnology and the regulatory needs of biotechnology products. This new legislative model can not only effectively ensure bio-safety, but also give full play to the due evaluation and educational role of China's law.

4.2 Formulation of Comprehensive Special Legislation on Biotechnology

At the same time, starting from the characteristics of the application risk of gene biotechnology and combined with the application interest appeal of gene biotechnology, this paper believes that China's law should comprehensively evaluate, optimize and adjust the possible risks of relevant gene biotechnology products and services.

The essence of the so-called risk governance mechanism is to reasonably and scientifically coordinate and distribute the interest demands of different subjects. In other words, in the application process of gene editing technology, our government should comprehensively consider and scientifically govern according to the interests of relevant stakeholders involved in the application process of gene editing technology. This paper holds that under such premise, it is an efficient and convenient way for China to formulate and launch comprehensive laws, regulations and legislative models specially serving the application of gene editing technology, which is also in line with the current international provisions on the risk supervision of modern gene editing technology.

In the process of application, gene editing technology involves many stakeholders, including civil law, public law and social law, and it also includes national interests, collective interests, social interests and personal interests [6]. Therefore, if we want to coordinate and distribute the interests of the stakeholders involved in gene editing technology scientifically and correctly, China must determine and

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launch a comprehensive and systematic special legislative model and relevant laws and regulations of gene editing technology. This paper holds that, in view of the fact that the application of gene editing technology is still in its infancy, the relevant legislation and laws and regulations of gene editing technology should mainly include two aspects: the utilization and protection of personal gene information and the use safety of biological genes.

4.3 Advancement of the Scientific Risk Prevention System

While constructing the application risk prevention system and risk supervision system of gene editing technology, we must follow the scientific principle. In other words, the application process of gene editing technology should adhere to science as the core. Only by taking the scientific guiding ideology as the core to carry out gene editing, can we carry out gene editing scientifically and reasonably, effectively identify and evaluate potential risks, and then prevent potential risks.

Therefore, the risk prevention system of gene editing technology must respect the scientific principle, otherwise the system will lose its original significance, lose its relevant social role, and may even lead to a series of adverse consequences.

4.4 Construction of Ethical Review System

From the perspective of law, ethical review does not threaten human health, human social welfare, people's self-esteem and citizens' personal privacy. In the application of gene editing technology, gene editing baby events, eugenic human events and so on all touch the bottom line of human ethics. Similarly, the application of gene editing technology in the treatment of genetic diseases also has the risk of touching the bottom line of human ethics.

At present, China has not yet established an ethical review system dedicated to the application of gene editing technology. However, the development and application of gene editing technology and its possible risks all illustrate the necessity and importance of building a sound ethical review system.

Building a sound ethical review system is of great significance for the application of gene editing technology, which is mainly reflected in the people-oriented legal attribute, so as to effectively ensure that the application of gene editing technology in human individual gene therapy and gene improvement can be carried out smoothly and safely [7].

4.5 Improvement of the Biotechnology Supervision System

At present, since the first application of gene editing technology in China, China has attached great importance to the application and development of gene editing technology. However, it is worth noting that for the application of gene editing technology, China pays more attention to the supervision of bio-safety, and ignores the problem of bio-ethical review to a certain extent, which gradually exposes a series of problems in the application and development of gene editing technology.

According to the application and development needs of gene editing technology, China should build a sound biotechnology supervision system, which should be jointly supervised by the heads of agricultural departments, science and technology departments, environmental protection departments, health and Family Planning Commission, commerce and trade departments and so on.

4.6 Enhancement of Relevant Procedural Rights

In the application of gene editing technology, if we want to minimize or even avoid potential risks, we should strengthen the relevant procedural rights.

Specifically, in the process of the application and development of gene editing technology, the purpose of strengthening procedural rights is to coordinate the actions of various departments through the scientific and correct setting of relevant procedural rules, so as to ensure the consistency of basic standards and basic ideas of gene editing, so as to effectively reduce a series of social risks caused by the public's personal behavior preferences, Especially moral and ethical risks.

5. Conclusion

The emergence and application of gene editing technology has successfully cured the world's first

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infant leukemia patient, which has attracted the attention of people all over the world. At the same time, gene editing technology is different from traditional gene engineering technology. It has high efficiency, controllability and accuracy, and the investment cost of gene editing technology is low, which also makes gene editing technology applied to the field of gene therapy and bio-pharmaceutical as soon as it appears, and has achieved good application results in these fields.

To sum up, with the application and development of human gene editing technology, it has not only brought great convenience to mankind, but also made great contributions to prolonging human life, treating diseases and eradicating poverty, but also caused a series of moral and ethical problems. This paper holds that gene editing technology is a double-edged sword. We should treat it in two and establish a sound risk supervision mechanism, so that the technology can effectively and scientifically serve the progress and development of human society.

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