



Hidden Changes in DNA: Understanding Genetic Mutations and Their Effects on Human Health

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DESCRIPTION

Genetic mutations are changes that occur in the DNA sequence of an organism. DNA carries the instructions needed for growth, development, and proper functioning of the body. When these instructions are altered, the results can vary widely, from harmless variations to serious health conditions. These changes may be inherited from parents or may occur spontaneously during a person's lifetime due to environmental influences or errors in cell division. Every human cell contains genetic material organized into genes, which act as coded messages directing the production of proteins. Proteins carry out essential tasks such as building tissues, supporting metabolism, and regulating bodily processes. A mutation can alter the structure or function of a protein, leading to changes in how cells behave. Some mutations have no noticeable effect, while others can lead to disease or developmental differences. Mutations are generally classified into different types based on how they affect DNA. A point mutation involves a change in a single nucleotide, which may or may not impact protein function. Insertions and deletions occur when segments of DNA are added or removed, sometimes shifting the reading frame of genetic instructions. Larger changes can involve entire sections of chromosomes, leading to more significant consequences. The effect of a mutation depends on its location and how it influences gene expression.

There are two main categories of genetic mutations: Inherited and acquired. Inherited mutations are passed from parents to offspring through reproductive cells. These mutations are present in every cell of the body and may increase the risk of certain genetic disorders. Examples include conditions such as cystic fibrosis and sickle cell disease. Acquired mutations, on the other hand, occur during a person's lifetime and are found only in certain cells. These can result from exposure to radiation, chemicals, or errors during DNA replication. Environmental factors play a role in the development of mutations. Ultraviolet radiation from sunlight can damage DNA in skin cells,

potentially leading to conditions such as skin cancer. Exposure to harmful chemicals, tobacco smoke, and certain pollutants can also increase the likelihood of mutations. While the body has repair mechanisms to correct DNA damage, these systems are not always perfect, allowing some mutations to persist. Genetic mutations are not always harmful. In fact, they are a source of genetic diversity, which contributes to differences among individuals. Some mutations may even provide advantages, helping organisms adapt to changing environments over time. However, when mutations disrupt essential biological functions, they can lead to disease. For instance, mutations in genes responsible for cell growth and division can contribute to the development of cancer.

The study of genetic mutations has advanced significantly with modern technology. Techniques such as DNA sequencing allow scientists to analyze genetic material in detail, identifying specific changes associated with diseases. This knowledge has improved diagnosis and has led to more accurate risk assessment for individuals with a family history of genetic conditions. Genetic testing can provide valuable information, although it also raises ethical considerations regarding privacy and decision-making. Medical management of conditions caused by genetic mutations varies depending on the disorder. Some conditions can be managed with medications that address symptoms or modify disease progression. In certain cases, gene therapy is being explored as a method to correct faulty genes or replace them with functional ones. Although still under development for many conditions, this approach offers potential for future treatment options. Preventive measures can reduce the risk of acquiring certain mutations. Limiting exposure to harmful environmental factors, such as excessive sunlight or toxic chemicals, helps protect DNA from damage. Maintaining a healthy lifestyle, including proper nutrition and avoiding tobacco use, supports the body's natural repair systems. For individuals with a known genetic risk, genetic counseling can provide guidance on family planning and health monitoring.

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CONCLUSION

In summary, the neurological examination is a comprehensive and systematic approach to assessing the nervous system. It combines observation, physical testing, and patient interaction

to provide valuable insights into brain and nerve function. Through this process, healthcare providers can identify abnormalities, guide further investigation, and support effective management of neurological conditions.