

## Mutations

### Types and Effects

## Mutations

- A mutation is a change in genetic material
- From the Latin word meaning “to change”
- They are the source of genetic variation in a population.

## Mutations:

- Most are harmless (neutral or beneficial), though some will cause disruption of normal biological activities due to dramatic changes in protein structures (creation of harmful proteins or defective malfunctioning proteins.)
- Harmful mutations cause genetic disorders.
- Beneficial mutations may be useful in a changing environment.

## Mutations

- Two types:
  - Germ Mutations
    - can be passed to offspring.
  - Somatic mutations
    - are not passed to offspring.

## Gene vs. Chromosome Mutations

- Gene Mutations: Produce changes to one gene.
- Chromosome Mutations: Produce changes in whole chromosomes.
  - \*\* Remember that a gene is a complete message (initiator to end); a series of codons that form a polypeptide chain (chain of amino acids.)

## Point mutations:

- Gene mutations involving one or a few nucleotides.
- Occur at a single point in the DNA sequence.
- Insertion- an extra base is inserted into the DNA sequence.
- Deletion- an base is removed from the DNA sequence.
- Substitution- one base is changed to another.

## Insertions and Deletions

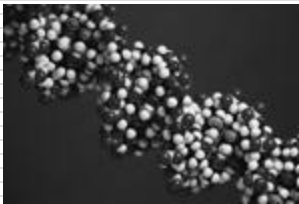
- Cause frameshift mutations: shift the “reading frame” of the genetic message.
- THE FAT CAT ATE HER
- THE FAT CAA TAT EHE R : Insertion
- TEF ATC ATA TEH ER : Deletion

## Substitution

- Usually affect only one codon therefore only one amino acid.
- DNA: TAC GCA TGG AAT
  - Amino Acids: Met, Arg, Thr, Leu
- DNA: TAC GTA TGG AAT
  - Amino Acids: Met, His, Thr, Leu

## Chromosomal Mutations:

- Involve changes in the number or structure of chromosomes.



## Chromosomal Mutations:

- The chromosomal mutations can be:
  - a change in the location of a gene on a chromosome.
  - a change in the number of copies of a gene
  - deletions: loss of all or part of a chromosome
    - non-disjunction: the loss of a complete chromosome due to improper segregation during meiosis.
  - inversions: reverse the direction of parts of chromosomes
  - duplications: produce extra copies of parts of chromosomes
  - translocations: part of a chromosome breaks off and attaches to another chromosome.