AI and Genome Editing:

How do these technologies affect human autonomy and rights?

Destiny Hale

Old Dominion University

IDS 300W

Professor Kozlowski

12/6/2024

Abstract

This interdisciplinary paper examines the significant risks of genome editing and the integration of artificial intelligence to human autonomy and rights. The CRISPR era has existed for numerous years in medicine and health. Many scientists have utilized this technology to design embryos or modify genes in the prevention of diseases. With the rapid shift of technological advancements, artificial intelligence has become predominant and used throughout other operations, including medical procedures. The recent integration of artificial intelligence in CRISPR has become beneficial and impactful to genome editing. However, the ethical considerations and risks that surround these technologies are crucial and rarely covered in scholarly discussion. Human autonomy and rights are the main significant risks that only a few address. The disciplines of medicine, law, and philosophy can collectively provide a better understanding and perspective on how these technologies affect humanity. Before the discussion begins, the terms "AI" and "gene editing" will be used interchangeably throughout the paper.

Keywords: Artificial Intelligence, AI, CRISPR, Genome Editing, Human Autonomy, Human Rights, Gene Editing, Genetic Engineering

AI and Genome Editing:

How do these technologies affect human autonomy and rights?

Introduction

In the field of bioengineering, embryos and new genes are produced through CRISPR genome editing. This powerful technology is used to modify the DNA of living organisms such as embryos or adults. The procedure involves cutting and replacing old DNA sequences with new ones to prevent diseases or repair a gene. The integration of artificial intelligence is a current addition to CRISPR, making the tedious practice efficient and quicker by providing insights on the DNA strands and quick precision in targeting locations for DNA (Kiseleva, 2022). The combination of both artificial intelligence and CRISPR genome editing opens a new era of possibilities for scientists and is currently being discovered. However, ethical considerations and issues continuously arise from this powerful integration. AI and gene editing, while being beneficial to medicine, pose significant risks to human rights and autonomy. These technologies magnify social inequality, loss of individuality, loss of privileges, and legal challenges.

Medicine and Health

Since this powerful integration is beneficial to numerous doctors and scientists, it leads to the question of whether it's a blessing or curse to medical research, which Reddy et al. (2023) explore this question in a research study. AI has played a significant role in genome editing such as analyzing and interpreting genomic data for research purposes. This is utilized for drug development, personalized medicine, and disease diagnosis (Reddy et al., 2023). For AI's quick precision, this helps with prediction of genes, identification of patterns, and personalized medical plans for the patient. In CRISPR editing, the algorithms from this advancement provide accurate

diagnosis and a better view of the patient's health. However, the limitations of AI can cause certain risks and prevent actions from being done despite its features.

A few limitations that Reddy et al. (2023) list are the algorithms, privilege of choice, and privacy. Although it was previously mentioned that the algorithms can provide accurate results for the patient, they can also backfire in giving misleading and inaccurate readings. This could potentially affect the trust between patients and doctors or cause harm to the patient's health if given the wrong treatment. The privilege of choice is affected by the analysis of the results. This is a crucial step since it needs to balance the insights of both AI and clinical professionals. If this isn't addressed, it can lead to an overrule of expertise. However, "it is important to have experienced and knowledgeable professionals who can interpret the results and make informed decisions based on them" (Reddy et al., 2023). By this, most of the choices made by these professionals wouldn't have to fully rely on the results from AI. Privacy is a high priority in medical research. Due to the genomic data being highly sensitive, this can reveal sensitive information about the patients and families.

In addition to privacy, informed consent plays a role in medical procedures. Informed consent involves the doctor or nurse educating the patient or the patient's family about what will happen in the procedure and the possible consequences during the operation. Also, this involves granting permission from the patient to either continue with the procedure or to suggest an alternative method through a written document. Francis I. (2024) wonders if the AI method understands the concept of consent or if it's possible for the method to only extract the required information and discard the rest of it.

AI has the ability to learn concepts and apply them to technical practices through learning the definitions of the terms or given prompts. However, its artificial knowledge is limited to the

human aspects. Although the AI method might interpret what consent is, it may fail to acknowledge the traditional beliefs and values of the patient. So, for the information to be extracted, the method has to undergo training to determine what counts as “required information” and what counts as “irrelevant information” depending on the procedure, or else this may result in misinterpretation of results and leak of personal information. According to Francis I. (2024), researchers would have to keep the models of informed consent in mind when considering the answers.

Regulations are a key to maintaining safety, order, and equality in society. In healthcare, these are to maintain the safety of the patients, the order of medical practices, and equality in medical treatment. For CRISPR gene editing, numerous regulatory frameworks are being developed to minimize risks and ensure safety using ethics as a foundation for protecting human rights and autonomy. In this case, human rights are the main fixation. In a case study, Doxzen and Halpern (2020) address the issues of CRISPR and develop an effective framework. The tool that they used for the framework is the HRIA or Human Rights Impact Assessment, providing constraints on germline genome editing. One issue they addressed is the line between treatment and enhancements. A treatment in a culture could be an enhancement to another.

Another issue addressed is social justice and the spectre of eugenics. Doxzen and Halpern (2020) state that germline genome editing may lead to increased stigmatization of disabled people. An example they provided is how this affects deaf children. With gene editing, it creates a critical level of pressure to eradicate all deafness and leads the child more to isolation and stigmatization. Eugenics pushes this issue further into creating inequality between social classes and more problems for the disabled people community. Using this technology results in the same predicament as the deaf child example in the increase in stigmatization, with the addition of

social exclusion in the community. The loss of privilege is also high in certain social classes. The wealthy would be the only community to obtain this treatment due to its expense, causing an unfairness in the distribution of health and injustice. However, in the implementation of the ethical framework, the HRIA provides a public health approach that cancels out unequal rights and safeguards to those who are vulnerable to infringements of rights (Doxzen and Halpern, 2020).

Law

In continuation of regulatory frameworks, Kiseleva (2022) discusses various legal frameworks for AI in somatic gene editing in marketing and the following legal challenges. To list a few, these frameworks are Advanced Therapy Medicinal Products Regulation (ATMP), Clinical Trials Regulation (CTR), and In-Vitro Diagnostic Medical Devices Regulation (IVDR). ATMP is a regulation governed by the Directive European Commission and concerns the authorization, supervision, and pharmacovigilance (Kiseleva, 2022). The CTR is a regulation that concerns the safety and efficacy of medical products, also covering research and verification of medicine with the inclusion of human participants. Lastly, IVDR covers specific types of devices that apply to gene editing applications.

The legal challenge these frameworks have is the failure to establish a specific element. For example, the CTR establishes the involvement of human subjects in assessing the quality and safety of medical products. On the other hand, another framework called Medical Device carries out clinical investigations for AI-based medical products (Kiseleva, 2022). Nevertheless, both frameworks need to establish how they would comply with developing a product that involves elements covered by both. This also leads to the question of which one will regulate the practice

of AI gene editing in clinical trials. Another example is the lack of establishment of single authorization in AI devices covered by the IVDR. Each element would be separately authorized.

In certain legal orders, CRISPR gene editing is either banned or restricted due to its complex compliance with regulations or the potential endangerment to patients. In an article, Van Beers (2020) examines legal proposals and legal bodies regarding this technology from a human rights perspective. Regulators want to lift or reconsider the ban on gene editing; however, Van Beers (2020) argues that they fail to understand the principles of human rights and dignity in this issue. The existing human rights law on this advancement ignores the process of genetics and morals of human rights. They also rarely mention the implications for humanity itself, human dignity, and the future generations that are made from genetic engineering.

An example she provides includes the views of two international bodies such as the Oviedo Convention and the Universal Declaration on Human Genome and Human Rights. They both recognize the principles of protecting human interests and addressing the consequences of genome editing to humanity. However, another international body called the International Bioethics Committee warns about the interpretation of human autonomy that ignores both the social and ethical concerns of this technology. The Nuffield Council followed the pursuit of dismissing human dignity as a principle for the governance of human gene editing. Altogether, these proposals lead to legal debates on the meaning of human rights and dignity in the context of human gene editing.

Philosophy

As gene editing advances, this technology raises ethical concerns about the alteration of human traits and how this impacts human autonomy and future generations. They also challenge the concepts of morality and traditional values. Karin-Frank (1987) discusses how gene editing

can endanger individual autonomy and moral issues. In the article, she argues that gene editing is often rejected on emotional grounds by intuitions and inconsistent with other moral institutions. She states that this would possibly violate the individual's autonomy if it's only based on the genetic definition of individuality. Numerous individuals formed opinions based on how they perceive this procedure; however, it is on a surface level rather than deep reasoning, leading to conflicting views with moral beliefs. If the individual is defined by their genes, the alteration from gene editing affects the character. This leads to more consequences; although this wouldn't affect the true nature of the individual, it still harms them.

Another argument she makes is that gene editing doesn't concern itself with the future beliefs and value judgments of the individual. Although this technology is made by man, it is artificial. The artificial technology wouldn't understand the psychological aspects of a human; however, the main focus of the machine is on the physical and biological components. In other words, it can't alter the thoughts or beliefs. Therefore, Karin-Frank (1987) states gene editing limits the individual's future choices, and the genetic modification consequences that follow violate their autonomy.

In one of the moral issues, Karin-Frank (1987) evaluates how Utilitarians and Kantians may view the principles of gene editing. Utilitarianism focuses on the happiness and well-being of the individual and opposes actions that may affect happiness. In contrast, Kantinism focuses on reasoning whether it's good or bad. From the Utilitarianism perspective, they may view whether this may result in the individual's happiness or reduce suffering for the offense against autonomy (Karin-Frank, 1987). In other words, how would this outweigh the individual's autonomy? On the other hand, the Kantians treat the individual as an autonomous personality

regardless of their genetic makeup. This means that we have to respect and accept the individual despite how they are made.

Another moral issue is the analogy of education being correlated to gene editing. The analogy states that the defective embryo is similar to a child being educated, both having the potential to develop. However, education and gene editing are two different topics. One key difference that Karin-Frank (1987) gives is that gene editing uses direct force or violence while education is the opposite. In gene editing, the alteration directly targets the biological components of the embryo, potentially causing coercion. Whereas, in education, it's indirect in the altering of the child's mind through learning; however, there isn't any coercion present. Another key difference that she provides is that education takes on the child's abilities and doesn't shape their personality based on outside influences. In contrast, gene editing would affect those abilities, making it difficult to achieve either in educational or environmental conditions.

Since these technologies can potentially alter the biological factors of an embryo or adult, could this result in a new race and form of inequality? Gha et al. (2023) answer this question given in the concept of the superhuman and how it affects human dignity. The superhuman is either made from the "hybrid between human intelligence and artificial intelligence" or a "product of genetic engineering" (Gha et al., 2023). However, the main focus will be on the superhuman made from gene editing. According to Gha et al. (2023), this new race would be able to solve various complex problems in the domains of science, technology, and even in our moral lives. Although this being could be beneficial to society, questions arise on whether it'll replace humanity or would understand the values of humans.

From this creation are two problems, the destruction of human dignity and the rise of inequality. In the first problem, Gha et al. (2023) come from religious and metaphysical

perspectives. From a religious standpoint, they believe anything or anyone that goes against the creations of God, such as using gene editing for selfish purposes, will experience condemnation. Monotheistic religions believe that God is the creator of all living things such as humans. In the bible, Genesis chapter 1, states humans are created in the image and likeness of Him. This means that we carry the nature and ways of God. In Genesis chapter 2, God also created man from dirt and breathed life into his creation. This is how humanity was formed. However, in the context of gene editing, this is disrespectful to God's creative nature. From the metaphysical perspective, humans are considered a homogenous whole (or complete human beings); however, breaking down into pieces for our ideal creation doesn't align with the authenticity of the human race. In other words, the superhuman goes against the nature and value of humanity.

The second problem is the rise of inequality between social classes. In society today, there is still discrimination and inequality between social classes, leading to certain classes losing privileges to obtaining beneficial healthcare treatment or other materialistic things. Gha et al. (2023) state that in institutions and governments, everyone seeks to benefit from one another, and the interaction between people and nations is inhuman such as killing innocent people for money. In addition, nations are willing to sacrifice their cultural heritage for economic gain and political protection. In other words, they are driven by self-interest, exploitation, and harm for power and economic gain. As for the superhuman in this case, this will further extend the gap between the less fortunate and the wealthy. The wealthy would have the privilege of having this creation while the underclass may not be able to.

Synthesis/Application

Synthesis/Application

The interdisciplinary approach from medicine, law, and philosophy collectively provides numerous examples of how AI and gene editing affect human rights and autonomy. In addition, these disciplines provide possible solutions to make both technologies ethically friendly and acceptable to humanity. Legal frameworks are currently being created to further protect the nature of human rights from gene editing; however, there are legal challenges that regulators face during development. One of the challenges is the blurred line between treatment and enhancement. A treatment for a medical condition in one culture could be an enhancement to another (Doxzen & Halpern, 2020). If there are strict regulations set in place, the fear of gene editing turning into eugenics is unfounded (Van Beers, 2020). Therefore, a robust framework wouldn't be able to distinguish the differences (Doxzen & Halpern, 2020).

With these advancements, it creates a loss of privileges such as choice and equality. The integration of AI in gene editing, and its quick, precise algorithms provide accurate treatment plans for the patient. However, the results can affect the choice of medical professionals. This is a crucial step in balancing insights from AI and clinical professionals. If this issue isn't addressed, it leads to an overrule of expertise (Reddy et al., 2023). As for equality, gene editing expands the division of social classes between the wealthy and the less fortunate (Gha et al., 2023). This advancement would be accessible to the wealthy, which would provide "more health and other advantages that will not be fairly distributed" (Doxzen & Halpern, 2020). This can also cause suffering and burden to the child (Francis I., 2024).

The altering of these technologies can cause significant risks to the individual's autonomy or the individual. For example, Karin-Frank (1987) states that emotional rejection from intuitions on gene editing violates the individual's autonomy only if it's based on the genetic definition of

individualism. The opinions from people are only on a surface level of understanding and not deep reasoning, leading to conflicting views and harm towards the individual. The addition of AI can lead to the reveal of sensitive information about the patients and their families (Reddy et al., 2023). This can also result in the creation of the superhuman (Gha et al., 2023)

Nevertheless, there are possible solutions to reduce the issues that surround these technologies and make them ethically acceptable. Kieselva (2022) suggests a few recommendations for legal frameworks for AI gene editing. One suggestion is establishing accountability for those who were involved in the production of the embryo. This will justify the actions of the people. Another she suggests is strengthening the role of AI Devices. Manufacturers who developed these products must provide instructions for the users as to how to use them and what can be added to the system. From a human rights perspective, the HRIA cancels both unequal rights and safeguards for individuals who were exposed to infringement of rights (Doxzen & Halpern, 2020). To prevent inequality, Reddy et al. (2023) state that it is important to ensure diverse datasets and address biases in algorithm development in the prevention of healthcare conflicts.

Conclusion

CRISPR gene editing and AI open new opportunities and possibilities for scientists and doctors. However, the controversial views of both technologies and integration raise ethical questions such as whether is it a blessing or curse or would AI and gene editing understand human values. Although these are beneficial to medical procedures, they pose a risk to human autonomy and rights. From these risks, they cause social inequalities, loss of individuality, loss of privileges, and legal challenges. Numerous regulatory makers are in the debate of how they can develop a robust framework that covers the issues of gene editing either from a human right

or AI perspective. For individuality, these technologies create division between social classes, violation of autonomy, loss of choice, and a possible new race. Through the interdisciplinary approach from medicine, law, and philosophy, they helped us perceive how these technologies affect humanity as a whole. In addition, they provided solutions to reduce these conflicts as these aren't addressed in other disciplines.

References

Doxzen, K., & Halpern, J. (2020). Focusing on Human Rights: a framework for CRISPR germline genome editing ethics and regulation. Perspectives in Biology and Medicine 63(1), 44-53. https://dx.doi.org/10.1353/pbm.2020.0003.

Francis, O. (2024). Ethical Considerations in AI-Driven Genome Editing . Research Output Journals. https://rojournals.org/wp-content/uploads/2024/08/ROJPHM-3114-18-2024.pdf

Gha, A. E., Takov, P., & Shang, N. (2023). The Superhuman Born Out of Artificial Intelligence and Genetic Engineering: The Destruction of Human Ontological Dignity. Horiz. J. Humanit. Artif. Intell, 2, 56-65.

Karin-Frank, S. (1987). Genetic Engineering and the Autonomous Individual. Royal Institute of Philosophy Lecture Series, 22, 213–229. doi:10.1017/S0957042X0000376X

Kiseleva, A. (2022). Somatic Genome Editing with the Use of AI: Big Promises but Doubled Legal Issues. European Journal of Health Law, 29(3-5), 381-408.

https://doi.org/10.1163/15718093-bja10079

Reddy SSP, Francis DL, Thirumoorthi H, Manohar B, Krishnan SA, Chopra SS. Artificial Intelligence in the Genomics Era: A Blessing or a Curse?. J Regen Biol Med. 2023;5(3):228-35. DOI: https://doi.org/10.37191/Mapsci-2582-385X-5(3)-134

Van Beers, B. C. (2020). Rewriting the human genome, rewriting human rights law? Human rights, human dignity, and human germline modification in the CRISPR era. Journal of Law and the Biosciences, 7(1), lsaa006.