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A Study on the Ethical Risks of "Designer Babies" and the Path to Dissolve

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Abstract

CRISPR (gene-editing technology) is widely applied into food, targeted medical treatment, biodiversity, environmental protection and other fields.It is like a double-edged sword, bringing technological dividends and technology-spillover effects to human beings. While at the same time, there are great ethical risks for the safety risks of "designer babies" itself, the conflicts between technical value and rational value, the lack of legal norms, and the alienation of individual needs. This paper provides some theoretical explanation, analyzes reasons of problems existing on "designer babies" from the perspective of bioethics theory, and puts forward some proposals and countermeasures for eliminating ethical risks, such as the aspects of four principles of bioethics(principles of benefits, no injury, respect and justice), lawful supervision, research results transparency and ethical responsibility of consciousness.

Keywords

CRISPR (gene-editing technology); "designer babies"; ethical risk.

1. Introduction

CRISPR (the gene-editing technology) is a technique-editing behavior of knockout, insertion and site-directed mutagenesis on the genetic DNA of the biological genome, aiming to carry out targeted modification on the gene sequenceand realize the cure for some of the hereditary diseases by the correction of the biological gene DNA sequence.

In recent years, CRISPR (the gene-editing technology) has been widely used in food, targeted medical treatment, biodiversity, environmental protection and other fields (such as the treatment of thalassemia, cancer, AIDS, etc.). This technology is like a double-edged sword, which brings technological dividends and technology-spillover effects to human beings. Meanwhile, there are also great biologicaland social-ethical risks for the safety risks of "designer babies" itself, the conflicts between technical value and rational value, the lack of lawful norms, and the alienation of individual needs. Once the technology is misused or abused in life science field, the whole society will be exposed to a great risk gap, especially for thesafety and integrityof the living body. Therefore, it is necessary to guide and regulate this technology.

2. Review of the Case of "Designer Babies"

2.1. The Case of "Designer Babies"

Professor He Jiankui of South University of Science and Technology of China (SUSTC) made a stirring speech on Nov. 26, 2018—the world's first twin babies who are immune to AIDS were born in China. He used CRISPR/Cas9 gene editing technology to have an operation that removed the gene CCR5 from the embryo, and inserted the edited embryo into the mother body, successfully giving birth to a pair of baby twins through gene editing, Nana and Lulu. This news immediately aroused domestic and foreign public questions and criticisms from medical field,

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ethical circle, sociological circle and government departments. Due to the lack of relevant laws and regulations its application on human embryos both at home and abroad, there is lack of legal justifications to immunize specific diseases through this tech, which challenges traditional conceptions and ways of pregnancy.

2.2. Medical Values of CRISPR(Gene Editing Technology)

CRISPR/Cas9(gene editing technology), with high accuracy, low off-target rate, simple technical requirements, easy operation and low cost, has been experimented on the body of animals and plants so many times that it can change the genes of them successfully. After learning the great benefits of CRISPR/Cas9 technology, scientists intend to change humans' gene through it, which is a good starting point in this respect. For the benefits of human beings, gene editing technology, therefore, has its medical values.

2.2.1. Cure Intractable Diseases

In recent years, gene editing technology has made great progress. If this technology can be applied to clinical treatment successfully, it is very likely to cure complicated diseases that can not be cured by now (such as cancer, AIDS, thalassemia, etc.) by modifying somatic cells or individual genes. This study has found new approaches and methods to the treatment of these diseases, which brought new hope to patients with terminal illnesses.

2.2.2. Take Precautions Against Hereditary Diseases

Gene editing technology is essential to prevent hereditary diseases. Many hereditary diseases are caused by a single genetic mutation, for which the gene editing on human embryo is to make the next generation no longer carry the pathogenic gene that causes hereditary diseases by modifying the mutated gene in embryo or germ cell. This technology is very helpful for human health. For example, parents with AIDS or other intense infectious diseases can make their child born with these diseases they are suffering through the gene editing technology of human embryo.

2.2.3. Strengthen Individuals

Gene editing is also a technique aiming to "strengthen" the modification of human physical features, physiological functions, mental capabilities and even cognitive abilities. That is to say, it can change children's skin, hair or pupil color, and to a certain extent, it can improve their height, enhance their strength, raise their levels of IQ, enhance the immunity, etc. At present, there is no such practical research on these fields of gene editing technology. However, if the researches can be applied to human beings in the future, human beings will be able to realize "designer babies", and parents can insert their desired genes to "manufacture" one perfect children as what they want.

3. The Ethical Risks of "Designer Babies"

3.1. The Challenge to the Dignity of Life

Gene editing technology is closely related to both human and animal life, but it also has been experimented on innumerable corpses of minute lives, which is contrary to the idea that human beings should respect animals' rights and live with them in peace.

First of all, it does not conform to the respect for life. Although human beings are considered to be higher creatures, their embryos or germ cells will eventually be used to do experiments for the final success. Embryos may also grow up to be a person, but with the failure of experiments, those embryos being tested will become a minute life as well. One failure of experiment represents one disappearance of one life of a small baby in the future. Nowadays, although we emphasize that animals should be protected and life should be respected, experiments must be carried out if gene editing technology is seeking to develop. However, no one feels pity for the

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lives lost in these experiments, not only to mention animals, but a piece of life that continuously lost as human embryos, which greatly challenges the dignity and integrity of life. From the view of protection of animals or reverence of life, the topic that whether the animal experiment should be carried out is worthy of our deep consideration.

Secondly, gene editing technology, which changes some genes in embryo, makes the natural development and growth process of human so "technicalized" that it also interferes with the natural growth of life.

Moreover, human is in the step-by-step evolution from the monkey to the anthropoid, and from the anthropoid to what we look like today. Gene editing technology is expected to "strengthen" the human, which changes the physical characteristics and functions of human's body, changes the way of human's evolution, and impels human to a higher-level life evolution that full of technology. If gene editing develops as a common technology to "strengthen" some certain aspects with certain price standards of each "enhancement" item in the future, this technology will be submerged in the ocean of money, making life loses its nature.

3.2. The Lack of Rights of Self-decision

If gene editing technology used to "strengthen" human beings in the future, parents will edit embryonic genes according to their needs and preferences without the consent of the next generation, so that their children will be born innately "perfect human". However, what is "perfect"? Can life be close to perfection by strengthening people's psychological or physical functions? Can human beings edited by the gene still be the original human themselves? Since ancient times, life has existed and evolved in a natural way. The original intention of scientists to use gene editing technology is to avoid difficult diseases (including family genetic diseases) of the next generation, while to "strengthen" human beings is the result of human's rapacity. When the next generation is still in the embryonic state, they has been changed their genes as the parents' will, which is completely violate the autonomy of the next generation. How should the parents who have "designer babies" according to their needs and preferences do when facing the dilemma that the child is unsatisfied with the settings his parents chose after birth, and complains why he is not given the right to choose? For example, parents want their child to become sportsman, so they strengthen the child's motor nerves for power of arms through genetic editing; however,if the child finds that he does not want to be a sportsman or cannot be a sportsman after born and growing up, the parents' original intention of gene editing technology using will be useless. The child's autonomy is in the hands of parents and scientists without the permission and choice of the child, which is a serious violation of bioethics.

3.3. The Leakage of Genetic Privacy Information

Nowadays, with the leapfrog development of network technology, the profession of "hacker" has emerged as well. Whether it is broadcast media, news media or all kinds of application software, all need our mobile phone number to register and bind, and some software even needs our ID card, bank cards and other private information. Our personal privacy has become so "transparent" that we often receive advertising messages and fraudulent calls, and our social software accounts such as QQ, WeChat are even stolen directly. Gene editing technology development needs a large number of experiments, in which the gene used comes from ordinary volunteers. This technology cannot develop faster without information sharing, for which it may cause invasions of privacy of voluntary participants in experiments. The future that gene editing technology begins to be used can also mean that genetic information will be "transparent" when individuals can be found out on the Internet whether they have been edited with genes or not. If genetic information can be found in public, for example, in a competitive employment, the interviewers edited by gene editing technology brush off non-edited interviewees, which will lead to a social injustice. If gene information is stolen and used by other people with ulterior motives, there will be not only a violation of the individual's privacy, but

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also a threat to one's life safety. Once the genetic information of our country is stolen by other countries for other purposes, it is also a threat to national security.

3.4. Aggravation of Social Injustice

With the rapid development of gene editing technology, it will aggravate the current situation of social injustice.

First, the application of gene editing to the treatment of diseases will exacerbate social injustice. Gene editing technology is the most advanced technology for the treatment of disease at present and even in the future, and the price of treatment will be expensive if this technology is used for clinical treatment in the future. The ordinary families cannot afford to this expensive cost, while the rich and the authoritative can make their children no longer suffer from certain diseases through this technology, which will make the social inequality deeply entrenched.

Secondly, one important function of gene editing technology is to "strengthen" human beings. If the rich and high-status people change their children's genes through genetic editing techniques for making their children win from the starting point in an embryonic state, it will be unfair for families without ability to change their children's genes. If the "strengthened" children may look down on those children who are not "strengthened" in the school, there will form two groups divided as "reformed" and "unreformed" in the school, which will lead to discrimination and inequality in schools. If the function of "strengthening" human is realized in the future, inequality of wealth, power, status and so on will increase in society. The inequality of the gene will also increase; and thus, quality of gene will become a major factor in the division of social class, which will aggravate the inequity of the society. No country wants to foresee that.

4. The Causes of Ethical Risks in "Designer Babies"

4.1. The Risks of Security of "Design a Baby" Itself

Although the CRISPR/ Cas9 technology has more advantages than the ZFN technology and the TALENs technology, it also exists disadvantages more or less. The universal development of gene editing technology in many fields has brought more possibilities for the development of human embryonic gene editing. Once the gene editing technology is applied in human embryo, it will be unchangeable for a whole life, in which the uncertainty of the technology will bring immeasurable risks to our posterity. Although tumors, AIDS, various genetic diseases and cancers can be cured by gene editing technology and finally conquered by medical science in the future, gene editing technology must face doubts about the safety of the technology itself, such as "de-targeting" phenomenons, errors in gene editing, and unpredictable potential risks, etc. Gene editing is one of the most advanced techniques in the field of biomedical science, but its "side effect" is unknown. Once a security risk occurs, the consequences are unpredictable.

4.2. The Conflicts between Technical Rationality and Value Rationality

Nowadays, more and more attention is paid to the development of technology. Gene editing technology is the most advanced technology for human life and health in the biomedical sciencesfield, and it has the enormous medical value of treating difficult diseases, blocking genetic diseases and "designing" human beings; thus the level of demands for gene editing technology will be higher and higher. CRISPR/Cas9 technology is cheap, simple, easy to operate with high efficiency, and it is more convenient for the study of gene editing technology, thus, many scholars and experts use CRISPR/Cas9 technology for gene editing of human embryos. As more and more researches and applications of "designer babies" occur in the future, the conflicts between technical rationality and value rationality will become more and more prominent. Gene editing is a technology discovered for humans no longer suffering from certain diseases. However, with the wide application, and even to the extent of abuse, of the future technology , it will generate serious ethical risks. Now, most family is child-oriented, so

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all their thoughts are focused on the child and his future. Their expectations for the future of the child is higher and higher, with the hope that their children will have been successful and perfect. If gene editing technology can "optimize" humans in the future, it will provide parents a “shortcut”: genetic editing technology enables their children to be more excellent than others before birth for wining from the starting line. Although such a "shortcut" can meet the expectations and requirements of parents, the deviation of values caused by the growing desires and demands of parents may even cause their relying on genetic editing for their child instead of educating their child on their own, which will aggravate the conflicts between technical rationality and value rationality.

4.3. The Lack of Strict Laws and Regulations

The leakage of personal privacy information has become a normality in today's society, and many people receive fraudulent messages, sales calls and other different forms of harassment. Some people have a strong sense of precaution and are not easily to be tricked out of his money, while the old and the young with poor ability to distinguish may be easily tricked. We have to worry about the leakage of our gene information one day in the future of universal research and clinical application of gene editing technology, which is caused by the lack of legal norms. Gene editing technology is still an advanced technology for human beings, so all kinds of legal provisions have not been promulgated correspondingly. In the future, unsound laws and regulations will also lead to the leakage of genetic information running rampantly like the leakage of our names, telephone numbers, and even ID numbers doing now. Now the phenomenon of our personal privacy information leakage is becoming more and more serious due to the absence of strict legal provisions. Everyone will become "transparent” for laws and regulations are still not strictly regulated. If genetic information continues to be leaked and used by lawbreakers in the future, the consequences will be unimaginable. Therefore, it is necessary to establish laws and regulations related to genetic privacy information.

4.4. Alienation of Individual Needs

With the development and progress of society and the improvement of people's living standards, people pursue a better life. Individual needs and their expectations for the next generation are expanding. People usually place their unfinished wishes or the rest of their lives on their child. The emergence of gene-editing technology provides a “shortcut” for parents who are eager for their child to succeed. One of the great medical values of gene-editing technology is “to design perfect humans”, which has alienated individual needs. If this technology is widely used in the future because of the expanding needs of individuals, it will challenge the authority of life and aggravate social injustice. The “strengthened” generation is more excellent than other unedited children from birth, so under the universal psychology of comparisons that no one wants their child to be worse than other children, people will choose the technology to edit their child’s gene instead of educating him on their ow. People also have psychology of conformity in communities, thus whether they understand the benefits and risks of the technology or not, they will start to try gene editing one after another, blindly following the shortcut to make their children more excellent.

5. The Path to Eliminate Ethical Risiks in “Designer Babies”

5.1. Strictly Follow the Four Principles of Bioethics (Principles of Good, No Injury, Respect and Justice).

Gene editing is a technology used by human beings to treat difficult diseases and prevent genetic diseases, and with the deeper research, experts have found that it can also be used to "strengthen" human beings. If we do not strictly follow the four principles of bioethics (principles of benefits, no injury, respect and justice), there will be unpredictable consequences.

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First, the researchers must follow the principle of benefits based on the original intention to benefit the human, keeping the mission in mind firmly. It is the basic ethical bottom line not to do something harmful to mental or physical integrity of human. Secondly, respect and revere for nature. Experts and parents should respect for the rights of the next generation to make decision independently instead of making decisions dictatorially for their child. Thirdly, we should follow the principle of justice. The research results of gene editing technology belong to all mankind, so there should be no discrimination among the treatment of patients with different skin colors, races, statuses, wealth and so on. Finally, we should follow the principle of mutual assistance. Countries should have a sense of mutual assistance and cooperate fully in order to eliminate editing technology safety risks and technical risks.

5.2. Establish and Perfect the Regulations and Laws.

Although many countries have formulated regulations on gene editing technology, there are no strict and perfect laws and regulations. In order to create a wonderful environment for the research of gene editing technology to promote its rapid development and avoid the occurrence of ethical misconduct, it is necessary to establish and perfect the relevant regulations and laws. First, We should establish a supervisory committee composed of gene editing technical professionals and people in various industries, whose major role is to monitor the process and results of gene editing technology and measure whether it conform to the ethics or not. Secondly, it is necessary to establish a strict disciplinary system. Gene editing of human embryos is not allowed in our country at present, but Professor He Jiankui has applied this technology to human beings, which is obviously an act of transgression. There is no disciplinary system in our country so there is no specific punishment for this incident. Finally, we must establish a commonly recognized system. Researchers should make clear the legal responsibility and the greater social responsibility they bear in the research process. In the face of the questioning of the public and the incompleteness of technology, they should study in accordance with the principle of benefiting mankind.

5.3. Make the Results of Research Transparent

Gene editing technology is still a new technology that has not been totally understood by the public. Because of its strangeness and uncertainty, the public will have resistance it. In order to promote the better development of gene editing technology, it is necessary to make the results of research transparent. Gene editing is a technology for life and health of the public, so the public is the most participants for the technology. To increase the public's participation, the process and outcome of the study should be presented to the public, making the public aware of the accomplishments and risks of gene editing technology. In this way, the research results will be transparent to the greatest extent, so that the public participate in the study indirectly, which is more conducive to supervision by public opinion and to prevent the emergence of ethical issues.

5.4. Improve the Sense of Ethical Responsibility.

Human embryo gene editing is a technology with great great potential. In the future, it is not known whether researchers can hold on to their original intentions and bear ethical responsibility in the face of the temptation of commercial interests in enormous business investment, so it is necessary to improve the researchers' awareness of ethical responsibility. Confronted with technical security risks and ethical conflicts, researchers bear more ethical responsibility and they should always be clear about their responsibilities. Gene editing technology is aimed at the public and researchers should not harm the mental and physical integrity of the subjects in study, which requires that the researchers themselves should improve the sense of responsibility, abiding by the system of laws and regulations strictly, never crossing the bottom line.

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6. Conclusion

With the further research and development of gene editing technology, human embryonic gene editing has opened up a new way for human treatment of difficult diseases, which has great room for development with great medical value to human beings. However, the potential risks of gene editing technology also bring some ethical problems. Aiming at the ethical problems of "designer babies", this paper makes a preliminary study on the review of "designer babies" case, the analysis of ethical risks, the causes of ethical risks and the path to eliminate ethical problems, which provides a preliminary analysis for solving the ethical risks brought about by "designer babies". This paper holds that the ethical risks of "designer babies" can be gradually eliminated by following the four principles of life ethics, establishing and perfecting laws and regulations, making research results transparent and improving the consciousness of ethical responsibility. Gene editing technology is constantly developing, so the ethical risks of "designer babies" should be addressed in a comprehensive governance about social, legal, political and more areas in the future.

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