

## MEIOSIS

Meiosis is a type of cell division where the parent nucleus divides into four daughter nuclei each having half the number of chromosomes as the parent cell. Before the active division occurs, the cell first undergoes interphase. During Interphase there is replication of chromosomes, storage of ATP for the meiotic cell division and replication of organelles.

Meiosis has two successive divisions known as division I and division II. Each division is subdivided into four stages, which are not distinct but grade into each other.

Thus Meiosis I is subdivided into Prophase I, Metaphase I, Anaphase I, and Telophase I. Also

Meiosis II is subdivided into Prophase II, Metaphase II, Anaphase II, and Telophase II

### Meiosis I

#### Prophase I

Prophase I is subdivided into five phases. The first phase is known as leptotene. During this phase the chromosomes appear as thin threads that are not divided into chromatids and centromere is not visible. The second phase is known as zygotene. During this phase the pair of homologous chromosomes are attracted to each other and come together. They pair up, forming a bivalent, starting at one end and to other end they zip up like a zip fastener, a process known as pairing (or synapsis). Zygotene is followed by pachytene, when the chromosomes become shorter and thicker by coiling; they also coil around each other and each appears to have two chromatids. In diplotene, crossing over occurs: breaks occur in homologous chromatids due to the strain of their coiling; they then join up cross-wise with the chromatid of the homologous chromosome. This grades into diakinesis, when the chromatids of homologous chromosomes are no longer attracted to each other and so try to move apart but are held together at the point where they crossed over. This point known as a chiasma and appears as visible cross. By the end of prophase, the nucleolus and the nuclear membrane have broken down and in animals and lower plants a spindle is organized in the cytoplasm by the centrioles.

#### Metaphase I

In the second stage (metaphase), of division I the bivalents orientate themselves on the spindle. Their centromeres come to lie on either side of the equatorial plate and are equidistant from it. The homologous chromosomes strain to separate but are held together by their chiasmata which may begin to slip towards the ends of the chromosomes, in a process known as terminalisation.

#### Anaphase I,

Metaphase I is followed by Anaphase I, when the spindle contracts and elongates. The pairs of homologous centromeres finally separate and move towards their respective poles, each pulling the rest of the chromosome after it.

#### Telophase I

Telophase I follows Anaphase I. During Telophase I the spindle disappears and a nuclear membrane usually forms around each group of chromosomes. The length of telophase varies in different species: two complete nuclei form and cell division occurs. 2 cells are formed and these are haploid.

## **Meiosis II**

The second division is mechanically very similar to mitosis except that the two cells are dividing synchronously.

### Prophase II

The length of the second prophase is longer than that of the telophase I. At the end of it, the chromosomes have appeared, the nuclear membrane has broken down and the spindle is organized.

### Metaphase II

In metaphase II, the chromosomes come to lie on the equatorial plate.

### Anaphase II

The chromatids of the chromosomes separate in anaphase II

During Telophase II the spindle disappears and a nuclear membrane usually forms around each group of chromosomes., resulting in four nuclei that go into inter phase.

Meiosis can occur only in diploid or polyploid cells. It occurs in the process of gamete formation in animals, in the production of the pollen grains and embryo sac in higher plants and in the formation of spores in plants with alternation of generations. In fungi meiosis results in the production of spores for example the ascospores and basidiospores.

## ASSIGNMENT

- i) Give the significance of meiosis to living organisms. (use Biological Science)
- ii) State the differences between Meiosis and Mitosis. (use Biological Science)