

Chapter 10

Cutting Edges in Human Germline Editing Reconciling Scientific Progress With Rogues and Legal Framework: Global Observatory Its Inherent Conundrums

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ABSTRACT

Human germline editing refers to the process of making changes to the genetic material of human embryos, eggs, or sperm cells, which can then be passed on to future generations. It is a highly controversial and ethically complex field of research. The ability to precisely and easily alter the DNA sequences of living things has been made possible by new biochemical techniques. The potential of these new tools to deepen our understanding of biology, change the genomes of microorganisms, plants, and animals, and treat human diseases has caused enormous enthusiasm in the scientific and medical communities. They have also sparked important discussions about how people might decide to change future generations' genomes as well as their own. This chapter focus on the human germline editing with reconciling scientific progress with rogues and legal framework global observatory and its inherent conundrums.

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1. INTRODUCTION AND BACKGROUND

Human genome editing technologies have a lot of promise and these arguments concerning its implementation invariably centre on ethical, legal, and societal issues. The recent misuse of genome editing technology by some Chinese entities has drawn attention and concern (Selvaraj et al., 2024). As a result, different policy experts, scientists, bioethicists, and members of the public are urging caution on the appropriate use of human germline genome editing and its possible consequences for future generations (Townsend, 2020). More than 60 years of fundamental investigation into the structure of DNA molecules have resulted in the development of the latest gene editing tools. It had been possible to modify DNA at specific sites in the past using molecules known as zinc finger nucleases and TALENs. Genome editing is a powerful and sophisticated technique for making precise changes, additions, and replacements to the genome (Van Beers, 2020). When compared to prior procedures, the emergence of innovative approaches has considerably improved the precision, efficiency, adaptability, and cost-effectiveness of genome editing. Each use of genome editing, like previous medical advancements, presents its own set of benefits, possible hazards, ethical issues, and social ramifications, potentially demanding the formation of new regulatory frameworks (Brownsword, 2007).

The clinical studies are now using these technologies, although they are cumbersome and challenging to operate. CRISPR-Cas9, a molecular assembly that was discovered while studying how bacteria defend themselves against viral infection, is a new technology that is easy to use, reasonably priced, and can target DNA sequences with high specificity (Matthews et al., 2021). “The system is so overwhelmingly efficient and specific that it is changing our entire outlook for future gene editing,”

The most direct effect of the new gene editing tools, according to some summit speakers, has been on fundamental biology and medicinal research. In labs all throughout the world, CRISPR-Cas9 is being used to better understand how genes, proteins, and cells function (Singh, 2023). It is used to research human sperm and egg cell differentiation, fertilisation, cell division, and embryonic development. It is generating new understanding on everything from complex human diseases to the genome editing methods themselves. In the context of genome editing, fundamental problems arise, such as how to strike a balance between possible advantages and the danger of unintended consequences, how to control the use of these technologies, and how to include societal values into relevant clinical and policy considerations (Marchant, 2021).

There are major concerns concerning the use of heritable genome editing have grown, as have questions about how to regulate persons who act without sufficient authority. This study investigates several options to regulating genome editing in a way that promotes society interests while keeping legal and ethical principles and

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