

Aberations

Chromosomal Aberrations

Chromosomes are the structures with definite organisation. They carry genes which remain arranged in them in linear order. In ordinary conditions, though the chromosomes remain unchangeable, but, under certain natural or artificial conditions some structural changes may occur in them. These structural changes are collectively called *Chromosomal aberrations*.

Most chromosomal aberrations are caused due to accidental, natural, or induced breakage of chromosomes. The induced chromosome breakage may be caused by radiation, and chemicals such as Lysergic acid diethylamide (LSD), etc. The chromosomal aberrations may remain confined to a single chromosome, or may extend to both of the members of a pair or may be of following two pairs of chromosomes. The chromosomal aberrations, may be of following two kinds:

- Intrachromosomal aberrations
- Interchromosomal aberrations

Intrachromosomal Aberrations

The Intrachromosomal or homosomal aberrations occur in one and the same chromosome and are of the following kinds:

- **Deficiency or deletion** When a chromosome lacks in an intercalary or terminal segment, the deficiency or deletion occurs. The lost chromosomal segment if lacks in a centromere, lag in anaphasic movement and is from reorganising nuclei.
- **Duplication** Duplication occurs when a segment of the chromosomes is represented two or more times in the chromosomes. The extra segment may be attached to the chromosome whose loci are repeated or to a different linkage group, or even be present as a separate fragment.
- **Inversion** An inversion is a chromosomal aberration in which a segment is inverted at 180 degree. Inversions are called *pericentric* when the segment includes the centromere and *paracentric* if the centromere is located outside the segment. When a crossing over occurs within the inverted segment of a paracentric inversion, dicentric and acentric chromatids are formed. The dicentric chromatids form a bridge that breaks when the anaphase chromosomes separate towards the poles. If crossing over occurs within the loop of a pericentric inversion, the chromatids are produced with a deficiency and a duplication.

Isochromosomes An isochromosome is a chromosome in which both arms are identical. It is thought to arise when a centromere divides in the wrong plane, yielding two daughter chromosomes, each of which carries the information of one arm only but present twice.

Interchromosomal Aberrations

When breaks occur in non-homologous chromosomes and resulting fragments are interchanged by both of the non-homologous chromosomes, the interchromosomal aberration occurs. The interchromosomal aberrations include following one type:

Translocation:

Translocation involves the shifting of a part of one chromosome to another, non-homologous chromosome. If two non-homologous chromosomes exchange parts, which need not be of same size, the result is a *reciprocal translocation*. The reciprocal translocation may be of following types:

- **Homozygotic translocation** In Homozygotic translocation normal meiosis occurs and that cannot be detected cytologically. Genetically they are marked by altered linkage groups and by the fact that a gene with "new neighbours" may produce a somewhat different effect in its new location.
- **Heterozygotic translocation** In Heterozygotic translocation a considerable degree of meiotic irregularity occurs. Typically cross-shaped formation is seen in prophase I ; this often opens out into a ring as chiasmata terminalize. The heterozygous translocation produces semisterile organisms because between half and two third of gametes (in animals) or meiospores (in plants) fail to receive the full complements of genes required for normal development of sex.