Karyotyping and Non-Disjunction

Non disjunction
- occurs when there is an **extra** or **missing** chromosome in the resulting gamete cells after meiosis

- occurs when chromosomes fail to **separate** properly during **anaphase**, so one of the gametes has an **extra** (trisomy) and one gamete is **missing** one (monosomy)

Disorders of Non-Disjunction

Down's Syndrome: Trisomy 21

If ND occurs in the sex chromosomes, you may end up with an extra chromosome or lacking a sex chromosome

Turner Syndrome: **only 1 X chromosome**

- affects growth and sexual development. Girls with this disorder are **shorter** than normal and may fail to start puberty when they should.

- **Ovaries** fail to develop properly (produce eggs, hormones estrogen and progesterone

- stocky appearance, arms that turn out slightly at the elbow, receding lower jaw, short webbed neck, low hairline at the back of the neck.

- medical symptoms include: lymphedema (swelling of hands and feet), heart/kidney defect, high blood pressure, and infertility

Klinefelters: **XXY** (extra X chromosome)

- are typically considered genetically male, although the phenotype can be male, female or intersex

- this exists in 1:500 to 1:1000 male live births but many of these people may not show symptoms. If the physical traits associated with the syndrome become apparent, they normally appear after the onset of **puberty**.
Process of Nondisjunction

Nondisjunction

- Normal Cell .......... A
- First Chromatids ...... B
- Second Chromatids ... C
- Sperm Cell ............ D
- Egg Cell ............... E
- First Egg Cell Chromatid .......... F
- Second Egg Cell Chromatid .......... G
- Cell with Missing Chromosome .......... H
- Cell with Extra Chromosome .......... I

Effects of Nondisjunction

1. Egg

2. Sperm

- Example: Turner's Syndrome
- Example: Trisomy 21

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Karotype chart: can you spot the difference?

Karyotype of a person with Down syndrome. Note the three number 21 chromosomes.