

CELL DIVISION

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CELL DIVISION

- Multiplication of cells takes place by division of pre-existing cells. Such multiplication constitutes an essential feature of embryonic development.
- Necessary for after birth of the individual for growth, for replacement of dead cells.
- Embryology is the study of the formation & development of the embryo (or fetus) from the moment of its conception up to the time when it is born as an infant.

- Mitosis – somatic cells all over the body.
- Meiosis – in testis and ovary.
- Embryo –first two month from conception in IUL
- Fetus –from 3rd month until birth
- Infant
- Gametes – the cells that carry out the special function of reproduction.

STRUCTURE OF CHROMOSOME

- Chromatids –two rod shaped structure place more or less parallel to each other.
- Centromere- chromatids are united to each other at a light staining area called centromere.
- Genes –are made up of a nucleic acid called deoxyribonucleic acid (or DNA) and all information is stored in the molecules of this substance.

MITOSIS

- Daughter cells must have chromosomes identical in number to those in the mother cells. This type of cell division is called mitosis.
- 5 phases+ 2
 1. Interphase – early, late
 2. Prophase – early, late
 3. Metaphase
 4. Anaphase
 5. Telophase

- The sequence of events of the mitotic cycle is best understood starting with a cell in telophase.
- Each chromosome consists of a single chromatid.
- Chromatin of the chromosome uncoils and elongates & become indistinct.

1. Early interphase- Chromosomes are in the form of extended threads.
2. Late interphase- DNA content of the chromosome is duplicated. So another chromatid is formed, which is identical to the first one or another.
New chromosome is made up of 2 chromatids.

3. Early prophase- chromatin of the chromosome becomes gradually more & more coiled, it becomes thread like structure or rod like appearance. centrioles move separate, to opposite poles of the cells. It is a typical chromosomes structure.
4. Late prophase- nuclear membrane breaks down & nucleoli disappear. A number of microtubules are pass from one centriole to the other & form a **spindle**.

5. Metaphase – chromosomes move and placed midway between 2 centrioles. Then each chromosomes attached to microtubules of the spindle by its centromere.
6. Anaphase – centromere of each chromosome splits longitudinally into two. So that chromatids now become independent chromosomes. One chromosomes of each pair moves to either pole.

7. Telophase – nuclear membrane formed, 2 daughter nuclei are formed, chromosome gradually lengthen & become indistinct, centriole divided or duplicated.

Division of nucleus is accompanied by division of cytoplasm.

In this process the organellae are duplicated & each daughter cell comes to have a full complement of them.

MEIOSIS

- A different kind of cell division occurs during the formation of the gametes is called meiosis.
- It consist of 2 divisions- first & second meiotic division.
- Number of chromosome is reduced to half the normal number.
- Genetic information in the various gametes produced is not identical

FIRST MEIOTIC DIVISION

- Leptotene- chromosomes become visible. Each chromosome consists of 2 chromatids but these cannot be made out separately.
- Zygotene – two homologous chromosomes come to lie parallel to each other (side by side). This **pairing** of chromosome also referred to as **synapsis or conjugation**. These chromosomes together constitute a bivalent.

- Pachytene – 2 chromatids of each chromosome become distinct. The bivalent now has 4 chromatids in it & called **tetrad**.
- Two central & peripheral chromatids, one from each chromosome.
- Two central chromatids become coiled over each other. So that they cross at a number of points. This is called **crossing over**.

- At the site where the chromatids cross, they become adherent, the points adherence are called **chiasmata**.
- Diplotene – the two chromosomes of a bivalent now try to move apart.
- The central chromatids ‘break’ at the points of crossing and unite with the opposite chromatid.
- This results in exchange of genetic material between these chromatids.

- Metaphase - nuclear membrane disappear, spindle forms, chromosomes are attached to it by their centromeres.
- Anaphase – no splitting of the centromeres. One entire chromosome of each pair moves to each pole of the spindle.
- The resulting daughter cells have 23 chromosomes, each made up of 2 chromatids.

- Telophase – two daughter nuclei are formed , division of the nucleus is followed by division of the cytoplasm.
- the chromosomes in each cell have been reduced to the haploid number.

SECOND MEIOTIC DIVISION

- First meiotic division is followed by a short interphase.
- This differs from usual interphase in that, there is no duplication of DNA.
- Such duplication is unnecessary as chromosomes of cells resulting from the first division already possess 2 chromatids each.
- Because of the crossing over that has occurred during the first division, the daughter cells are not identical in genetic content.