

MEIOSIS

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CHROMOSOME

- Single structured
- Unreplicated DNA
- One chromatid
- Counted as one chromosome

DUPLICATED CHROMOSOME

- Double structured
- Replicated DNA
- Two chromatids
- Counted as one chromosome

Both chromosome and duplicated chromosome are counted as one chromosome because chromosomes are counted from centromeres.

- n – full set of 23 chromosomes
- $2n$ – diploid number of chromosomes (46 chromosomes)
- N – notation used for amount of DNA in a given cell

DNA Replication

Before the cells goes to meiosis 1, all chromosomes are to be replicated

HOMOLOGOUS CHROMOSOMES

The paternal and the maternal chromosomes in our cells are homologous to each other

The homologous chromosomes lie in the nucleus randomly

SYNAPSIS

During meiosis, double-structured homologous chromosomes come near to each other and pairing takes place from chromosome 1 to 22 i-e all autosomes. Sex chromosomes will also come together and they have few homologous genes on short arm which will pair up.

(During mitosis, synapsis doesnot take place)

The point to point pairing of homologous chromosomes is called synapsis.

CROSSING OVER

After synapsis, the chromosomes exchange alleles with eachother and this process is called crossing over. Somewhere 30 to 40 cross overs occur in each maternal and paternal set of chromosomes.

CHIASMA FORMATION

Chiasma is the point of contact between two chromatids belonging to homologous chromosomes. Exchange of genetic material can occur between both chromatids at a chromosomal crossover.

GENETIC VARIABILITY IS DUE TO:

1. Crossing over
2. Random assortment of chromosomes into daughter cells (secondary gametes)

FORMATION OF SECONDARY GAMETE

After alignment of chromosomes on spindle fibers, the chromosomes are randomly assorted into daughter cells.

In oogenesis, one daughter cell becomes secondary oocyte while the other daughter cell receives very little cytoplasm and is called first polar body.

In males, both daughter cells are called spermatocytes.

So primary gamete gives secondary gamete at the end of first meiotic division.

2nd MEIOTIC DIVISION

At second meiotic division, centromere dysjunction takes place and each chromatid goes to daughter cell. Four haploid daughter cells are formed with single-structured chromosomes.

In male, from one primary gamete four spermatids are formed which eventually mature into four sperms. In female, one primary oocyte forms mature ovum and 3 polar bodies and degenerate.



Chromosome

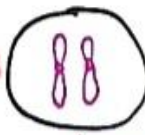


Duplicated chromosome



Paired Homologous chromosomes

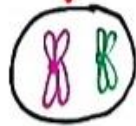
Oogonia / Spermatozoa



23 maternal chromosomes (1n)
23 paternal chromosomes (1n)
Total = 46 chromosomes = 2n
Amount of DNA = 2N (1N from maternal, 1N from paternal)

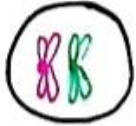
DNA Replication

Primary Gamete



23 maternal (n)
23 paternal (n)
Total 46 (2n)
Amount of DNA = 4N (2N from mother, 2N paternal as DNA is replicated)

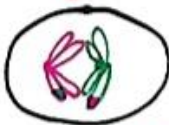
Synapse



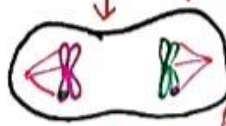
Crossing Over



Chiasma

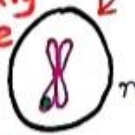


Alignment on spindle fibre



Random assortment into daughter cells

Secondary Gamete



1n (23-double structured chromosome)
Haploid

2nd Meiotic Division

