iJournals: International Journal of Social Relevance & Concern (IJSRC)
ISSN:2347-9698, ijournals.in/ijsrc
Volume 13 Issue 6, June 2025

Genetic Modification: A Tool for Progress or A Path to New-Age Eugenics

Author: Chaeyun Kang

Cornerstone Collegiate Academy of Seoul

rachelkang0705@gmail.com

ABSTRACT

This article examines the possibilities and risks of genetic manipulation technology. Genetic manipulation technologies such as CRISPR can help cure genetic diseases or solve food problems, but there are also concerns such as inequality, unexpected side effects, and problems similar to the past eugenics may arise again. In particular, there must be a distinction between the purpose of treating diseases and the purpose of using it to sacrifice a minority for the supposed good of society, which requires regulation, international cooperation, and public participation. Whether genetic manipulation will benefit or harm humanity depends on how we deal with this technology.

Keywords: Genetic modification, CRISPR, Eugenics, Bioethics, Regulation and public participation

1. INTRODUCTION

Genetic modification stands at the front of contemporary bioengineering, offering unprecedented possibilities to transform medicine, agriculture, and environmental management. From drought-resistant crops to gene therapies for inherited diseases, the ability to alter DNA holds remarkable promise.

Yet such potential also brings profound ethical questions: Are we advancing human well-being or violating fundamental natural and moral boundaries? To fully engage with this question, it is essential to consider the past and modern eugenics. Historically, eugenics was used to force eliminating undesirable traits for improving society. In the late 19th and early 20th centuries, forced sterilization under the name of making a better society was prevalent in countries such as the United States, Nazi Germany, and other countries.

However, in the modern age, genetic modification has emerged as a more scientifically advanced form of eugenics. Unlike past eugenics, modern genetic modification is considered as a tool for therapeutic purposes.

Genetic engineering also brings with it concerns over intellectual property, and patenting of created animals and/or the techniques used to create them. Preserving intellectual property can breed a culture of confidentiality within the scientific community, which in turn limits data and animal sharing [1]. It is similar to the purpose of past eugenics -human improvement- which aims to correct genetic defects. While classical eugenics forced sterilizations and racial policies through government power, modern genetic modification is voluntary, based on personal choice. Moreover, it has the purpose of curing people's diseases and creating improved foods, but in the past eugenics forcibly eliminated minorities under the name of improving society.

This essay contends that while caution is necessary, genetic modification can be a force for good—if governed by rigorous ethical standards, global equity, and public accountability.

2. THE SCIENTIFIC PROMISE OF GENE EDITING

Gene editing technologies, particularly CRISPR-Cas9, have revolutionized the precision with which we can modify DNA. In agriculture, genetically modified (GM) crops have been engineered to resist pests, tolerate drought, and enhance nutrition. A notable case is Golden Rice, which is biofortified

with beta-carotene to address vitamin A deficiencies in developing countries [2].

In medicine, somatic gene therapies are already yielding positive results. Diseases like sickle cell anemia and beta-thalassemia have been successfully treated using CRISPR technology [3]. Additionally, recent studies demonstrate CRISPR's potential in preventing infectious diseases. For example, researchers created chickens resistant to influenza using CRISPR. In chickens, influenza A virus (IAV) relies on host protein ANP32A. They used CRISPR/Cas9 to generate homozygous gene edited (GE) chickens containing two ANP32A amino acid substitutions that prevent viral polymerase interaction. After IAV challenge, 9/10 edited chickens remain uninfected [4]. Moreover, novel delivery systems—such as carbon nanotubes—offer non-transgenic pathways for gene transfer, minimizing regulatory hurdles while accelerating innovation. These advances offer tools not just to treat illness, but also to address urgent global challenges like food insecurity and climate adaptation.

3. ETHICAL BOUNDARIES: BETWEEN HEALING AND HUBRIS

Despite its potential, gene editing raises deep ethical concerns. Philosopher Hans Jonas (1984) warns against interventions with unforeseeable long-term effects, especially when future generations are impacted without consent. Critics often invoke the "playing God" objection, reflecting a worry that altering life at its genetic core exceeds appropriate human authority.

From a deontological view, some argue that life possesses intrinsic value and should not be engineered to serve utilitarian ends. Particularly contentious are enhancement applications—genetic modifications for traits such as intelligence or physical appearance—which echo eugenic ideologies and risk undermining human dignity [5]. Moreover, environmental ethicists caution that tools like gene drives, designed to alter or eliminate species such as mosquitoes, could unintentionally destabilize entire ecosystems [6].

One of the most controversial applications of gene modification is designer babies. In the case of Chinese scientist He Jiankui, he had edited twin girls' genomes using CRISPR-Cas9 technology. However, the scientific community widely condemned the experiment for ethical issues. This case highlights the fine line between therapeutic interventions and genetic improvements, raising questions about potential revival of eugenic practices under the name of scientific advancement [7].

4. GLOBAL JUSTICE AND ACCESS

Ethical reflection must also consider equity. Access to advanced gene-editing technology is mainly concentrated in rich countries. On the other hand, low-income countries have difficulty accessing these treatments, which is likely to further the health gap.

A case in point is sickle cell anemia (SCD). CRISPR-based treatments are being developed in the United States, but these treatments are too expensive to access patients in Africa. This situation suggests that life-saving treatments could become a luxury that only the rich can enjoy. If genetic modification technology is concentrated only in rich countries, technology can rather be a tool to deepen inequality rather than resolve it.

International cooperation is essential to address this inequality. There is a need to promote the fair distribution of technology to countries internationally and to ensure that public health takes precedence over the profits. This can ensure access to essential gene modification treatments while also preventing monopolizing technology.

5. CHARTING A RESPONSIBLE PATH

Instead of completely accepting or rejecting genetic modification, we need a more balanced way of thinking about it. This approach should clearly separate medical uses—which try to treat diseases and bring the body back to normal—from uses that try to make someone better or give them an advantage.

Therapies that alleviate suffering and promote health are consistent with ethical commitments to human dignity and the common good. Enhancements, by contrast, risk reducing people to

engineered products, undermining moral agency and social equality [8].

It is essential to distinguish between treatment and enhancement. Treatment focuses on alleviating or restoring normal function, but enhancement focuses on improving intelligence and physical ability. This can lead to serious ethical problems.

The most effective way to prevent this problem is to have a legal mechanism to limit genetic modification to therapeutic purposes only. If it is used for enhancement purposes, it should be mandated to undergo strict screening by an independent ethics committee. These could prevent the mass production of designer babies and promote new forms of eugenics. Public participation is also important. It is necessary to encourage the public to engage in informed discussions through educational programs on the potential risks and ethical dilemmas of genetic modification

6. ACKNOWLEDGMENTS

In the past, eugenics programs were promoted with the aim of removing social minorities such as disabled, from forced sterilization in the United States to Nazi Germany's racial policy. This dark history is a lesson that modern genetic modification must avoid. Genetic modification is not inherently unethical. However, genetic modification is both a treatment and potential to encourage new forms of eugenics. Therefore, we must handle this technology carefully and prevent technology abuse through ethical guidelines, global regulation, and social consensus. Its value depends on how it is used and who it benefits. Will we repeat our past mistakes or sublimate genetic engineering to the true progress of mankind? The answer depends not on science, but on how we control this technology.

7. REFERENCES

[1]. E. H. Ormandy and J. Dale, “Genetic engineering of animals: Ethical issues, including welfare concerns,” Can. Vet. J., vol. 52, no. 5, pp. 544–550, 2011. [Online]. Available: https://pmc.ncbi.nlm.nih.gov/articles/PMC3078015/

[2]. I. Potrykus, “The 'Golden Rice' tale,” In Vitro Cell. Dev. Biol. Plant, vol. 37, no. 2, pp. 93–100, 2001. [Online]. Available: https://embryo.asu.edu/pages/golden-rice6

[3]. H. Frangoul, et al., “CRISPR-Cas9 gene editing for sickle cell disease and β-thalassemia,” N. Engl. J. Med., vol. 384, no. 3, pp. 252–260, 2021. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/33283989/

[4]. A. Idoko-Akoh, D. H. Goldhill, C. M. Sheppard, et al., “Creating resistance to avian influenza infection through genome editing of the ANP32 gene family,” Nat. Commun., vol. 14, no. 6136, 2023. [Online]. Available: https://doi.org/10.1038/s41467-023-41476-3

[5]. J. Habermas, *The Future of Human Nature*. Cambridge, UK: Polity Press, 2003.

[6]. K. M. Esvelt, et al., “Concerning RNA-guided gene drives for the alteration of wild populations,” eLife, vol. 3, e03401, 2014. [Online]. Available: https://pmc.ncbi.nlm.nih.gov/articles/PMC5689824/

[7]. H. T. Greely, “CRISPR’d babies: Human germline genome editing in the ‘He Jiankui affair’,” J. Law Biosci., vol. 6, no. 1, pp. 111–183, 2019. [Online]. Available: https://academic.oup.com/jlb/article/6/1/111/5549624

[8]. M. J. Sandel, “The case against perfection: Ethics in the age of genetic engineering,” Atlantic Monthly, Apr. 2004, pp. 50–62. [Online]. Available: https://pmc.ncbi.nlm.nih.gov/articles/PMC416457/

[9]. H. Jonas, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*. Chicago, IL: Univ. of Chicago Press, 1984.