Germ cell and somatic cell chromosome mutations

Mutations types (according range in size)

- gene/point mutations (e.g. substitution, insertion, deletion)
- chromosome mutations (e.g. trisomy, translocation)
- genome mutations (e.g. triploidy)

Germ cell mutation -> abnormal gamete -> abnormal zygote -> abnormal karyotype in every cell of organism = congenital (constitutional) abnormal karyotype (example: meiotic nondisjunction -> disomic gamete with two copies of chromosome 21 -> trisomic zygote with three copies of chromosome 21 -> Down syndrome)

Somatic cell mutation -> one abnormal somatic cell -> abnormal cell clone -> abnormal karyotype in some somatic cells of organism = mosaicism, acquired chromosomal aberrations (example: mitotic nondisjunction -> trisomic somatic cell -> mosaicism of normal and trisomic cell lines)

Phenotypic effects – severity of symptoms depends on proportion of abnormal cells

- abnormality in all cells of organism (due to meiotic error) – specific symptoms of particular syndrome (e.g. Down sy)
- abnormality in majority of cells (mosaicism due to mitotic error in early period of development) – symptoms similar to those of syndrome specific ones but usually less severe, in general better prognosis
- abnormality in minority of cells (low-frequent mosaicism due to mitotic error in late period of development) – effects depend on distribution of abnormal cells within organism, could be isolated only to one organ/tissue, and could contribute to cancer development

Acquired chromosomal aberrations

1. Exposition to external factors
2. Hereditary syndromes of chromosome instability (congenital defects of repair mechanisms)

- Causes of acquired chromosomal aberrations (see question No. 37 – Etiology of chromosomal aberrations)
- Methods of analysis of acquired chromosomal aberrations (see question No. 31 – Methods of chromosomal examination)

Gonadal mosaicism = two or more cell lines in gonads; higher probability to produce gametes with the same abnormality

- e.g. mosaicism of trisomy 21 – recurrent pregnancies with Down syndrome