

# Difference Between Translocation and Crossing Over

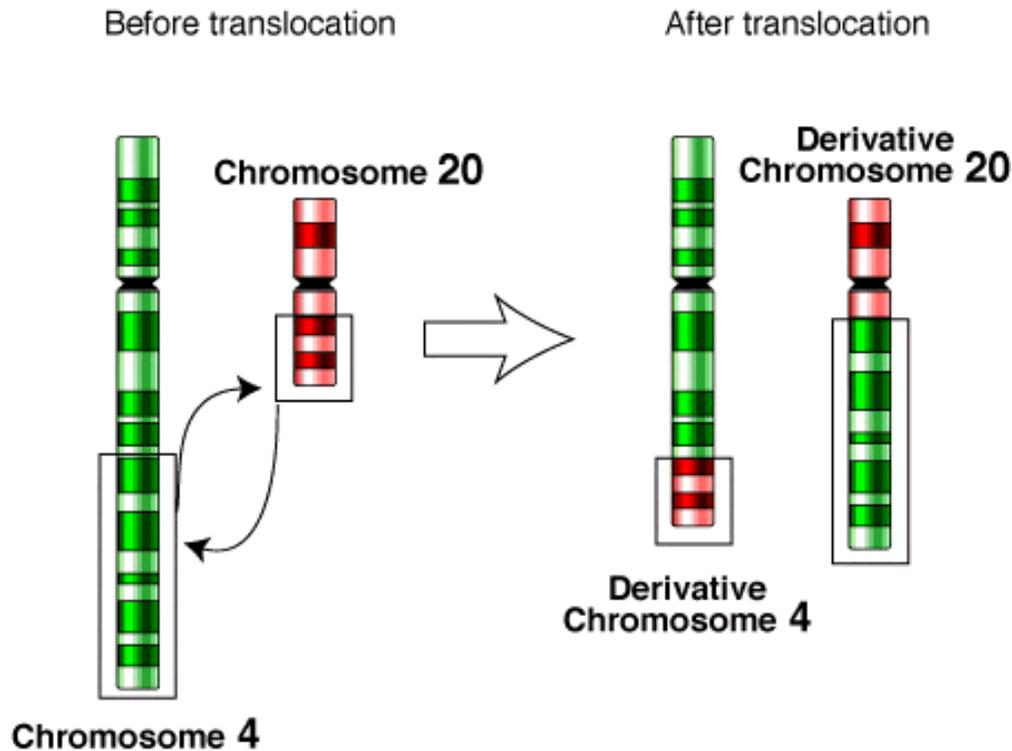
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## Key Difference - Translocation vs Crossing Over

[DNA recombination](#) is a phenomenon which describes the exchange of genetic materials between [chromosomes](#) or different regions of the same chromosome. It results in a new gene combination that varies from the parental gene combinations. DNA recombination is important since it affects the genetic diversity of the organisms and also for the evolution, diseases, DNA repair etc. During [meiosis](#) of the cells, DNA recombination can occur naturally by the process called crossing over between [homologous chromosomes](#). Crossing over is an exchange of genetic material between homologous chromosomes. Translocation is another process which causes genetic recombination. Translocation is the exchange of fragments of chromosomes (genetic materials) between non-homologous chromosomes. It is a genetic abnormality which causes different disease conditions. The **key difference** between translocation and crossing over is that **translocation occurs between non-homologous chromosomes while crossing over typically occurs between homologous regions of matching chromosomes**.

## What is Translocation?

When the exchange of genetic material occurs between non-homologous chromosomes, it is known as translocation. During the translocation, fragments of chromosomes containing the genetic material exchange between different chromosomes. This results in highly different gene combinations due to the movement of chromosome segments of one chromosome to another non-homologous chromosome which gets positioned in a new location. Translocation is an abnormality of chromosomes. Therefore, it is a type of [mutation](#) which causes disease conditions such as cancers, [down syndrome](#), [infertility](#), XX male syndrome etc. due to the rearrangement of genes with wrong chromosomes. Hence, translocation is considered as a dangerous process which can lead to various fatal diseases in organisms.

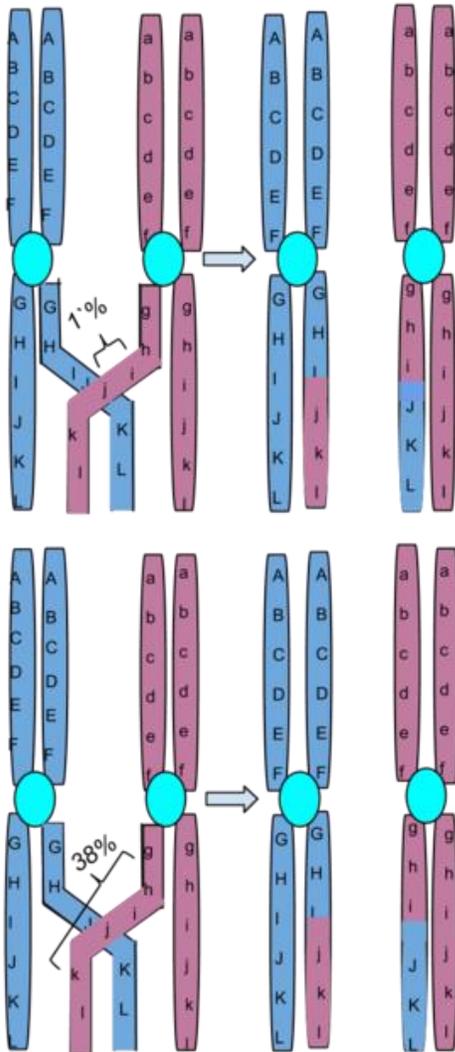


**Figure 01: Translocation**

The [cytogenetics](#) and [karyotype](#) can identify the chromosomal abnormality that is caused due to translocation.

## What is Crossing Over?

Crossing over is the process of exchanging genetic material among the homologous chromosomes. It results in [recombinant](#) chromosomes which can lead to genetic variations. In sexual reproduction, the formation of gametes occurs through meiosis. Homologous chromosomes pair up with each other during the prophase I of the meiosis and exchange their genetic materials. Due to this exchange of different segments of the chromosomes between homologous chromosomes, recombinant chromosomes are produced by the crossing over process. Crossing over is an important process, and it is a normal process during the segregation of chromosomes in meiosis. When crossing over occurs during meiosis, offsprings get a different set of gene combinations than their parents have. If crossing over occurs during mitosis, it results in heterozygosity.



**Figure 01: Crossing over**

Homologous chromosomes have similar lengths, gene positions and centromere locations. Hence, crossing over between homologous chromosomes do not make mutations since it is a normal process of genetic recombination. During the chiasma breaks, broken chromosome segments switched with the opposite homologous chromosome. Broken segments of maternal chromosome get switched with the homologous chromosome of the paternal side.

## What are the similarities Between Translocation and Crossing Over?

- Translocation and crossing over are two processes of genetic recombination.
- Both occur in chromosomes (in genetic material).
- During both processes, chromosome segments exchange.

- Both results in recombinant chromosomes.

## What is the Difference Between Translocation and Crossing Over?

<b>Translocation vs Crossing Over</b>	
Translocation is the process of exchanging genetic materials between non-homologous chromosomes.	Crossing over is the process of exchanging matching segments of chromosomes between homologous chromosomes during the sexual reproduction.
<b>Process</b>	
Translocation is not a normal process.	Crossing over is a normal process during the meiosis.
<b>Mutation</b>	
Translocation is a mutation.	Crossing over is not a mutation
<b>Occurring Chromosomes</b>	
Translocation occurs between non-homologous	Crossing over occurs between homologous chromosomes.
<b>Change of the Genetic Information</b>	
Translocation results in a change in genetic information.	Crossing over does not change the genetic information.
<b>Causing Diseases</b>	
Translocation can cause cancers, infertility, down syndrome, XX male syndrome etc.	Crossing over between homologous chromosomes do not cause fatal diseases.
<b>Chromosomal Abnormality</b>	
Translocation is a chromosomal abnormality.	Crossing over is not a chromosomal abnormality.

## Summary - Translocation vs Crossing Over

Genetic recombination results in genetic variation among the individuals. It occurs due to various reasons. Crossing over and translocation is two processes which cause genetic variations. Crossing over is the process of exchanging genetic materials of the

chromosomes between homologous chromosomes. It is a normal process of meiosis, and it causes new gene combinations. But it does not cause mutations due to the homologous nature of the chromosomes. Translocation is the process of exchanging genetic materials between non-homologous chromosomes. Translocation results highly variable gene combinations which can be dangerous and cause different disease conditions such as cancers etc. This is the difference between crossing over and translocation.

#### **Reference:**

1. "Chromosomal translocation." Wikipedia, Wikimedia Foundation, 6 Jan. 2018. [Available here](#)
2. Bailey, Regina. "What Is Crossing Over and How Are Genes Recombined?" ThoughtCo. [Available here](#)
3. Nature News, Nature Publishing Group. [Available here](#)

#### **Image Courtesy:**

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APA: Difference Between Translocation and Crossing Over.(2018 January 08). Retrieved (date), from <http://differencebetween.com/difference-between-translocation-and-vs-crossing-over/>

MLA: "Difference Between Translocation and Crossing Over" Difference Between.Com. 08 January 2018. Web.

Chicago: "Difference Between Translocation and Crossing Over." Difference Between.Com. <http://differencebetween.com/difference-between-translocation-and-vs-crossing-over/> accessed (accessed [date]).



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