

Biology is the study of life. Almost all biological life has chromosomes, therefore chromosomes are also part of the study of biology. In order to understand how chromosomal disorders form, you need some background knowledge. Sexual reproduction requires 2 cells to have half the normal amount of chromosomes. These cells are called gametes and they undergo a process called meiosis. Meiosis turns 1 germ cell (a cell that's meant to be diploid) into 4 daughter cells. First meiosis replicates all the chromosomes in a stage called the interphase. Then in prophase I, homologous chromosomes pair up and segments of DNA are transferred between in a process called crossing over. In the next phase, Metaphase I, microtubules line up at the metaphase plate and get ready to pull apart the homologous pairs. In Anaphase I, the microtubules split the homologous pairs (tetrads) apart. In telophase I, the cell divides and we have two daughter cells now.

In Meiosis II, the sister chromatids are the ones that get separated. This process happens to both daughter cells. The first stage of meiosis II is Metaphase II. Just like how the tetrads (homologous pairs) meet at the metaphase plate, the sister chromatids also meet at the metaphase plate. In Anaphase II, the sister chromatids are split apart by microtubules and move towards the ends of the cells. In the last stage of meiosis II, The cells finally split resulting in 4 haploid cells. Now that you understand this process, we can talk about common problems that occur.

The three most common problems that occur are translocation, nondisjunction, and inversion. Translocation is when a piece of a chromosome breaks off and reattaches to either another chromosome or itself. There are two types of translocation. Reciprocal, which just means that multiple pieces of chromosomes broke off and reattached themselves in each other's original

spot. Then there's non-reciprocal which means that they did not all reattach at any other one's original spot.

Nondisjunction is when tetrads or sister chromatids don't separate properly in Meiosis and results in either too many sets of chromosomes or too few. Individuals with an abnormal amount of chromosomes are called aneuploidy and an individual with the normal amount is called euploids. Risk of Nondisjunction increases with the age of parents.

Inversions are kind of like translocations but the chromosomes rotate  $180^\circ$  and reattach to itself again. There are two types of inversions. Pericentric, meaning the detachment includes the Centromere and Paracentric which means it doesn't include the centromere.

Examples of chromosomal disorders include but are not limited to, Down syndrome, Turner syndrome, and Edwards syndrome. Down Syndrome has an extra chromosome in chromosome 21 and Edwards syndrome has an extra chromosome in chromosome 18. Turner syndrome has only one X chromosome. These are mostly because of nondisjunction but it can also have something to do with translocation as well.

## Works Cited

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