

Mutation means a change in the gene, nucleotide, and sequence. It may occur at DNA base by adding or deletion or it may be at chromosomal level. Chromosome can exchange parts and genetic material can jump from one chromosome to another and these events caused mutations.

Types of mutations

1- Spontaneous mutations: or what is called germ line mutations occurred or pass to the offspring as a result from mutated alleles from parents.

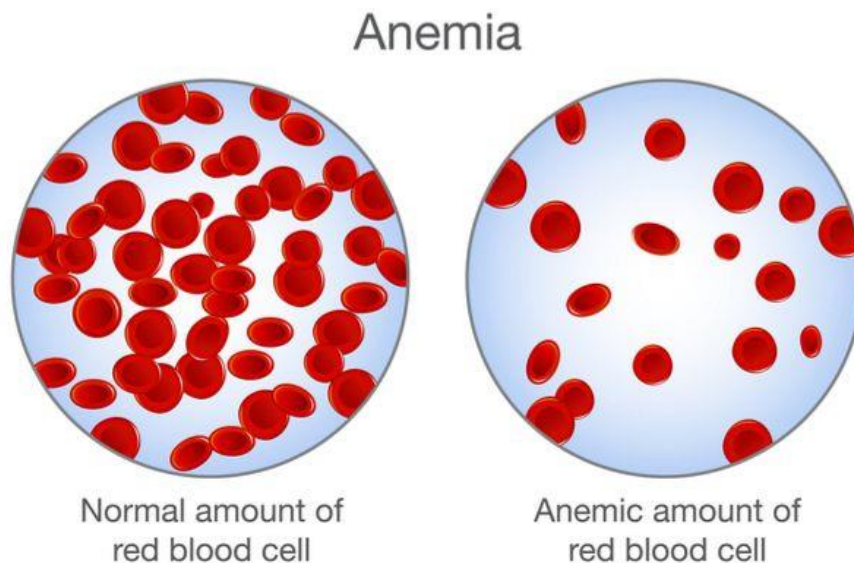
- **Achondroplasia** means bone growth disorder that causes **dwarfism**. People with achondroplasia has normal torso but short limbs as a result from mutation in the 4th chromosome.



2- Induced mutations: these mutations may be occurs by influence factor from environment like (X-Ray, Gama Ray or UV-radiation).

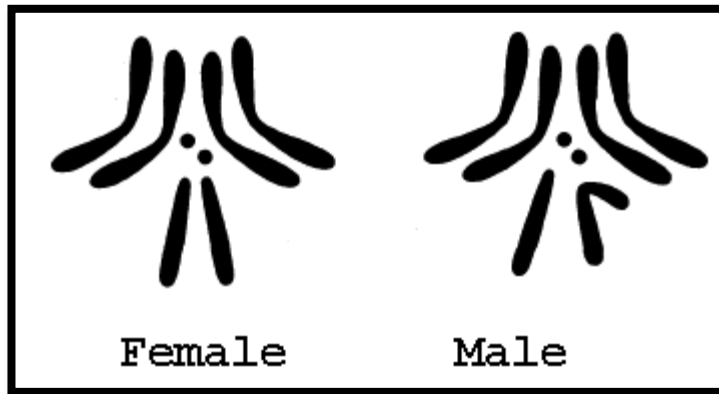
3- Conditional mutation: affect the phenotype under certain conditions for example Hemolytic Anemia glucose 6 phosphate dehydrogenase deficiency , in this situation RBC are broken down, **this deficiency is triggered by :**

1- bacteria 2- viral infection 3- drugs (Antibiotics or drugs for malaria) 4- eating fava beans 5- inhaling pollen from fava beans.



4- *Drosophila* mutations

Drosophila was a perfect organism in mutations studies because this organism has very low number of chromosomes and they were four pairs of chromosomes, three of them were somatic called **Autosomes** while the sex chromosome was one pair and they are called **Allosomes**.



Drosophila chromosomes

Characteristics	Kind	Chromosome number	Number of mutations
Vestigial wing	Recessive	II	Single mutation
Dumpy wing	Recessive	II	
Ebony body	Recessive	III	
White eye	Recessive	I	
Ebony-vestigial	Recessive	II , III	Double mutation
Ebony-dumpy	Recessive	II , III	

Phenocopy

- Is a variation in phenotype (referring to single trait) which is caused by environmental conditions (often, but necessary, during organisms development), it's not a mutation and it's not hereditary.
- An clear example for phenocopies is the effect of AgNO_3 on the color of *Drosophila* body for, its effect on the mechanism of Tyrosinase enzyme.
- If the larvae of flies fed on the silver nitrate they develop into yellow bodies which it was in the first way brown.
- Another chemical factor is **sodium metaborate** that effects on the color of eyes of *Drosophila*.