Research Report | [WHO]

Forum: World Health Organization

Issue: Addressing the Formation of Regulatory Measures Regarding Genome editing

Student Officer: Keith Tan | [kgttan26@xs.edu.ph]

Position: Deputy Chair

Welcome Letter

Dear Esteemed Delegates,

With great pleasure and anticipation, we wish to extend a warm welcome you to the World Health Organization. As the chairs of this esteemed assembly, we are truly honored to have the opportunity to preside over such a vital forum dedicated to sustainable global health and well-being development

Your active presence here signifies a shared commitment in addressing persistent health challenges facing the international community. Over the course of this conference, the chairs hope to see engagement in rigorous debate, and collaborative problem-solving to develop innovative and longstanding solutions.

We highly encourage you to approach this experience with an open mind, a spirit of cooperation, and dedication. It is with utmost significance that you possess resilient determination in advocating for a meaningful difference in improving the lives of countless individuals worldwide. With sincerity, thank you for your passion, and commitment to the mission of the World Health Organization.

With warm regards,

World Health Organization Model United Nations Conference

Background

Over the preceding years, genome editing technologies have paved the way for a rapid advance in scientific technology, offering opportunities in modifying the genetic makeup of living organisms with accuracy and efficiency. Such technology would include the CRISPR-Cas9, which has emerged as a vital tool that would enable geneticists and researchers to make precise changes to the DNA of living organisms such as plants and humans.

Furthermore, concern and scrutiny have arisen regarding its ethical, legal, and societal implications. The capability in modifying the genetic code of organisms has internationally raised ethical questions and considerations about genetic manipulation, its potential for unforeseen and unintended consequences, and its entailment for future generations. In addition, the genome editing accessibility too has raised apprehension with regard to the potential for misuse, such as but not limited to the creation of genetically modified organisms (GMOs) with unknown environmental consequences and the pursuit of further genetic enhancement beyond medical necessity.

Recent events, such as the controversial claims of germline editing by a Chinese biophysicist, He Jiankui, by genetically modifying twin infants to be resistant to HIV with these alterations passing through their future generations. Scientists have claimed that He's modifications would be deemed ethically

problematic as it involved deleting a region of a receptor on white blood cells using CRISPR-Cas9. While researchers and scientists have questioned the credibility of He's announcement, this widespread controversy thereby intensified the critical urgency for effective and stringent regulatory oversight. While these underscore the implementation of necessary measures that prevent unethical and unsafe applications, reflecting on the disputation would ultimately reignite debate about the ethical implications and regulatory frameworks surrounding germline genome editing.

Definition of Key Terms

Term	Definition
Genome editing	The process of making precise alterations to the organism's DNA sequence, typically achieved in utilizing molecular tools such as the CRISPR-Cas9 that can introduce gene insertions, deletions, or substitutions in meeting desired changes.
Genetically Modified Organisms	A species in which its DNA has been made different upon the application of genetic engineering techniques such as the CRISPR-Cas9.
Germline editing	Genome editing performed on reproductive cells or embryos that result in heritable changes that can be passed onto future generations. This type of editing, however, raises ethical and safety concerns upon and would require regulatory oversight.
Somatic editing	Genome editing is performed on non-reproductive cells of an organism, such as human cells, with changes confined to the individual being treated and not inherited by future generations, generally considered less ethically contentious than germline editing as somatic editing is carried out both to the patient and a limited number of his cells.
Ethical	Societal implications associated with genome editing,

considerations	strongly emphasizing the questions of consent, equity, justice, and the potential impact on global human health, biodiversity, and ecological systems.

Major Parties Involved

The Scientific Community:

The scientific community would include researchers, geneticists, biologists, and bioethicists particularly involved in genome editing research and development. They would conduct experiments, analyze data, and contribute to genome editing advancement, capable of assessing the costs and benefits of genome editing applications in various fields such as medicine and agriculture.

Regulatory Agencies:

These agencies include the European Medicines Agency (EMA), and the National Institute of Health (NIH). These organizations, on their respective countries and continents, establish guidelines aimed at ensuring the safety, security, efficacy, and the ethical use of genome editing technologies, overseeing the approval process for genome editing products. Moreover, these agencies can contribute to discussions on the regulatory oversight of existing and potential genetic technologies. Countries such as the United States and China have maintained a crucial role in overseeing and regulating genome editing technologies. In making significant advancements in genome editing, thorough research is evidently involved and necessary in discussions surrounding its proper regulation.

Biotechnology Companies:

These organizations play a crucial role as they specialize in genome editing technology development and deployment. They would invest in research and development in creating genome editing tools and products. Nonetheless, organizations, such as the CRISPR Therapeutics can engage in partnerships with governments in bringing these genome editing techniques to the international markets.

Timeline

Date	Description of Events
1970s-1980s	American biochemist Paul Berg initiates several experiments in recombinant DNA technology, signifying the groundwork for genetic engineering. Karry Mullis invents the polymerase chain reaction (PCR), utilized for swift DNA amplification.
1990s	Scientists identify clustered regularly interspaced palindromic repeats (CRISPR) in bacterial genomes. CRISPR-associated (Cas) genes become detected in bacterial adaptive immunity.
2012-2013	Jennifer Doudna and Emmanuelle Charptentier propose using CRISPR-Cas9 for accurate genome editing purposes. Feng Zhang's team at MIT demonstrated the CRISPR-Cas9 genome editing among human cells, stretching the tool's applications, with CRISPR-Cas9 being used for the first time in 2012 in correcting genetic mutations in human embryos for the first time.
2015-2017	Researchers use CRISPR-Cas9 in treating Duchenne muscular dystrophy in mice, revealing its therapeutic potential. The first CRISPR-Cas9 clinical trial in China begins, utilized in treating lung cancer among patients through immune cell editing.
2018	He Jiankui announces the internationally controversial birth of twin girls with edited genomes, leading to global debate regarding genome editing's ethical implications.
2024	Traditional methods of screening mutations in career-related genes have been time-consuming. However, scientists have made use of prime editing to screen cancer-associated genetic mutations, where researchers can generate thousands of genotypes seen in cancer patients in a single experiment.

Possible Solutions

- **Possible Solution 1**: Tightening Ethical and Impact Assessments
    - Establish structured frameworks and programs that closely evaluate the potential impacts and benefits of genome editing projects globally among governments and international bodies.
- **Possible Solution 2**: License and Certification Programs
    - A license and certification program that genome editing practitioners would ensure compliance with safety standards and total adherence to regulatory protocols. These could include regular audits and inspections among government agencies, biotechnology organizations, and other relevant bodies.
- **Possible Solution 3**: Transparency Platforms
    - Utilizing existing technologies to create a transparent and immutable platform aimed at promptly tracking and verifying genome editing activities from inception and implementation. Such platforms would provide access in assessing relevant stakeholders with real-time and critical information with regard to the regulatory approvals of genome-editing activities.

Useful Resources: (from most useful to useful)

Bergman, Mary Todd. 2019. “Perspectives on Gene Editing.” The Harvard Gazette. Harvard University. January 9, 2019. https://news.harvard.edu/gazette/story/2019/01/perspectives-on-gene-editing/

Joseph, Andrew M, Monica Karas, Yaseen Ramadan, Ernesto Joubran, and Robin J Jacobs. 2022. “Ethical Perspectives of Therapeutic Human Genome Editing from Multiple and Diverse Viewpoints: A Scoping Review.” *Cureus* 14 (11). https://doi.org/10.7759/cureus.31927.

World Health Organization. 2023. “Human Genome Editing.” Www.who.int. 2023. https://www.who.int/health-topics/human-genome-editing#tab=tab_1.
https://medlineplus.gov/genetics/understanding/genomicresearch/genomeediting/

MedlinePlus. 2022. “What Are Genome Editing and CRISPR-Cas9?” Medlineplus.gov. Medlineplus. March 22, 2022. https://medlineplus.gov/genetics/understanding/genomicresearch/genomeediting/.