

Mutagens



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Agents known as mutagens cause the changes in the DNA sequence. DNA mutation may occur through nucleotide substitution, deletion, and insertion and may range from a single DNA base to a large chromosome segment. DNA mutations may be hereditary or acquired (Distefano 2004). Acquired mutations result from environmental factors such as the sun's ultraviolet radiation or occur due to an error as the DNA copies itself during the process of cell division. Cells depend on proteins to perform their functions effectively. Mutations cause proteins to malfunction or be missed entirely as they change the gene instructions for making a protein. The alteration of a protein that plays a crucial function in the body can disrupt the normal development or cause a medical condition. Several human diseases result from mutations.

These include the duchenne muscular dystrophy, which result from a mutation in the X chromosome (Smeltzer 2009, p. 123). This mutation causes the body's inability to produce dystrophin, a protein responsible for anchoring actin microfilaments to the extracellular matrix of the muscle tissue. Another disease is the cystic fibrosis caused by a non-functional chlorine-ion channel membrane protein, which affects the water balance. Hemophilia results from the X-chromosome alteration leading to the body's inability to produce the blood-clotting factor. Other diseases are familial hypercholesterolemia due to a non-functional protein receptor, hunting disease, which results in a deteriorating nervous system, and the abnormal hemoglobin due to the beta-globin mutation. Considering that mutagens are naturally present in plants, others are produced through the combustion of organic materials, and others by industrial processes, human beings are

exposed to mutagens on daily basis. Statistics indicate that high dose exposure to mutagens does not relate directly to increased defects resulting from mutagens (Reid 1998). However, such exposure during pregnancy can affect the embryonic tissues. Studies show that mutagen effects depend on the metabolic activation and detoxification reactions balance. An imbalance at any level of exposure may result in detrimental effects (Reid, 1998). Thus, there are no safe levels of exposure to mutagens.