

9/26 lecture summary

Mutations

Cancer cells have high mutation rates

Mutations: abrupt changes in genetic material, occur typically in cell division.

- Mutations are important when they happen in tissues that are sent to offspring (testes/ovaries)
- **Somatic mutations:** Mutations in cells other than sex cells (not passed to next gen)

Types of mutation:

1. **Structural changes in chromosome** (occurs mainly when a screw up in meiosis)
  - a. **Loss or duplication of whole genes**
    - **Deletions-** whole chunks of DNA lost
    - **Duplications-** whole chunks replicated
  - b. **Changes in gene arrangement:**
    - **Translocation-** large pieces of chromosome moved to another place on genome
    - **Transposons-** "jumping genes" small pieces of DNA shifting within gene
    - **Inversions-** chunks of chromosome flipping over
2. **Numerical changes in chromosomes:**
  - a. **Aneuploidy-** addition of one or more chromosomes (xxy, xxxy, xxxy, etc)

Mutations are not all due to mother-

- Sperm cells divide every 15 days
- More cell divisions = more chance of mutation
  - b. **Polyploidy-** multiple copies of entire genome (liver or intestinal cells)
- 3. Gene (point) mutations = nucleotide changes
  - a. **Substitution mutation-** could code for same amino acid
  - b. **Addition-** moves nucleotides down the chain
    - Frame shift
  - c. **Subtraction-** also causes frame shift
  - d. **Protein chain length modifiers (start/stop codons)-** leads to short or extra-long non functional protein

Mutation in developmental genes:

Heterochronic mutations: Alter rates of growth of some organs relative to others in organism

- Many differences in species due to regulatory genes

Allometry: comparing growth rates between tissues and structures

Shifts in growth gradients: change in time of development

- Transformations of species by genetic changes
- Regulating embryonic chemical gradients

- Homeotic Genes- homeotic gene, any of a group of genes that control the pattern of body formation during early embryonic development of organisms