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MAINTAINING BODY'S HORMONAL-GENETIC SYNERGY PROLONGS HUMAN LIFE

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ABSTRACT

With age, mutations and damage to DNA accumulate, disrupting the normal functioning of cells, the hormonal and genetic systems, and the body as a whole. The synergy between the hormonal and genetic systems and the body's energetic connection with nature are disrupted. This leads to accelerated aging. As the body ages, cells lose their ability to divide due to the fraying of chromosome ends, which shorten with each division. The lifespan of cells and the body itself is shortened. The future of healthcare lies at the intersection of genetic and hormonal technologies. The integration of genetic and hormonal technologies has ushered healthcare into a new era of precision medicine. From understanding the complex signaling pathways of auxins and neurons to harnessing the regulatory functions of hormones, researchers have unlocked the potential of the genome and endocrine system. By harnessing the potential of hormonal and genetic synergies, new horizons are opening up in personalized medicine, treating diseases, improving the human body, slowing aging, and extending human life. Precision personalized medicine utilizes hormonal regulation of genes and genetic regulation of hormones through the correction of genomic DNA to prolong human life through the synergy of hormonal and genetic systems.

1. Introduction

Human life extension is considered within the context of the aging process. Human aging is a complex and individual process that can begin at different times depending on genetics, lifestyle, health, and the environment. Generally, it is believed that the first signs of aging begin to appear around age 30-40. However, specific changes can appear earlier or later, and their nature depends on a variety of factors:

- Physiological changes: decreased skin elasticity, decreased muscle mass, decreased metabolic activity.
- Biochemical processes: accumulation of cellular damage, decreased mitochondrial function, changes in hormone levels.
- Cognitive and emotional aspects: deterioration of memory and attention, psychological changes.

Accelerated aging shortens human life. The biological process of aging is a complex and multifactorial set of changes that occur at the cellular, tissue, and systemic levels over time. It involves a combination of hormonal and genetic changes that lead to a gradual deterioration of bodily functions and an increased risk of disease. The first signs of aging begin to appear at age 30. Let's consider the main aspects of this process:

1. Mechanisms and stages of aging:

- Cellular senescence: cells lose the ability to divide, which is called cellular senescence. This occurs due to the wear and tear of telomeres—the ends of chromosomes that shorten with each division. When telomeres become too

short, cells stop dividing and may die or enter a state of senescence.

- Cellular senescence: a condition in which cells stop dividing but remain metabolically active, releasing signals that cause inflammation and damage to surrounding tissues.
 - DNA Damage: With age, mutations and damage to DNA accumulate due to exposure to oxidative stress, radiation, and other factors, disrupting normal cellular function.
 - Oxidative Stress: The accumulation of free radicals (reactive oxygen species) damages lipids, proteins, and DNA, contributing to aging.
 - Metabolic Disorders: Changes in metabolism, decreased energy efficiency, and mitochondrial function lead to decreased energy and increased stress.
 - Inflammation (Chronic): With age, chronic low-grade inflammation develops, contributing to tissue damage and the development of age-related diseases.
 - Weakening of Regenerative Processes: A decrease in the body's ability to repair damaged tissues and organs.
- ### 2. Primary Molecular and Cellular Changes:
- Decreased telomere function and shortening.
 - Impaired mitochondrial function and decreased energy production.
 - Increased oxidative activity and damage to cellular components.
 - Disruptions in protein systems and waste removal systems (proteasomes and autophagy).
 - Changes in hormonal systems.

- Epigenetic changes affecting gene expression.

3. Consequences of biological changes:

- Weakening of the immune system.
- Slowing of tissue repair and regeneration processes.
- Increased susceptibility to diseases such as cardiovascular disease, diabetes, neurological disorders, and cancer.
- Decreased muscle mass and bone density.
- Disruptions in organ and system function leading to a decrease in overall quality of life.

4. Impact of environmental and lifestyle factors:

- Smoking, poor diet, stress, lack of physical activity, and environmental factors accelerate the aging process.
- A healthy lifestyle can slow these processes and prolong active longevity.

Thus, aging is the integration of numerous biological processes that lead to a gradual deterioration of body functions. Modern research continues to seek ways to slow or reverse some of these changes to improve quality and longevity.

The author of the article proposes maintaining the body's hormonal-genetic synergy as a way to extend human life [1].

Melatonin, an endocrine hormone of the pineal gland, can directly neutralize free radicals as a potent antioxidant [2–3]. Melatonin regulates the activity of antioxidant enzymes. Clinical trials have shown that melatonin is effective in preventing cellular damage in diseases such as metabolic and neurodegenerative diseases, cancer, inflammation, and aging. Its global effects on oxidative stress, as well as its

rhythmicity, which plays a role in a number of metabolic functions, make melatonin attractive for improving public health.

Longevity has a genetic basis [4–7]. Longevity is a complex polygenic trait influenced by the interaction of multiple genetic variants, as demonstrated by several genetic studies conducted in recent years. A study of centenarians from different regions found an association between the APOE (apolipoprotein E) gene and lifespan.

Advances in molecular genetics, endocrinology and neuro-imaging start to unravel the relationships between genes, hormonal status, cognition and functional brain regions and to build new bridges between molecular, cellular and neuro systems levels in humans.

Maintaining hormonal and genetic synergy in the body is an effective way to extend human life to 120 years (Genesis 6:3). Personalized medicine, which uses genetic and hormonal information to develop individual life extension protocols, holds promise [8-9]. Modern research confirms that the interaction between hormonal systems and genetic factors plays a key role in regulating aging processes.

Advances in molecular genetics, endocrinology, and neuroimaging are beginning to reveal relationships between genes, hormonal status, cognitive function, and functional areas of the brain, as well as establishing new links between the molecular, cellular, and neural levels of systems in humans.

Modulation of these pathways is a promising avenue for the development of hormonal and genetic therapies that

could slow aging and extend human lifespan [10].

2. Research on hormonal-genetic synergy for human longevity extension

Research on hormonal-genetic synergy for human longevity extension is a cutting-edge field in the biology of aging and gerontology. It aims to understand how the interaction of hormonal systems and genetic mechanisms influences aging processes and longevity. Key research areas include:

1. Hormonal regulators of aging:

- Study of the role of hormones, such as insulin-like growth factor-1 (IGF-1), growth hormone, testosterone, estrogens, melatonin, and others, in regulating aging processes.

- Determining how changes in the levels of these hormones affect lifespan and health in old age.

2. Genetic mechanisms and their interactions with hormones:

- Analysis of genes associated with longevity (e.g., genes involved in metabolism, cellular repair, and stress responses).

- Studying how hormonal signals modulate the activity of these genes, creating synergistic effects that promote longevity.

3. Models of life extension based on hormonal and genetic interventions:

- Animal experiments show that altering hormone levels or genetic modification can increase lifespan.
- Potential for applying these approaches to humans.

4. Therapeutic strategies:

- Development of hormonal therapies aimed at balancing hormonal systems to slow aging.

- Using gene therapy to modulate key genes associated with longevity.

5. Personalized approaches:

- Studying individual genetic and hormonal profiles to develop personalized lifespan extension methods.

Despite significant progress, many of these studies are in the early stages, and their application in clinical practice requires additional testing and the development of safe methods. However, understanding hormonal and genetic synergies opens the prospect of creating new strategies to combat age-related diseases and extend human lifespan.

Maintaining hormonal, genetic, and biochemical harmony in the body is considered an important factor in prolonging human life. Here are some aspects related to this statement:

6. Hormonal Balance:

- Hormones regulate many bodily functions, including metabolism, immunity, tissue repair, and psycho-emotional state. For example, balanced levels of hormones such as testosterone, estrogen, insulin, growth hormone, etc. help maintain health and prevent age-related diseases.

7. Genetic Stability:

- Genetic makeup determines susceptibility to various diseases, as well as the aging process. Maintaining genetic integrity and reducing the influence of factors that cause mutations contributes to a longer and healthier life [11-12].

8. Biochemical Synergy:

- The interaction of various biochemical processes within the body—metabolism, antioxidant systems, immune responses—is important for protecting cells and

tissues from damage associated with aging and disease.

9. Modern approaches:

- Biomedical research is aimed at developing methods for regulating hormonal levels, genetic therapy, and improving metabolic processes to increase life expectancy and quality of life.

3. Diagnosis of Hormonal-Genetic Synergy

Diagnosis of hormonal-genetic synergy in the body includes a range of studies aimed at assessing hormonal genetic factors and their interactions that affect the health and development of the body. The main areas and methods of diagnosis are listed below:

1. Hormonal studies:

- Blood and urine tests for hormone levels (e.g., thyroid, sex hormones, pituitary, and adrenal).
- Stimulant and suppressive tests to assess endocrine gland function.

2. Genetic testing:

- DNA analysis (e.g., sequencing, polymorphism studies) to identify genetic variants affecting hormonal balance.
- Research on hereditary diseases and predispositions.

3. Assessment of the interaction of hormonal and genetic factors:

- Study of gene expression associated with hormonal regulation.
- Analysis of biomarkers reflecting the functional state of the hormonal system.

4. Instrumental methods:

- Ultrasound examination of endocrine organs.
- MRI and other imaging techniques if necessary.

- Examination by an endocrinologist, geneticist, and other specialists to interpret the results and prescribe further testing.

It is important to remember that diagnostics should be performed under the guidance of qualified specialists to correctly interpret the results and determine treatment or prevention strategies.

4. Synergy of the Hormonal and Genetic Systems

4.1 Hormonal Correction and Genome Regulation

Hormonal correction and genome regulation are areas of biological and medical research related to the effects of hormones on genetic activity and the modification of the body's genetic material [10].

Hormonal correction involves the use of hormones or drugs that affect hormonal levels to treat various diseases associated with hormonal system disorders (e.g., hypothyroidism, hypogonadism, hormonal imbalances). It helps restore normal hormone levels and improve the function of organs and systems.

Genome regulation is the process by which gene activity is controlled or modified. This can occur through epigenetic mechanisms (modification of DNA and histones), regulatory RNAs, transcription factors, and other means. Modern methods, such as genome editing (e.g., CRISPR-Cas9), enable targeted modification of DNA sequences to correct inherited diseases or modify traits.

Together, these areas enable the development of new approaches to therapy, prevention, and understanding of complex biological processes associated with hormonal regulation and the body's genetic information.

4.2 Genetic Correction and Hormone Regulation

Genetic correction and hormone regulation are areas of biomedicine and molecular biology aimed at modifying the body's genetic information to restore or improve the function of the hormonal system.

Genetic correction involves the use of genome editing techniques (e.g., CRISPR-Cas9) to correct mutations or defective genes responsible for impaired hormone synthesis or regulation. This allows for the treatment of inherited diseases associated with hormonal dysfunction, such as hypothyroidism, hypogonadism, and others.

Hormonal regulation refers to the processes by which genetic mechanisms control the synthesis, secretion, and action of hormones. Research in this area enables the development of methods for targeting genes that regulate hormone levels, facilitating more precise treatment and prevention of diseases associated with hormonal imbalances.

Modern approaches include gene therapy, epigenetic modifications, and the use of genetic engineering to adjust hormone levels and their interactions in the body. This opens up prospects for more effective treatment of hormonal and metabolic disorders.

4.3 Synergy of Hormonal Genome Regulation and Genetic Hormonal Correction

Synergy of hormonal genome regulation and genetic hormone correction is an integrated approach in modern biomedicine that combines hormonal regulation mechanisms with the capabilities of genetic engineering to achieve more effective results in the treatment and prevention of diseases. Key aspects of this synergy include:

1. Multilevel regulation:
 - using knowledge of how hormones influence gene expression to target the gene circuits that regulate hormone synthesis and secretion.
2. Genetic correction to restore hormonal balance:
 - correcting mutations or defective genes responsible for hormonal dysfunction, thereby eliminating the underlying causes of the imbalance.
3. Hormonal modulations to enhance the effectiveness of gene therapy:
 - using hormonal drugs or methods that stimulate or suppress specific gene pathways to enhance the effectiveness of genetic interventions.
4. Personalized approach:
 - combining genetic information and the patient's hormonal profiles to develop individualized therapeutic strategies.
5. Synergy benefits:
 - More precise and effective treatment of diseases associated with hormonal disorders.
 - Possibility of correcting both genetic defects and hormonal imbalances within a single strategy.
 - Improving the prognosis and quality of life of patients through a comprehensive approach.

Thus, the integration of hormonal regulation with genetic correction opens new horizons in medicine, enabling the development of more targeted and personalized therapies to maintain the body's hormonal and genetic balance.

Hormonal-genetic balance plays a key role in maintaining the body's health. It regulates the synthesis and activity of various proteins and enzymes necessary for normal physiological processes. Hormones interact with genes, controlling their expression, which influences the production of specific proteins and enzymes, ensuring the proper functioning of organs and systems. Disruption of this balance can lead to the development of various diseases, so maintaining it is important for overall health and harmony in the body.

The set of proteins and enzymes that maintain hormonal-genetic balance includes a variety of molecules that regulate the synthesis, activity, and interaction of hormones, as well as gene expression. These include:

1. Hormone-regulatory proteins—for example, hormone receptors (glucocorticoid, thyroid, and gonadal receptors), which recognize and transmit signals.
2. Enzymes involved in hormone synthesis—such as steroidogenic enzymes (e.g., the CYP450 family), which catalyze the conversion of precursors into active hormones.
3. Carrier proteins—transport proteins that ensure the movement of hormones through the blood and within cells (e.g., thyroid hormone-binding globulins).
4. Enzymes that regulate gene expression—e.g., transcription factors involved in the activation or repression of

genes associated with hormonal regulation.

5. Target proteins—structural proteins acted upon by hormones, initiating physiological responses.

This complex of proteins and enzymes creates a dynamic system that ensures the stability of hormonal-genetic balance, health of the body and longevity.

A diet that supports the body's hormonal and genetic balance should be balanced and rich in essential nutrients that promote normal hormonal function and regulate genetic activity. The basic principles of such a diet include:

1. Balance of proteins, fats, and carbohydrates:
 - Proteins: sources of amino acids necessary for the synthesis of hormones and enzymes (e.g., meat, fish, eggs, legumes).
 - Fats: especially beneficial omega-3 and omega-6 fatty acids involved in hormone synthesis (e.g., fish oil, flaxseed oil, nuts).
 - Carbohydrates: primarily complex, low-glycemic index carbohydrates (whole grains, vegetables, fruits).
2. Vitamins and minerals:
 - B vitamins (including B6, B12), vitamin D, and vitamin E are important for hormonal regulation.
 - Magnesium, zinc, and selenium are involved in the synthesis and regulation of hormones and genes.
3. Antioxidants:
 - Fruits and vegetables rich in antioxidants help reduce oxidative stress and support cellular health.
4. Limiting Unhealthy Foods:

- Eliminating trans fats, excessive sugar, and processed foods from your diet, which can disrupt hormonal balance.

5. Regular Eating:

- Maintaining stable blood sugar and hormone levels through a balanced diet.

6. Hydration:

- Adequate water intake for optimal functioning of all body systems.

A balanced diet helps normalize hormone levels, maintain gene activity, and stabilize hormonal-genetic balance, which is important for maintaining health and longevity.

4.4 Hormonal-Genetic Balance and Longevity

Hormonal-genetic balance plays a crucial role in the aging and longevity processes [11-12]. It involves the interaction of various hormones and genetic mechanisms that regulate metabolism, regenerative processes, the immune system, and other physiological functions. Key aspects of the relationship between hormonal-genetic balance and longevity:

1. Hormonal Balance and Aging:

- With age, levels of certain hormones, such as growth hormone, testosterone, estrogen, and thyroid hormones, decrease. This can contribute to a slowdown in metabolic processes, a decline in the body's regenerative capacity, and the development of age-related diseases.
- Maintaining optimal hormone levels helps preserve muscle mass, bone density, improve metabolism, and overall well-being.

2. Genetic Mechanisms and the Regulation of Longevity:

- Genetic predisposition influences the rate of aging and susceptibility to certain diseases. For example, genes regulating metabolism, stress responses, and cell cycle function may promote longer lifespan under certain conditions.

- Research shows that activation of certain genetic pathways, such as those involving signaling molecules and active proteins (e.g., sirtuins), is associated with increased lifespan.

3. Interactions between Hormones and Genetics:

- Hormones regulate gene expression, which influences the aging process. For example, hormonal changes can activate or suppress genes associated with cellular regeneration, oxidative stress, and apoptosis.

- Maintaining hormonal and genetic balance helps slow age-related changes, increase resilience to stress, and reduce the risk of chronic diseases.

4. Practical Approaches to Maintaining Balance:

- A healthy diet, physical activity, stress management, and proper sleep patterns help normalize hormonal levels. Modern methods, such as hormone replacement therapy or genetic testing, can help correct imbalances to improve quality of life and lifespan.

Hormonal and genetic balance is a key factor determining the rate of aging and lifespan. Maintaining harmony in these systems promotes healthy body functions and active longevity. To achieve this, it is important to maintain a healthy lifestyle, monitor your health, and, if necessary, utilize modern medical approaches to support the body's hormonal and genetic synergy.

4.5 Hormonal-Genetic Synergy in the Body

Hormonal-genetic synergy in the human body is the interaction and interdependence of hormonal processes and genetic information, which ensures the coordination of physiological functions and the maintenance of homeostasis [13-18]. Key aspects:

1. Hormones as regulators of gene activity:

Hormones affect cells by activating or suppressing the expression of certain genes. For example, thyroxine (thyroid hormone) influences metabolism and stimulates genes responsible for energy metabolism.

2. Genetic predisposition and hormonal responses:

Genetic characteristics determine the sensitivity of receptors to hormones, the level of hormone synthesis, and their metabolism. For example, variations in the genes encoding insulin receptors can influence the predisposition to diabetes.

3. Feedback between genes and hormones:

Hormones regulate gene activity, and genes, in turn, encode proteins involved in hormone synthesis, their receptors, and metabolism, creating complex regulatory chains.

4. Hormonal-genetic adaptation:

In response to external and internal changes, the body uses its genetic program and hormonal regulation to adapt—for example, stress increases cortisol levels, which influences the expression of numerous genes associated with metabolism and immunity.

Overall, hormonal-genetic synergy allows the body to effectively respond to

environmental changes, ensuring development, growth, reproduction, and survival at the cellular and systemic levels, increasing cell lifespan, and extending human lifespan to 120 years.

5. Conclusion

Living to 120 years of age while maintaining hormonal and genetic synergy and balance requires a comprehensive approach that includes health, lifestyle, and the environment. Here are the key factors that contribute to a long and healthy life:

1. Healthy eating:

- A diet rich in vegetables, fruits, nuts, fish, and whole grains.
- Limiting processed foods, sugar, trans fats, and dyes.
- Maintaining a balanced diet and moderating portion sizes.

2. Regular physical activity:

- Regular exercise (walking, swimming, calisthenics, aerobics, etc.).
- Maintaining muscle mass and flexibility, which promotes mobility and disease prevention.

3. Psychological resilience and social connections:

- Maintaining a positive outlook and stress resistance.
- Actively engaging in social activities with loved ones and friends.
- Participation in volunteer activities or hobbies.

4. Quality sleep and rest:

- Regular and sufficient sleep.
- Recuperation and avoidance of chronic stress.

5. Disease prevention and timely treatment:

- Regular medical checkups.

- Monitoring blood pressure, cholesterol, and blood sugar.
- Vaccinations and infectious disease prevention.

6. Avoiding bad habits:

- Smoking, alcohol, and drug abuse.

7. Environmental cleanliness and a healthy environment:

- Clean air, water, and a safe environment.
- Minimizing exposure to toxins and harmful substances.

8. Genetic predisposition:

- Hereditary factors play a role, but lifestyle can significantly modify their impact.

9. Psychological and spiritual harmony:

- Self-development, clear thinking, and inner peace.

10. Live according to the Creator's teachings:

- Proverbs 4:20: My son, give ear to my words, and incline your ear to my sayings. Let them not depart from your eyes; keep them in the midst of your heart. For they are life to those who find them, and health to all their flesh.

- Exodus 20:12: "Honor your father and your mother: that your days may be long upon the land which the Lord your God gives you."

- Proverbs 4:10: Hear, my son, and receive my words, that the years of your life may be many.

It is important to note that health and longevity are the result of a complex interaction of many factors, including lifestyle, nutrition, physical activity, psychological state, clear thinking, and supportive medical care, as well as hormonal and genetic synergy.

Descartes famously said, "I think, therefore I am" ("Cogito, ergo sum"). As

long as a person thinks, they confirm their existence as a thinking subject. Human biological life ends with the cessation of all vital bodily functions. This includes the cessation of the heart, respiratory system, brain, and consciousness. The connection with the Creator as the source of life is severed, the body's cells begin to deteriorate, and decomposition occurs. In medical and legal contexts, the cessation of bodily functions is recognized by the absence of signs of life, such as a pulse, breathing, and electrical activity in the brain.

Ensuring the age of 120 years with a healthy lifestyle and maintaining the body's hormonal-genetic synergy is the combined result of a person and the achievements of modern medicine and healthcare.

References

1. Evgeniy Bryndin. (2025). Hormonal Genetic Synergy - Induced Regression of Prostate Adenocarcinoma. *Journal of Immunology Research & Reports*, Volume 5(5):1-6.
2. Dewan Md. Sumsuzzman, Zeeshan Ahmad Khan. Differential role of melatonin in healthy brain aging. *Aging* 13(7). 2021. DOI:[10.18632/aging.202894](https://doi.org/10.18632/aging.202894)
3. [Huiqin Wang](#), [Zhangyu Liu](#), [Xiaomei Sun](#), [Xin Wang](#). Microbial synthesis of serotonin and melatonin. *Advances in Applied Microbiology*, 132:169-240. 2025. DOI:[10.1016/bs.aambs.2025.08.003](https://doi.org/10.1016/bs.aambs.2025.08.003)
4. Sara Bozzini, Colomba Falcone. Genetic Factors Associated with Longevity in Humans. *IntechOpen Senescence - Physiology or Pathology*. 2017.

<http://dx.doi.org/10.5772/intechopen.69637>

5. Dario Costa, Michele Scognamiglio, Carmela Fiorito, Giuditta Benincasa. Genetic background, epigenetic factors and dietary interventions which influence human longevity. *Biogerontology*, 20(4). 2019. DOI:10.1007/s10522-019-09824-3

6. Calogero Caruso, Mattia Emanuela Ligotti, Giulia Accardi, Anna Aiello, Giovanni Duro, Damiano Galimberti, Giuseppina Candore. How Important Are Genes to Achieve Longevity? *Int J Mol Sci*. 2022, 18;23(10):5635. doi: [10.3390/ijms23105635](https://doi.org/10.3390/ijms23105635)

7. Evgeniy Bryndin, Maintaining the Health of Organism at Molecular Level Based on Informative Genomics *International Journal of Biochemistry, Biophysics & Molecular Biology*. 2025, Vol. 10, No.2, pp. 53-60.

<https://doi.org/10.11648/j.ijbbmb.20251002.13>

8. Personalized Anti-Aging Strategies Based on Hormonal and Genetic Profiling. (2023)

9. Piotr Paweł Chmielewski, Krzysztof Data, Bartłomiej Strzelec, Maryam Farzaneh, Amir Anbiyaiee, Uzma Zaheer, Shahab Uddin, Mohadeseh Sheykhi-Sabzehpoush, Paul

Mozdziak, Maciej Zabel, Piotr Dzięgiel, Bartosz Kempisty. Human Aging and Age-Related Diseases: From Underlying Mechanisms to Pro-Longevity Interventions. *Aging and disease*, 2025, Vol. 16 » Issue (4) : 1853-1877. DOI: 10.14336/AD.2024.0280

10. Raj Kumar. Gene regulation by the steroid hormone receptors: new promises and challenges for therapeutic targeting. *OAT*. 2021. DOI: 10.15761/BGG.1000121

11. Andrzej Bartke, Karen Coschigano, John Kopchick, Varadaraj Chandrashekar. Genes That Prolong Life Relationships of Growth Hormone and Growth to Aging and Life Span. *The Journals of Gerontology Series A Biological Sciences and Medical Sciences* 56(8):B340-9, 2001. DOI:10.1093/gerona/56.8.B340

12. Sofra X. Can gene expression delay aging and increase longevity? *J Diabetes Metab Disord Control*. 2023;10(2):93–99. DOI: 10.15406/jdmdc.2023.10.00259

13. K. Paige Harden, Kelly L. Klump. Introduction to the Special Issue on Gene-Hormone Interplay. *Behav Genet* (2015) 45:263–267. Springer Science+Business Media New York. DOI 10.1007/s10519-015-9717-7

14. Cox RM, McGlothlin JW, Bonier F. *Integr. Hormones as Mediators of Phenotypic and Genetic Integration: an Evolutionary Genetics Approach. Integrative and Comparative Biology*. 2016 Aug;56(2):126-37. doi: 10.1093/icb/icw033.

15. Unlocking the Secrets – The Intricate Relationship between Genes and Hormones Revealed in Groundbreaking Study. *Science of Bio Genetics*. 2023. admin-science.

16. Rhya Pachin. Are Hormonal Imbalances Genetic? Exploring the Role of Genetics and Lifestyle in Hormonal Health. *Nutrigenomics*. 2024.

17. Lidia Malaty. Hormones and Genetics – Understanding the Power of Interplay. *AustinMD Aesthetics & Wellness*. 2024.

18. Evgeny Bryndin. 2025. International Translational Medicine in World Healthcare. *International Journal of Current Microbiology and Applied*

Sciences. 14(09): 68-74.
doi:<https://doi.org/10.20546/ijcmas.2025.1409.008>

