AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 03. February ,2026

BIOLOGICAL BASIS OF HEREDITY AND ITS IMPORTANCE IN ORGANISM DEVELOPMENT

Turdimuratov Bakhtiyor Kurbonovich
Termez branch of Tashkent State Medical University
Lecturer, Department of Social and Humanitarian Sciences.
baxtiyor.turdimuratov6691@gmail.com
Ergasheva Ma'mura Bahodirovna
Termez branch of Tashkent State Medical University
Assistant, Department of Medical Biology and Histology
ergasheva3006@gmail.com
Tojixonov Jobirxon Ayubxon ugli
1st year student of the pediatric faculty, direction of dentistry
jobirtojixonov@gmail.com

Abstract: This article analyzes the biological essence of heredity, the mechanisms of transmission of genetic information from generation to generation, and its significance in the development of living organisms. During the study, the laws of heredity, the preservation and transmission of genetic information were examined based on scientific literature in genetics and molecular biology. In addition, the roles of genes, chromosomes, and DNA molecules in the formation of hereditary traits as well as the influence of environmental factors were analyzed. The results show that heredity plays a crucial role in preserving biological characteristics of living organisms, regulating developmental processes, and ensuring biological diversity. A deeper understanding of heredity contributes significantly to the advancement of biology, medicine, and genetics.

Keywords: heredity, genetics, gene, chromosome, DNA, mutation, genotype, phenotype, biological evolution.

INTRODUCTION

Heredity is one of the fundamental concepts in biology and refers to the ability of living organisms to transmit their characteristics from one generation to another. Due to heredity, organisms preserve species-specific morphological, physiological, and biochemical traits.

The formation of the science of genetics made it possible to study heredity on a scientific basis. In the nineteenth century, the famous scientist **Gregor Mendel** discovered the basic laws of heredity through experiments conducted on plants. His research laid the scientific foundation for the development of modern genetics.

Later, studies in molecular biology revealed that the main carrier of hereditary information is the **DNA molecule**. DNA contains genetic information that regulates the growth, development, and functioning of organisms.

In modern biology, heredity serves as a key scientific basis for understanding evolutionary processes, biological diversity, and hereditary diseases. Therefore, studying heredity in depth remains one of the most important issues in the fields of biology, genetics, and medicine.

Biological evolution and biodiversity are influenced by several genetic mechanisms. These mechanisms lead to the formation of new traits, adaptation of organisms to environmental conditions, and the emergence of new species.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 03. February ,2026

One of the main sources of evolutionary change is **mutation**, which refers to alterations in the DNA structure. Mutations may lead to the emergence of new hereditary traits, enhance adaptation to environmental conditions, and create new genetic variations.

Another important mechanism is **genetic recombination**, which occurs during sexual reproduction when genes from both parents mix. As a result, each generation becomes genetically unique and genetic diversity within populations increases.

The process of **natural selection**, first systematically explained by **Charles Darwin**, plays a central role in evolution. Organisms that are better adapted to environmental conditions survive and reproduce, while less adapted individuals are gradually eliminated.

In addition, **genetic drift** can cause random changes in gene frequencies within small populations. This may lead to the loss of certain genes or the emergence of new genetic combinations.

Another factor influencing genetic diversity is **gene flow (migration)**. When organisms move between populations, genetic material is exchanged, which increases the genetic diversity of populations.

MATERIALS AND METHODS

This research was conducted based on theoretical biological analysis. During the study, scientific sources, textbooks, and research articles related to genetics and molecular biology were reviewed.

The following scientific methods were applied:

- analysis of scientific literature
- comparative biological analysis
- theoretical modeling of genetic processes
- generalization of statistical data

In addition, genetic models and biological observation data were analyzed to study the mechanisms involved in the formation and transmission of hereditary traits.

RESULTS

The research findings indicate that the biological basis of heredity is associated with several key factors.

Preservation of Genetic Information

Hereditary information is stored in genes. Genes are located within chromosomes and consist of DNA molecules that carry the genetic instructions for organism development.

Transmission of Hereditary Traits

During cell division, genetic information is transmitted from parent cells to daughter cells. This process ensures the preservation of biological characteristics across generations.

Relationship Between Genotype and Phenotype

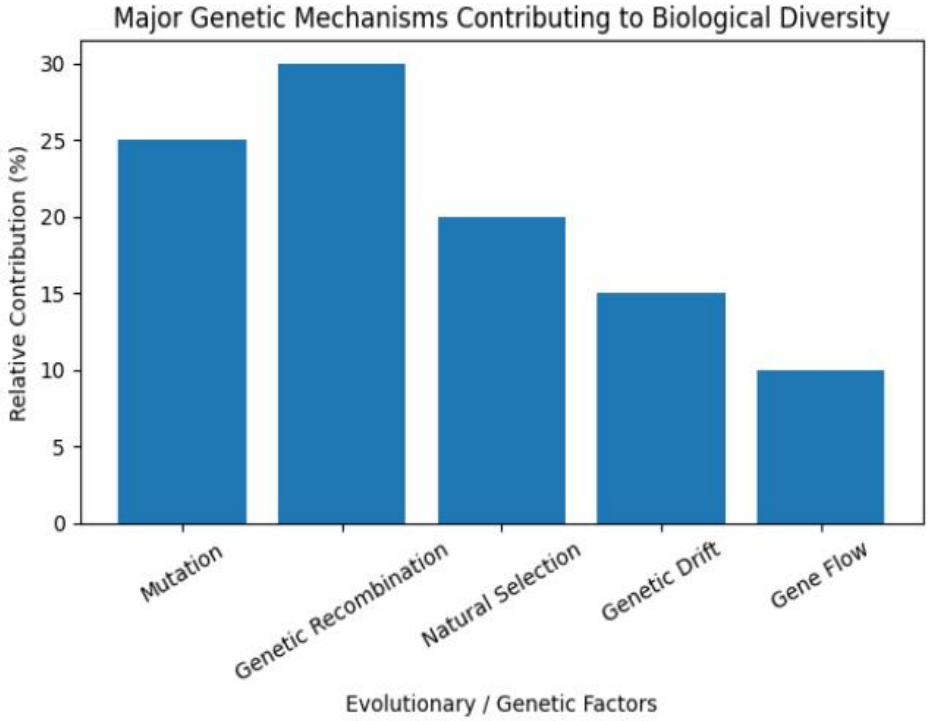
The **genotype** represents the genetic structure of an organism, while the **phenotype** refers to its observable characteristics and functional features. The formation of phenotype depends not only on genotype but also on environmental influences.

Mutations

Mutations represent one of the primary sources of genetic variation. They contribute to biological diversity and play an essential role in evolutionary processes.

Factors Shaping Evolution and Biological Diversity

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 03. February ,2026



No	Genetic Factor	Role in Evolution	Relative Influence (%)
1	Mutation	Creates new genetic traits through changes in DNA structure	25
2	Genetic recombination	Forms new gene combinations through mixing of parental genes	30
3	Natural selection	Preserves organisms that are adapted to environmental conditions	20
4	Genetic drift	Causes random changes in gene frequencies in populations	15
5	Gene flow (migration)	Ensures exchange of genes between populations	10

All these processes occupy an important place in evolutionary theory. The scientific foundation of evolution largely relies on the theory of natural selection developed by **Charles Darwin**.

DISCUSSION

Heredity is one of the most important factors influencing biological evolution. The preservation and transmission of genetic information ensure biological similarities among organisms within the same species.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 03. February ,2026

Genetic studies have made it possible to identify the genetic basis of many hereditary diseases. These discoveries have significantly expanded the opportunities for early diagnosis and prevention in modern medicine.

Advances in molecular biology techniques allow researchers to study genetic processes at deeper levels. Such research may contribute to future developments in **gene therapy**, **genetic engineering**, and personalized medicine.

Furthermore, understanding genetic mechanisms helps scientists explain the processes of adaptation, speciation, and biodiversity formation within ecosystems.

CONCLUSION

Heredity is one of the fundamental biological properties of living organisms, ensuring the transmission of genetic information from generation to generation. The results of this study indicate that genes, chromosomes, and DNA molecules play a central role in the formation and inheritance of biological traits.

The study of heredity has significant scientific importance in the fields of biology and medicine. Modern genetic research contributes to the identification of hereditary diseases, understanding biological diversity, and explaining evolutionary processes.

Continued research in genetics and molecular biology will further enhance our knowledge of hereditary mechanisms and support the development of advanced medical technologies in the future.

References

1.Gregor Mendel. *Experiments on Plant Hybridization.*

2.James Watson & Francis Crick. *Molecular Structure of Nucleic Acids.*

3.Biology textbooks of the Republic of Uzbekistan.

4.Collection of modern research articles on genetics.

5.Kurbonovich T. B. et al. USE OF ICT AND SOFTWARE IN TEACHING PRACTICAL MEDICAL EXERCISES //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2025. – Т. 3. – №. 11. – С. 1-6.

6.Turdimuratov B. K., Ibragimova D. O., Kurbanov A. B. THE IMPORTANCE OF SUI INTELECT IN THE TREATMENT OF NEUROLOGICAL DISORDERS //ОСНОВЫ МЕДИЦИНЫ. – 2025. – Т. 1. – №. 7. – С. 344-347.

7.Kurbonovich T. B., Kholboyevich I. E. USE AND EFFECTIVENESS OF ELECTRONIC MEDICAL RECORD (EMR/EHR) SYSTEM IN MEDICINE //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2025. – Т. 3. – №. 11. – С. 7-11.

8.Kurbonovich T. B. et al. DIGITAL TECHNOLOGIES IN MEDICINE. TELEMEDICINE //IMRAS. – 2025. – Т. 8. – №. 12. – С. 39-41.