

# Study of Genes, Genetic Engineering and Genome Editing: An Analytical Review in Islamic Perspective

دراسة الجينات، والهندسة الوراثية، وتحرير الجينوم: مراجعة تحليلية في ضوء المنظور الإسلامي

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# Study of Genes, Genetic Engineering and Genome Editing: An Analytical Review in Islamic Perspective

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## Abstract

Islam is a complete system of life which guides the human life in particular while the rest of the living beings in general. Genetic engineering and editing has been the subject of discussion for the last several decades, which has been appreciated by people due to its effective results. But for a long time, it has been given the impression that Islam is against this type of technology, which is not the case at all. However, in view of this need, in this discussion, the Shariah status of genes, genetic engineering and genome editing was examined. And it has been tried to explain that Islam is not completely against this technology, but it is a consultant towards the correction of its negative aspects, which are especially directly related to the human world.

**Keywords:** Quran, Hadith, Islam, Gene, Genome, Genetic, Sign, human world.

## Introduction

Islam, as a complete code of life, provides comprehensive guidance not only for human beings but also offers a worldview concerning all aspects of existence, including science and technology. In recent decades, advancements in the fields of **genetic engineering** and **genome editing** have revolutionized modern science, offering significant benefits in medicine, agriculture, and biotechnology. These technologies enable scientists to manipulate genes, correct genetic defects, and even design genetic traits, leading to both remarkable possibilities and serious ethical concerns.

Despite the apparent advantages of these innovations, a misconception persists that Islam is inherently opposed to such scientific developments. This notion stems largely from a lack of awareness regarding Islamic jurisprudential principles and their dynamic approach toward emerging scientific phenomena. In reality, Islam does not categorically reject genetic interventions; rather, it encourages beneficial knowledge and innovation, provided they align with ethical values and do not transgress the boundaries set by Shariah.

This study aims to explore the **Islamic perspective on genes, genetic engineering, and genome editing**, with a focus on the ethical and legal implications associated with these practices. It seeks to clarify that Islam does not oppose the core objectives of genetic technologies but emphasizes the regulation of their application to prevent harm, exploitation,

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and moral degradation. By examining relevant Quranic principles, Hadiths, and scholarly opinions, this paper endeavors to establish a balanced understanding of how Islamic thought interacts with contemporary scientific challenges in the field of genetics.

### Gene

“In biology, the word **gene** (from Greek : γένος, génos ; <sup>1</sup> meaning generation <sup>2</sup> or birth or gender) can have several different meanings. The Mendelian gene is a basic unit of heredity and the molecular gene is a sequence of nucleotides in DNA that is transcribed to produce a functional RNA. There are two types of molecular genes: protein-coding genes and noncoding genes.” <sup>3</sup>

Or

“A **gene** is the basic physical and functional unit of heredity. Genes are made up of DNA. Some genes act as instructions to make molecules called proteins. However, many genes do not code for proteins.” <sup>4</sup>

Or

“**Gene**, unit of hereditary information that occupies a fixed position (locus) on a chromosome. Genes achieve their effects by directing the synthesis of proteins.” <sup>5</sup>

### Gene therapy

“Gene therapy is a medical field which focuses on the genetic modification of cells to produce a therapeutic effect, or the treatment of disease by repairing <sup>6</sup> or reconstructing defective genetic material.” <sup>7</sup>

### Genetics

“**Genetics** is the study of genes, genetic variation, and heredity in organisms.” <sup>8</sup>

<sup>1</sup> *Genome.gov*. "1909: The Word Gene Coined." Retrieved March 8, 2021. "Wilhelm Johannsen coined the word gene to describe the Mendelian units of heredity."

<sup>2</sup> Roth, Stephanie Clare. "What is Genomic Medicine?" *Journal of the Medical Library Association*, University Library System, University of Pittsburgh 107, no. 3 (July 2019): 442–448. Doi: 10.5195/jmla.2019.604. PMC 6579593. PMID 31258451.

<sup>3</sup> Orgogozo, V., Peluffo, A. E., and Morizot, B. "Chapter One-The 'Mendelian Gene' and the 'Molecular Gene': Two Relevant Concepts of Genetic Units." In *Current Topics in Developmental Biology*, 119: 1–26. Doi: 10.1016/bs.ctdb.2016.03.002. PMID 27282022. S2CID 24583286, 2016.

<sup>4</sup> "What is a Gene?" *MedlinePlus Genetics*, September 17, 2020. Retrieved January 4, 2021.

<sup>5</sup> "Studying Genes." *Nigms.nih.gov*. Retrieved January 15, 2021.

<sup>6</sup> Kaji, Eugene H. "Gene and Stem Cell Therapies." *JAMA* 285, no. 5 (February 7, 2001): 545–550. Doi: 10.1001/jama.285.5.545. ISSN 0098-7484. PMID 11176856.

<sup>7</sup> Ermak, G. *Emerging Medical Technologies*. Singapore: World Scientific, 2015. ISBN 978-981-4675-81-9.

<sup>8</sup> Griffiths, A. J., Miller, J. H., Suzuki, D. T., Lewontin, R. C., and Gelbart, W. H. *An Introduction to Genetic Analysis* (7th ed.). New York: W.H. Freeman, 2000. ISBN 978-0-7167-3520-5.

Or

“**Genetics**, study of heredity in general and of genes in particular. Genetics forms one of the central pillars of biology and overlaps with many other areas, such as agriculture, medicine, and biotechnology.” <sup>9</sup>

Or

“**Genetics** is termed as the study to understand the functioning of inheritance of traits from parents to offspring.” <sup>10</sup>

### Genetic Engineering

“Genetic engineering (also called genetic modification) is a process that uses laboratory-based technologies to alter the DNA makeup of an organism. This may involve changing a single base pair (A-T or C-G), deleting a region of DNA or adding a new segment of DNA. For example, genetic engineering may involve adding a gene from one species to an organism from a different species to produce a desired trait. Used in research and industry, genetic engineering has been applied to the production of cancer therapies, brewing yeasts, genetically modified plants and livestock, and more.” <sup>11</sup>

### Genome

“In the fields of molecular biology and genetics, a genome is all the genetic information of an organism.”<sup>12</sup>

### Genome editing

“Genome editing is a method that lets scientists change the DNA of many organisms, including plants, bacteria, and animals.” <sup>13</sup>

### Diff; b/w Genetic engineering and Genome editing

“The **key difference** between genetic engineering and genome editing is that genetic engineering involves introducing foreign genetic material into the genome, while genome editing does not involve introducing foreign genetic material.” <sup>14</sup>

### Quran's teaching

Sometimes something is not mentioned clearly in the Qur'an, but when you carefully consider its words, you will find many words and phrases in the Qur'an that contain many meanings and concepts. That actually reveals the completeness of the Qur'an. So, DNA and its related science can also be known from this verse of the Holy Qur'an.

<sup>9</sup> "The Definition of Genetics." *Dictionary.com*. Retrieved October 25, 2018.

<sup>10</sup> "Genetics." *Britannica.com*. Retrieved from <https://www.britannica.com/science/genetics>.

<sup>11</sup> "Genetic Engineering." *Genome.gov*. Retrieved from <https://www.genome.gov/genetics-glossary/GeneticEngineering>.

<sup>12</sup> Roth, Stephanie Clare. "What is Genomic Medicine?" *Journal of the Medical Library Association*, University Library System, University of Pittsburgh 107, no. 3 (July 1, 2019): 442–448. Doi: 10.5195/jmla.2019.604. ISSN 1558-9439. PMC 6579593. PMID 31258451.

<sup>13</sup> "What is a Gene?" *Genome.gov*. Retrieved from <https://www.genome.gov/search?terms=what+is+gene>.

<sup>14</sup> "Genetic Engineering and Genome Editing: What's the Difference?" *DifferenceBetween.com*. Retrieved from <https://www.differencebetween.com/what-is-the-differencebetween-genetic-engineering-and-genome-editing/>.

سَنُرِيهِمْ آيَاتِنَا فِي الْأَفَاقِ وَفِي أَنْفُسِهِمْ حَتَّىٰ يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ ۖ أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَيْءٍ شَهِيدٌ<sup>15</sup>

“Soon We (Allah) will show them **Our signs in the horizons (of the universe) and in their own selves**, until it becomes manifest to them that this is the Truth. Is it not enough that your Lord witnesses all things?”

Therefore, it can be said that the discovery of Gene, DNA, RNA, their related science and so many other sciences that will be discovered later on are come under this umbrella term “**Our signs**” of the above-mentioned verse.

#### Quran sayings about Gene and Genetics

وَأَنَّهُ خَلَقَ الزَّوْجَيْنِ الذَّكَرَ وَالْأُنثَىٰ ۖ مِن نُّطْفَةٍ إِذَا تُمْنَىٰ<sup>16</sup>

“And that He creates the two mates the male and female from a sperm drop when it is emitted.”

And also, many other verses<sup>17</sup>, that shows the human being (male and female) is made up of sperm, while according to the scientists the inheritance and functional changes the occurs in the offspring are basically due to their parents’ genes which are lies in the sperms.

#### Quran sayings about Genetic engineering & Genome editing

وَالْخَيْلَ وَالْبِغَالَ وَالْحَمِيرَ لِتَرْكَبُوهَا وَزِينَةً وَيَخْلُقُ مَا لَا تَعْلَمُونَ<sup>17</sup>

"And [He created] horses, mules, and donkeys for you to ride and as adornment. And He creates that which you do not know."

And (He created) the horses, mules and donkeys for you to ride and (as) adornment. And He creates that which you do not know. With reference to genetic engineering and genome editing, this verse is clear and perhaps the only verse that can be found in the Qur'an, because in this verse, the sequence of mentioning the horse first, then the mule, and later the donkey, is very clear about the genetic engineering of the mule itself.

Because everyone knows that the mule is actually born from the mating of a donkey and a mare, and the last part of the verse clearly points to more such animals or creations that will come into existence in the future as a result of genetic modification. In the same way, if we consider further, the first and last part of the verse, in their connection, entry and sequence, reveal all such future creations, which are actually the result of a systematic and useful sexual process that will be describe through genetic engineering and genome editing.

#### Hadith sayings about Gene and Genetics

عَنْ أُمِّ سَلَمَةَ رَضِيَ اللَّهُ عَنْهَا قَالَتْ: جَاءَتْ أُمُّ سُلَيْمٍ إِلَى النَّبِيِّ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ، فَقَالَتْ: يَا رَسُولَ اللَّهِ، إِنَّ اللَّهَ لَا يَسْتَحْيِي مِنَ الْحَقِّ، هَلْ عَلَى الْمَرْأَةِ غُسْلٌ إِذَا احْتَلَمَتْ؟ فَقَالَ: نَعَمْ، إِذَا رَأَتْ الْمَاءَ. فَضَحِكْتُ أُمُّ سَلَمَةَ، فَقَالَتْ: تَفْضُحُ النِّسَاءُ! فَقَالَ: فِيمَ الشَّيْبَةُ؟ إِذَا عَلَا مَاؤُهَا مَاءَ الرَّجُلِ أَشْبَهَ الْوَلَدُ أَخَوَالَهُ، وَإِذَا عَلَا مَاءَ الرَّجُلِ مَاءَهَا أَشْبَهَ الْوَلَدُ أَعْمَامَهُ<sup>18</sup>.

“A woman said to the Messenger of Allah, may Allah’s prayers and peace be upon him: Should a woman perform ghusl (bath) if she has a wet dream and sees water? He said: Yes. And is the resemblance only from before that, when

<sup>15</sup> Ha Meem Al-Sajdah, 41:53.

<sup>16</sup> Al-Najm, 53:45-46.

<sup>17</sup> Al-Nahl, 16:4; Al-Kahf, 18:37; Al-Hajj, 22:5; Al-Mu'minun, 23:13-14; Fatir, 35:11; Ya-Sin, 36:77; Ghafir, 40:67; Al-Qiyamah, 75:37; Al-Insan, 76:2; Abasa, 80:19.

<sup>18</sup> Muslim ibn Hajjaj, Al-Qushiri. *Shahih Muslim* (Nishā pūr: Dār al Khilāfā Al Ilmīya, 1330 AH), 1: 2722.



her water is higher than a man's water, the boy resembles his maternal uncles, and if a man's water exceeds hers, he resembles his uncles."

From this it can be well understood that the Prophet (peace be upon him) was informed by revelation that the semen actually has the ability to transmit the characteristics of the parents to its offspring and today geneticists have also recognized this fact. Which is actually a proof of their own correctness, otherwise the teachings of Quran and Hadith are 100% correct.

### Hadith sayings about Genetic engineering & Genome editing

<sup>19</sup> "وانظر في أي نصاب تضع ولدك؛ فإن العرق دساس، وفي رواية: "تخبروا لنطفكم".

Means that you have to choose well your mate (for your semen) as (the hidden) characters can reappear.

Although the authenticity of this hadith has been ordered as Dhæef, but its meaning is supported by many other hadiths and the Qur'an itself, which at least brings it to the level of Hasan.

### Uses of Genetic engineering & Genome editing

Now, in the light of the above-mentioned Quranic verses and Ahadith, it is well known that genetic modification itself is a real process which is capable of transferring the hereditary characteristics present in the semen or seed. Now if genetic process is used in right direction keeping human benefit in mind, then it is a commendable and laudable process, below we examine some of its merits and demerits.

### Merits and De-merits of Genetic Engineering and Editing

#### 1. Improvement in Reproductive Health of Spouses

Genetic engineering or editing can be beneficial for couples struggling with infertility or low reproductive productivity. In such cases, these technologies can help improve fertility. However, it is essential to ensure that the sperm and eggs used are from the couple themselves, as using genetic material from external sources would not only be illegal but could also give rise to numerous social and ethical issues. <sup>20</sup>

#### 2. Impact on Agricultural Practices

In agriculture, the development of new seeds or genetically modified crops must be carefully evaluated for their safety and health impact. If the seeds are created through genetic engineering, it is crucial that they do not pose a risk to human or animal health. Creating crops with mixed genetic traits without considering potential health consequences could lead to various diseases, both physical and social, that affect humans and animals alike. <sup>21</sup>

#### 3. Ethical Considerations in Livestock Breeding

When conducting genetic research in livestock breeding, special attention must be paid to the hygiene and health of both human and animal species. For example, it is essential to ensure that the semen used for breeding halal animals does not come from forbidden animals. Otherwise, the products like milk and meat from these edited breeds could raise religious concerns and potentially lead to new health issues. <sup>22</sup>

<sup>19</sup> Muhammad ibn Ismail, Al-Bukhari. *Al-Sahih*, Kitab Ahadees Al-Anbiya, Hadith No: 3329, 256AH.

<sup>20</sup> Ali, Dr. Arif. *Al-Qadhaya Al-Fiqhiya fil Jinayat Al-Bashariyah min manzoor Al-Islami*. Al-Dirasaat Al-Fiqhiyah fi qadhayah Al-Tibbiyah Al-Muasarah, Dar Al-Nafais – Omman, vol. 2, p748.

<sup>21</sup> "How Diet Can Change Your DNA." *Scientific American*. Retrieved from <https://www.scientificamerican.com/custom-media/sciencefor-life/how-diet-can-change-your-dna/>.

<sup>22</sup> Ibid.

#### 4. Use of Genetically Edited Drugs and Body Parts

Genetic editing has been used to create drugs and body parts (e.g., livers, lungs, hearts) to treat various conditions. However, these should only be used when no other halal or chemically approved methods are available. It is also crucial that the drugs or body parts created through genetic editing are thoroughly tested to ensure they do not pose any health risks. Recent cases have shown that some genetically edited drugs have caused serious side effects, raising concerns about their long-term safety.

#### 5. Need for Qualified Experts and Ethical Oversight

The field of genetic engineering and editing requires careful handling by qualified and ethical experts. Improper use of this technology could lead to its misuse as a biological weapon. If misapplied, genetic knowledge could harm not only human life but also all living organisms, potentially leading to catastrophic consequences.<sup>23</sup>

#### Conclusion

Islam is a comprehensive way of life that provides guidance for all aspects of human existence, including science and technology. In recent decades, genetic engineering and genome editing have revolutionized various fields, particularly in medicine, agriculture, and biotechnology, offering significant benefits. These technologies allow manipulation of genes to correct defects and design traits, leading to profound possibilities. However, there has been a misconception that Islam opposes these advancements, primarily due to a lack of understanding of Islamic jurisprudential principles.

In reality, Islam does not categorically reject genetic interventions but encourages beneficial knowledge and innovation, provided they adhere to ethical values and do not transgress the boundaries of Shariah. This study aims to highlight that Islam is not against genetic technologies but stresses the regulation of their application to prevent harm and exploitation. By exploring Quranic principles, Hadiths, and scholarly opinions, the paper seeks to establish a balanced understanding of how Islam interacts with contemporary scientific developments in genetics.

#### Suggestions and Recommendations

- \* As a result of the above research, it has been concluded that beneficial genetic engineering and editing are not only legitimate but also a worthy practice.
- \* This technology has proven to be helpful in providing effective and successful solutions to various complex issues, not only in human life but also in the lives of animals and plants.
- \* It has also been effective in offering solutions for human nutritional benefits related to animals and plants.
- \* The beneficial use of this technology can be applied in the treatment of many human diseases. For example, the preparation of organs like blood, liver, hands, and feet in the laboratory can help prevent social crimes such as the kidnapping of humans for the purpose of organ harvesting.
- \* Similarly, with the aid of this technology, malnutrition can be controlled on a large scale.
- \* Effective treatments can be discovered for many diseases that are currently considered incurable.

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<sup>23</sup> "Impact of Genetic Research on Human Health." *Ahbab Trust*. Retrieved from <http://www.ahbabtrust.org/ojs/index.php/jicc/article/view/94>.

- \* If this technology is effectively protected and regulated, it can prevent future dubious crimes and ensure that its applications serve the greater good of humanity.



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