

mutation occurs the adenine base is substituted by thymine so instead of GAG we have GTG. CAC on the coding strand (mRNA strand) of the DNA is now transcribed onto the mRNA triplet as GUG, which in turn is translated to the amino acid valine. Valine replaces glutamic acid in the beta chain. Valine has different properties from glutamic acid and so this single change in the amino acid sequence has very serious effects. The resulting haemoglobin molecule has a different shape, it is less soluble and when in low oxygen concentrations it deforms the red blood cells to give them a sickle shape. Sickle cells carry less oxygen, which results in anaemia. They are also rapidly removed from the circulation leading to a lack of red blood cells and other symptoms such as jaundice, kidney problems and the enlargement of spleens.

Homologous chromosomes are a pair of chromosomes with the same genes but not necessarily the same alleles of those genes.

Meiosis

Eukaryotic body cells have a diploid nucleus, which contains two copies of each chromosome in homologous pairs, e.g. humans have 46 chromosomes in 23 pairs, mangos have 40 chromosomes in 20 pairs and camels have 70 chromosomes in 35 pairs.

In sexual reproduction, two gametes fuse together, so in order to keep the chromosome number correct in the offspring, each gamete must contain only one of each chromosome pair, which is called the haploid number. During gamete formation, meiosis reduces the diploid number to the haploid number. At the moment of fertilisation the normal diploid number is restored as gametes fuse together.

Meiosis 1:

(1) Prophase 1 - (1) nuclear envelope starts to disintegrate. (2) Crossing over of chromatids may occur (the point where crossing over occurs is called chiasmata). (3) Homologous chromosomes pair up to form a bivalent (arranged parallel to each other). (4) At the end of prophase 1 spindle fibres are formed.

(2) Metaphase 1 - (1) bivalents line up across the equator of the cell, attached on the centromeres to spindle fibres. (2) Spindle formed as of mitosis. (3) Nuclear membrane fully disintegrates.

(3) Anaphase 1 - (1) centromeres do not divide unlike mitosis. Therefore more chromosomes move towards opposite ends of the spindle. (2) The centromeres attach to the spindles and then are pulled by microtubules.

(4) Telophase 1 - (1) spindles break down and a new nuclear envelope forms.