

Chromosome Count Changes

by Sophia

WHAT'S COVERED

In this lesson, you will learn to understand the impact chromosome count has on development. Specifically, this lesson will cover:

1. Nondisjunction

Chromosome numbers can change during mitosis or meiosis and are generally the result of nondisjunction. During the metaphase portion of mitosis and meiosis II, sister chromatids are being pulled towards the poles of the cell. Usually these sister chromatids separate, but sometimes they do not separate correctly. **Nondisjunction** is the failure of one or more pairs of sister chromatids to separate during cell division, and this results in some cells ending up with too many or too few chromosomes. Nondisjunction can lead to several different disorders.



Down syndrome, also called trisomy 21, is an example of nondisjunction. This disorder occurs when a person ends up with an extra copy of chromosome 21. Instead of having two homologs of chromosome 21, a person with Down syndrome has three homologs.

Nondisjunction

When chromosomes don't separate during anaphase, causing cells (such as gametes) to have abnormal numbers; Down syndrome is an example of a genetic disorder that results from nondisjunction.

Down Syndrome

A genetic disorder in which the 21st pair of chromosomes has three chromosomes vs. the normal pair, this is called a trisomy.

2. Changes in the Number of Sex Chromosomes

Turner syndrome, Klinefelter syndrome, and XYY condition are examples where there is an anomaly in the number of sex chromosomes.

- **Turner syndrome** is when an X chromosome is missing. Generally, a person who is missing an X chromosome would be miscarried by the mother, but anyone who does survive is always going to be a female. That female is going to end up with sexual abnormalities and, generally, a shortened life span.
- Klinefelter syndrome occurs when sex chromosomes have an extra copy. The person's genotype on their sex chromosomes would be XXY, and the individual would be a male with an extra X chromosome. A person with this disorder is going to have low fertility, the possibility of mental retardation, and small testes. They will also have physical abnormalities because of the presence of this extra X chromosome.
- XYY syndrome is another condition that affects the sex chromosome. This person would be male because of the presence of the Y chromosome. The only real result of this is that the male is probably going to be a little bit taller than average. There are no serious abnormalities caused by having an extra Y chromosome.

TERMS TO KNOW

Turner Syndrome

A genetic condition in which an X chromosome is missing (XO instead of XX or XY); if the child is not miscarried, the effects can range from non-life threatening to life-threatening. People with Turner syndrome are female due to the presence of only an X chromosome, are almost universally infertile, and typically have cardiovascular issues along with other organ system problems.

Klinefelter Syndrome

A condition in which a person has an XXY chromosomal pattern; males that inherit this are often infertile, may develop breasts and other female secondary characteristics and possible mental retardation.

XYY Syndrome

A condition in which a male inherits an extra Y chromosome; XYY syndrome doesn't express any cognitive or life-threatening abnormalities, it just tends to make males taller than average.

🗇 SUMMARY

Nondisjunction is the failure of one or more pairs of sister chromatids to separate during cell division and can lead to a change in chromosome number. This will result in cells that end up with too many or too few chromosomes. Down syndrome is an example of a disorder that is generally caused by nondisjunction. **Changes in the number of sex chromosomes** can also cause problems. Turner syndrome is caused when an X chromosome is missing, and Klinefelter syndrome is caused when an extra X is present in a male. Both of these disorders can cause long term problems for the person they affect. XYY condition causes no serious abnormalities.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND

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