GENES: CERTAIN FATE OF HUMAN? – SCIENTIFIC AND DIVINITY PERSPECTIVES

GENLER: DEĞİŞMEZ BİR KADER Mİ? – BİLİMSEL VE İLAHİ YAKLAŞIMLAR

Asst. Prof. Dr. Selcen Çelik Uzuner

ORCID ID: orcid.org/0000-0002-9558-7048
Karadeniz Technical University, Faculty of Science, Department of Molecular Biology and Genetics

Abstract

DNA is the static genetic code of human that provides the source of his all characteristics. However, DNA can be altered by chemical modifications that promote flexibility of genetic code by the regulation of gene activation or inactivation. DNA modifications, in contrast to genetic mutations, are reversible and stimulated by environmental factors, such lifestyle. The field that investigates these modifications is Epigenetics. From the viewpoint of molecular biology, human is therefore authorized to manage his genetic code to some extent and these DNA modifications can represent free will of human; however DNA sequence represents the absolute will of God. In other words, God gives human a limited authorization and ability for controlling his fate. This article attempts to discuss whether our genes are controlled by ourselves in the light of current scientific findings, the related verses of Quran and philosophical approaches, and therefore aims to build a new bridge between science and religion.

Keywords: Epigenetics, Fate, Free Will, Absolute Will of God, Quran

ÖZ

la çıkarak genlerimizin insan iradesi tarafından yönetilebilirliğini tartışmak amacını taşımakta böylece bilim ile din arasında daha önceden kurulmamış bir bağ kurmayı hedeflemektedir.

**Anahtar Kelimeler:** Epigenetik, Kader, Cüzi İrade, Külli İrade, Kuran

1. **INTRODUCTION**

With the discovery of three-dimensional structure of DNA helix by Watson and Crick in 1953, genes early studied by Gregor Mendel have become more understandable. This shot has been followed by new discoveries on genes e.g., how genes work, how genes are inherited from parents, what the relationships between genes are and how genetic diseases occur. For a long time, scientists have believed that the genetic material, DNA, itself is the only responsible for defining all features of human such physical appearance, behaviors and cognitive functions. Although this idea is true to some extent, it suggests a rigid and certain fate which human cannot resist to. But an unchangeable fate can be in conflict with the common perspective of divine religions. For instance, according to holy Quran, human is created as being able to improve himself, in other words man is awarded by being able to change what he is. This, of course, does not indicate the changes in certain physical features, but points out intellectual properties of human. We know well that human is the most sophisticated species which means the ability of man to cognitively develop himself. Although the field “genetics” says that genes are tough to change, a new scientific field which has been born in recent years, Epigenetics, says that genes can be modified in order to environmental conditions. Epigenetics basically focuses on the chemical modifications in DNA structure which do not affect the gene sequence, and can explain the effect of environmental conditions on human’s genes. These conditions include socio-economic status such income and education, psychological status, and life routines, e.g., exercise, smoking, alcohol drinking and nutrition habits. These can change the way of genes’ working but not the gene sequence. This study attempts to answer whether our DNA is our certain fate or not from the scientific perspective, and what the Quran says about fate in terms of free and divine wills.

2. **GENETICS AND EPIGENETICS**

Genetics is a scientific field which aims to explain inheritance among generations. The early knowledge of Genetics is based on Mendelian laws. Gregor Mendel (1822-1884) was a monk and a botanist as well. He had experiments on peas to understand the heritable characteristics, and concluded some terms such “genetic crosses”\(^1\), “independent segregation”\(^2\) and “independent assortment”\(^3\). He had used these terms to explain how offspring looks similar or different to its ancestries. The inheritance of physical characteristics, namely phenotypes, was nominated by “dominant”\(^4\) and “recessive”\(^5\) features as being a “homozygous”\(^6\) or “heterozygous”\(^7\) (Miko, 2008: 134). Although Mendel is considered as a father of genetics, his experiments on inheritance of phenotypes were based on non-molecular methods. He described the inheritance principles of genes but could not suggest the molecular bases of this inheritance by genes.

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\(^1\) Genetic crosses: the principle explaining how features are inherited from maternal and paternal patterns.

\(^2\) Independent segregation: the principle explaining how forms (alleles) of a gene are independently separated.

\(^3\) Independent assortment: the principle explaining how different genes are independently inherited.

\(^4\) Dominant: a feature e.g. phenotype appeared by an alternative form of a gene which is influential in any way.

\(^5\) Recessive: a feature e.g. phenotype appeared by an alternative form of a gene which is not influential unless inherited with the same alternative form.

\(^6\) Homozygous: having the same forms of a gene for a feature.

\(^7\) Heterozygous: having the different forms of a gene for a feature.
After a century, improvement of molecular methodologies has started to enlighten “Genetics” since genes are not seen by eyes or microscopes (even by the electron microscope). The milestone is the discovery of DNA double-helix structure using X-ray diffraction method by James D. Watson (1928-…), Francis H. C. Crick (1916-2004) and Maurice H. F. Wilkins (1916-2004), and with this invention they were awarded Nobel Prize in 1962 (Watson, 1953: 737-738). This DNA structure provided the biggest part of “genetic puzzle”. Scientists have then focused on describing the structure of a gene in details, the function(s) of a gene, the relationships and interactions between genes and sequences of distinctive genomic regions and genes. These have been enriched by the comparisons of a gene in healthy and abnormal cells, hence awareness of mutations. The completion of “Human Genome Project” in 2003 conducted by a range of research collaborations under the supervision of Dr. Francis S. Collins has provided whole sequence of human DNA, in other words human’s genetic code. This second breakthrough of DNA molecule has opened the doors towards such gene therapy for genetic abnormalities. Although whole genome sequence map of human DNA has been revealed, there are still more questions which cannot be answered by classical genetics. The most interesting and outstanding question is how monozygotic\(^8\) (identical) twins can be different whereas their DNAs are almost 99.9% identical. Many people having identical twins around can say that these siblings are different concerning intelligence, personal interests and social beings. Epigenetics comes to help for explaining these differences.

Epigenetics is rather a new field. The prefix “Epi-” means “above” in ancient Greek, representing more information than provided by genetics, therefore it is “more than Genetics”. The research topic of epigenetics is DNA as well as genetics, but epigenetics focuses on the chemical changes in gene/DNA structure without sequence change, thus called as “Non-Mendelian Inheritance”. The epigenetic changes in DNA are described as “modifications” occurred by either addition or removal of chemical groups such methyl, hydroxyl, formyl and carboxyl (Kriaucionis, 2014: 1). In epigenetic principle, gene sequences do not change so that there are no mutations, but some chemical groups (above) can bind to genes and affect the way of genes’ working. In fact, the first epigenetic modification of DNA, called DNA methylation, was found in 1904 (Wheeler, 1904: 591), very earlier than Watson-Crick’s model. However, the biological meaning of this chemical modification of DNA has been revealed thereafter. DNA methylation has now been known well to regulate gene expression (Simonsson, 2005: 513) depending on the location of methylation within a gene (Ball, 2009: 485, Ziller, 2013: 477). The latterly described modifications, DNA hydroxymethylation, DNA formylation and DNA carboxylation, are found to mostly associate with gene activation (Wu, 2011: 681, Neri, 2015: 677) yet the understanding on their function is limited. Briefly, genes are there with no change themselves, but modifying groups manipulate genes whether work actively or get silence. There are also epigenetic modifications on proteins, i.e. histones, which are packaging DNA molecule to promote its fitting into a nucleus of a cell. These are mainly methylation and acetylation, and they have been known to involve in regulating genes via such activating or inactivating as well (Song, 2011: 2127-2128, Wongtawan, 2011: 1878, Sadakierska-Chudy, 2015: 89-93). Epigenetics therefore seek to answer(s) whether our genes manage us or we manage our genes or both.

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\(^8\) Monozygotic (identical) twins: twins that are formed by the division of one cell, zygote, after fertilization.
3. HUMAN ACCORDING TO EPIGENETIC DYNAMISM

Epigenetic modifications of genes are reversible in contrast to genetic mutations. A vast amount of epigenetic modifications is facultative that means being subject to dynamic changes during life. We can classify this epigenetic dynamism according to (1) non-selectable or (2) selectable life conditions by human himself. (1) For instance, non-selectable and unchangeable conditions such as age (Fuke, 2004: 198, Subramanyam, 2013: 3, Wagner, 2015: 12512), race and gender (Pogribny, 2004: 1257, Zhang, 2011: 624-627, Subramanyam, 2013: 3) can affect the epigenetic patterns of human resulting in inter-individual differences. Epigenetic dynamism can be also affected by selectable and changeable (environmental) factors (2); socioeconomic status such education and income, psychological status, and life routines, e.g., exercise, smoking, alcohol drinking and nutrition habits. The pattern of DNA methylation between healthy and unrelated individuals can vary (Bock, 2008: 5), that is mostly in relation to these environmental conditions (Christensen, 2009: 9, Batra, 2010: 429, Guida, 2015: 2350). The main topic of this article is to discuss the effects of selectable and changeable environmental factors by human himself on human genome variety.

Here, the some noticeable examples are to clarify the fact. A research group studied DNA methylation status of some genes in identical twins whose intelligence levels were different, and has found significant varieties in DNA methylation profiles of some genes between the twins. The level of DNA methylation has also correlated with inactivation of those genes (Yu, 2012: 5). This indicates that DNA methylation plays a critical role for explaining intelligence differences between identical twins. The variety in DNA methylation pattern gets more remarkable when identical twins live apart and have dissimilar daily routines (Fraga, 2005: 10606). In addition to twins, schooling year is associated with more methylation in unrelated people (McGuinness, 2012: 154-155). The interesting finding that low-educated mothers induced more methylation in a diabetes-related gene of their 17 months-old babies (Obermann-Borst, 2012: 317) suggests that the maternal education can be also definitive for regulation of children’s genes even if babies are not within in the uterine. In other words, education of your mother can be as effective as your own educational level in terms of affecting your genes. The impact of parental care is very impressive as adult DNA methylation was also found to be affected by childhood socioeconomic status (Borghol, 2012: 67).

Work environment can also have an effect on epigenetic pattern of genes. For instance, people working in a high stressed-environment showed a minimized methylation of a gene which is related to have a tendency towards emotional defects (Alasaari, 2012: 2). An identical twin that both are chemical engineer but work at different environment conditions has been studied for DNA methylation, and one who exposed to pesticide during work had a decreased DNA methylation in neurons associated with Alzheimer’s. But the unexposed twin had a normal profile (Mastroeni, 2009: 3).

Methylation level of a DNA region was decreased in people with drinking alcohol habits (Zhu, 2012: 129), and also in people exposed to significant amount of traffic particles (Baccarelli, 2009: 575). However, wealth and income statuses of people have been shown to correlate to increased methylation of this genomic region (Subramanyam, 2013: 3). Diet can also affect the epigenetic pattern. Examples include that berry consumption can alter a liver-specific gene’s methylation (Heyman-Linden, 2016: 89), that high fructose 9 Mothers aged 28-34, max 12 years educated and smoking as well.
10 INISGF gene, involves in insulin metabolism.
11 SLC6A4 gene, encoding a serotonin transporter, related to obsessive-compulsive disease.
12 Alu region, a repetitive sequence of DNA which involves in gene regulation.
(a sugar) also encourages methylation of some genes in liver (Ohashi, 2015: 187) and that folic acid intake during conception of pregnancy can determine neonatal DNA methylation (Gonseth, 2015: 1167).

The important thing is that these epigenetic modifications can be reversible so that people can manage this reversibility as improving their life styles. This fact emphasizes the divergence of epigenetics compared to genetics. For instance, the methylation of some genes was changed with smoking, but their methylation profiles returned back to the times without smoking after quit smoking (Guida, 2015: 2350) suggesting the ability of interference of human with his gene structures to some extent. However, genetic mutations cannot be reversed.

DNA molecule in other creatures, plants (Karan, 2012: 2-3, Hu, 2015: 3-4) and other mammals such mice (Kovalchuk, 2004: 78-80, Wagner, 2015: 12512) can also undergone epigenetic alterations according to environmental conditions, like in human’s. The considerable point is that those cannot response the changes with awareness and consciously select the environment but human can.

4. HUMAN ACCORDING TO RELIGION (QURAN’S PERSPECTIVE)

The most emphasized doctrine of Quran is that human must think about the One the Absolute God (Tawhid), the meaning and reasons of life and the certain justice. God speaks to only human via all the verses, not to any other creatures. The importance of human is clearly stated in al-Isra;

“We have honored the Children of Adam, and carried them on land and sea, and provided them with good things, and greatly favored them over many of those We created.” al-Isra13 (17):70

The meaning of word “fate” in dictionary is stated as “the cause, force, principle, or divine will that predetermines events”14 and “the development of events outside a person’s control, regarded as predetermined by a supernatural power”15. In Quran’s doctrine, it basically means that God surely know everything which did happen, has happened and will have happened in details. This is naturally expected when the One God exists and continuously creates circles of biotic and abiotic life. All is under control of God. He does not create only but also manage everything after creation in a well-organized system as stated in the Quran:

“God created you from dust, then from a small drop; then He made you pairs. No female conceives, or delivers, except with His knowledge. No living thing advances in years, or its life is shortened, except it be in a Record. That is surely easy for God.” Fatir17 (35):11

“To Him is referred the knowledge of the Hour. No fruit emerges from its sheath, and no female conceives or delivers, except with His knowledge. And on the Day when He calls out to them, “Where are My associates?” They will say, “We admit to you, none of us is a witness.” Fussilat18 (41):47

“Everything We created is precisely measured.” al-Qamar19 (54):49

“Say, “Nothing will happen to us except what God has ordained for us; He is our Protector.” In God let the faithful put their trust.” at-Tawbah20 (9):51

“No soul can die except by God’s leave, at a predetermined time…” Ali ’Imran21 (3):145

13 English Translation from the original Arabic language of Quran: The Night Journey
14 http://www.yourdictionary.com/fate
15 http://www.oxforddictionaries.com/definition/english/fate
16 God has absolutely no gender. But there is no pronoun for this in English (“it” cannot be used) so that it is translated as “he” from its original Arabic language, and called as “he” in general.
17 Eng. Translation: Originator
18 Eng. Translation: Detailed
19 Eng. Translation: The Moon
20 Eng. Translation: Repentance
21 Eng. Translation: Family of Imran
“He regulates all affairs, from the heavens, to the earth. Then it ascends to Him on a Day the length of which is a thousand years by your count.” as-Sajdah\(^{22}\) (32):5

“For every nation is an appointed time. And when their time has come, they cannot delay it by one hour, nor can they advance it.” al-A’raf\(^{23}\) (7):34

“...God knows what the hearts contain.” Ali ‘Imran (3):154

“God abolishes whatever He wills, and He affirms. With Him is the source of the Scripture.” Ibrahim\(^{24}\) (14):39

These verses indicate that God has the all authority, called as “divine will”. However, this does not mean that human is not allowed to have “free will” to influence his life by his choices. God declares the free will of human in Quran by many verses. Some examples are as follows:

“And that the human being attains only what he strives for.” an-Najm\(^{25}\) (53):39

“Certainly you are accountable for what you do.” an-Nahl\(^{26}\) (16):93

Human can determine what he will be experiencing in his life. In other words, human is capable of being causes for the results, to some degree.

“Whatever misfortune befalls you, it is because of what your hands have earned; and yet He pardons much.” ash-Shura\(^{27}\) (42):30

“Whoever acts righteously does so for himself; and whoever works evil does so against himself.
Your Lord is not unjust to the servants.” Fussilat (41):46

“Whoever does the smallest good deed shall experience the result of it, and whoever does the slightest evil deed shall experience the result of it.” az-Zalzalah\(^{28}\) (99):7 – 8

“Let them laugh a little, and weep much; in recompense for what they used to earn.” at-Tawbah (9):82

Human is also set free to believe in God or not. This, of course, suits well with certain justice of God. Otherwise, no one can be judged whatsoever.

“Say, “Believe in it, or do not believe.” Those who were given knowledge before it, when it is recited to them, they fall to their chins, prostrating.” al-Isra (17):107

“Say: “The truth is from your Lord. Let him who will, believe, and let him who will, reject (it)...”” al-Kahf\(^{29}\) (18):29

There is a strong relationship between God’s will and free will, and human is not burdened by more than his capacity. God always desires the best for human so that he encourages human to do best.

“...God does not change the condition of a people until they change what is within themselves.

And if God wills any hardship for a people, there is no turning it back, and apart from Him they have no protector.” ar-Ra’d\(^{30}\) (13):11

“We never burden any soul beyond its capacity. And with Us is a record that tells the truth, and they will not be wronged.” al-Mu’minun\(^{31}\) (23):62

“Whatever good happens to you is from God, and whatever bad happens to you is from your own self. We sent you to humanity as a messenger, and God is Witness enough.” an-Nisa’\(^{32}\) (4):79

“And every man: We have fastened his action round his neck, and We shall bring forth unto him on the Day of Judgment a book proffered him open.” al-Isra (17):13

5. DISCUSSION

\(^{22}\) Eng. Translation: Prostration
\(^{23}\) Eng. Translation: The elevations
\(^{24}\) Eng. Translation: Abraham
\(^{25}\) Eng. Translation: The Star
\(^{26}\) Eng. Translation: The Bee
\(^{27}\) Eng. Translation: Consultation
\(^{28}\) Eng. Translation: The Quake
\(^{29}\) Eng. Translation: The Cave
\(^{30}\) Eng. Translation: Thunder
\(^{31}\) Eng. Translation: The Believers
\(^{32}\) Eng. Translation: Women
This is rational that if there is Only One God, he authorizes everything for sure. The context of divine will, particularly in monotheism, therefore appears clearer than free will’s. There are different philosophical ideas about the existence of free will and, if it exists, what the borders of human’s free will are being discussed. The thoughts are based on two main arguments: incompatibilism and compatibilism (Table 1) (Shadlen, 2012: 2). Incompatibilism includes “hard determinism”, “hard incompatibilism” and “libertarianism”. Hard determinist theory suggests that if determinism is true no human action therefore should be free. However, the libertarian argument supports that determinism is false and free will is true. Hard determinism and hard incompatibilism approaches do not agree with moral responsibility of human, but libertarian approach agrees. Compatibilists argue that human has free will and has all responsibility for his actions. Compatibilism is also called “soft determinism” (Table 1).

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<th>Determinism</th>
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<td>False</td>
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<td>Incompatibilism</td>
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Table 1. Philosophical approaches on determinism and free will

The foremost philosophers supporting compatibilism are Thomas Hobbes (1588-1679), David Hume (1711-1776) and Harry Frankfurt (1929-…). Hobbes and Hume argued that human is free for his acts unless preventing by exterior impediments (McKenna, 2015: 1-27). This idea can be parallel with God’s power for letting human not to actualize his wishes. They also believe that human is free for his acts and the context of divine will, particularly in monotheism, therefore appears clearer than free will’s. There are different philosophical ideas about the existence of free will and, if it exists, what the borders of human’s free will are being discussed. The thoughts are based on two main arguments: incompatibilism and compatibilism (Table 1) (Shadlen, 2012: 2). Incompatibilism includes “hard determinism”, “hard incompatibilism” and “libertarianism”. Hard determinist theory suggests that if determinism is true no human action therefore should be free. However, the libertarian argument supports that determinism is false and free will is true. Hard determinism and hard incompatibilism approaches do not agree with moral responsibility of human, but libertarian approach agrees. Compatibilists argue that human has free will and has all responsibility for his actions. Compatibilism is also called “soft determinism” (Table 1).

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er, John Martin Fischer argues “semi-
compatibilism” that moral responsibility is
compatible with determinism regardless hu-
man has free will or not, and he also suggests
agnosticism about the existence of human’s
free will (Fischer, 1994: 278, Fischer, 2002: 281-
308). In other words, it can mean that even if
human has no free will, still is responsible for
his actions, which is opposite to Frankfurt’s
theory. To me, Fischer’s approach sounds not
logical at all. This is also inconsistent with the
sense of justice and God’s justice system.

In Frankfurt’s theory, there are levels
of free will represented by a hierarchical
model (Frankfurt, 1971: 5-20). He defines de-
sires as “first-order” or “second-order”. Bas-
ically, “first-order desire” means a wish for
something, but “second-order desire” means
to wish for a wish and vice versa. From
Quran’s viewpoint, both desires of human are
possible, and can be considered within the
fact of having free will. Compatibilism theory,
as by Frankfurt, appears to be compatible
with the human’s will stated in Quran. On the
other hand, incompatibilism theory can repre-
sent God’s will. However, as mentioned
above, human has free will and can act ac-
cording to his wills but it is not completely
free from God’s will. God’s determination is
on top of any will (Figure 1). This is also con-
sistent with Holy Bible as it states “The heart of
man plans his way, but the Lord establishes his
steps” (Proverbs 16:9) and “Many plans are in a
man’s heart, But the counsel of the LORD will
stand” (Proverbs 19:21). God gives authority
to human for choosing life in Bible (Deuter-
onomy 30:19, 20) as well as in Quran.

6. CONCLUSIONS
This is assured that divine scriptures
are not in scientific context and these do not
aim to declare scientific facts or findings.
Thus, there are ongoing debates whether sci-
ence can be in relationship with religious af-
fairs, and whether it is possible and necessary
to bridge these two. Science just seeks the
truth by experimental approaches while reli-
gion already declares the truth combined with
suggestions to human. Scientific findings can
be falsifiable, but religious facts cannot. How-
ever, from the monotheist viewpoint, there
should not be a conflict between science and
religion because both are created by the only
One God suggesting that there should be a
way to connect these.

According to Quran, human can im-
prove himself intellectually, physically and
emotionally, in other words man is able to
growth his mindset and to govern his life-
tyle. These represent self-determination of
human by his own cognition (free will). How-
ever, it highly depends on the absolute will of
God (determinism) (Figure 1). This opinion
can be exemplified by current epigenetic
knowledge that God gives human a degree of
fixed fate on their DNA (determinism) but
also authorize them to manage and modify
their DNA (free will). At this point, epigenet-
ics is a candidate scientific field to compro-
mise a fixed DNA fate by science and a flexi-
ble fate by theological doctrines, therefore can
be included in “soft determinism” approach
(Table 1).

In conclusion, human is responsible
for his actions, and his actions are determined
by his free wills. However, the boundaries of
free will are determined by the absolute will
of God. DNA sequences of genes are one of
the examples for God’s absolute will and epi-
genetic modifications on DNA are considered
as human’s free will.
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