

# DNA Mutations: Types, Effects and Causes

Mike Makrigrigorgos\*

Department of Radiation Oncology, Dana-Farber Cancer Institute and Brigham and Women's Hospital, Boston, USA

## Introduction

DNA mutation is the process by which changes occur in the genetic material of an organism. The genetic material of an organism is contained in the DNA molecules that are located in the nucleus of the cell. Mutations can occur due to various factors, including errors in DNA replication, exposure to certain chemicals or radiation, and environmental factors. DNA mutations can have a wide range of effects, ranging from neutral to beneficial to harmful.

There are different types of DNA mutations, including point mutations, insertion mutations, deletion mutations, and chromosomal mutations. Point mutations involve a change in a single nucleotide in the DNA sequence. Insertion mutations involve the addition of one or more nucleotides to the DNA sequence, while deletion mutations involve the removal of one or more nucleotides from the DNA sequence. Chromosomal mutations involve changes in the number or structure of chromosomes.

Point mutations are the most common type of mutation and can occur in different ways. Substitution mutations occur when a nucleotide is replaced by a different nucleotide. For example, if a cytosine nucleotide is replaced by a thymine nucleotide, it is known as a C to T substitution. This type of mutation can have different effects depending on where it occurs in the DNA sequence. If it occurs in a non-coding region, it may have no effect on the organism. However, if it occurs in a coding region, it can change the amino acid sequence of a protein, leading to a change in its function.

Insertion and deletion mutations can also have different effects on the organism. If the number of nucleotides inserted or deleted is not a multiple of three, it can result in a frame shift mutation. This type of mutation can alter the reading frame of the DNA sequence, changing the amino acid sequence of the protein and potentially leading to a non-functional protein.

## Description

Chromosomal mutations can involve changes in the number or structure of chromosomes. For example, aneuploidy occurs when there are an abnormal number of chromosomes, such as in Down syndrome, which is caused by an extra copy of chromosome 21. Chromosomal mutations can also involve changes in the structure

of chromosomes, such as translocations, inversions, and deletions. These types of mutations can have a wide range of effects on the organism, depending on the specific chromosomes involved and the extent of the mutation.

DNA mutations can have different effects on the organism, ranging from neutral to beneficial to harmful. Neutral mutations have no effect on the organism and are usually found in non-coding regions of the DNA sequence. Beneficial mutations can provide an advantage to the organism, such as by conferring resistance to a certain disease or allowing it to adapt to a new environment. Harmful mutations can lead to genetic disorders, such as cystic fibrosis, sickle cell anemia, and Huntington's disease.

Mutations can occur spontaneously or be induced by external factors. Spontaneous mutations occur due to errors in DNA replication or other cellular processes. External factors that can induce mutations include exposure to certain chemicals, such as carcinogens, and radiation, such as ultraviolet light and X-rays. These external factors can cause DNA damage, leading to mutations in the DNA sequence.

The human body has mechanisms to repair DNA damage and prevent mutations from occurring. These mechanisms include DNA repair enzymes, which can correct errors in DNA replication and repair damage caused by external factors. The body also has mechanisms to detect and remove cells that have undergone significant DNA damage, such as through apoptosis, or programmed cell death.

## Conclusion

However, these mechanisms are not always effective, and mutations can still occur. In some cases, mutations can accumulate over time and contribute to the development of cancer or other diseases. Cancer is caused by the accumulation of mutations in genes that control cell growth and division, leading to uncontrolled cell growth.

**How to cite this article:** Makrigrigorgos, Mike. "DNA Mutations: Types, Effects and Causes." *J Genet DNA Res* 7 (2023): 174.

\*Address for Correspondence: Mike Makrigrigorgos, Department of Radiation Oncology, Dana-Farber Cancer Institute and Brigham and Women's Hospital, Boston, USA; E-mail: Mike.makri.mm@gmail.com

Copyright: © 2023 Makrigrigorgos M. This is an open-access article distributed under the terms of the creative commons attribution license which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Received: 06 May, 2023, Manuscript No. JGDR-23-97969; Editor assigned: 09 May, 2023, PreQC No. JGDR-23-97969 (PQ); Reviewed: 24 May, 2023, QC No. JGDR-23-97969; Revised: 06 July, 2023, Manuscript No. JGDR-23-97969 (R); Published: 14 July, 2023, DOI: 10.37421/2684-6039.2023.7.174