

# Difference Between Single Strand Break and Double Strand Break

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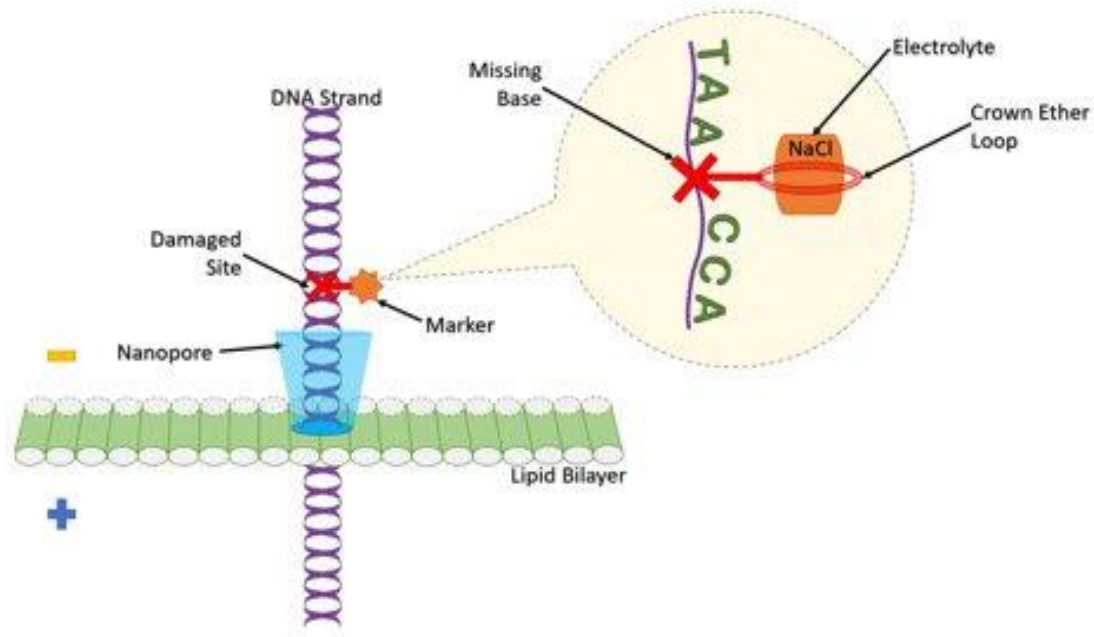
## Key Difference - Single Strand Break vs Double Strand Break

DNA damage is an alteration of the DNA sequence in the genetic material. There are various types of DNA damages. Among them, single strand breaks and double strand breaks are two types of DNA damages that cause the alteration of the chemical structure of DNA. **Single strand break is DNA damage that occurs in one strand out of the double strands hence, only one strand defects in single strand break DNA damage. Double strand break is DNA damage that occurs in both strands hence, the chemical structure of both strands is altered in the double strand damage.** This is the **key difference** between single strand break and double strand break.

## What is Single Strand Break?

Due to different reasons, one strand of the DNA double helix can be damaged. When the single strand is damaged, it is known as a single strand break. The nucleotide sequence of a single strand is altered in this type of DNA damage. Sugar-phosphate backbone of one strand gets damaged during the single strand break. Single strand breaks are the most common type of DNA damage seen in organisms. It is said that single strand breaks have a higher frequency of occurrence per cell per day due to intracellular metabolites and spontaneous DNA decay.

Single strand breaks can be easily repaired by several repair mechanisms. When one strand is damaged, complementary strand can be used as the guiding strand to correct the damage. Different excision repair mechanisms help to correct wrong or damaged nucleotides. They are base excision repair, mismatch repair, nucleotide excision repair etc.

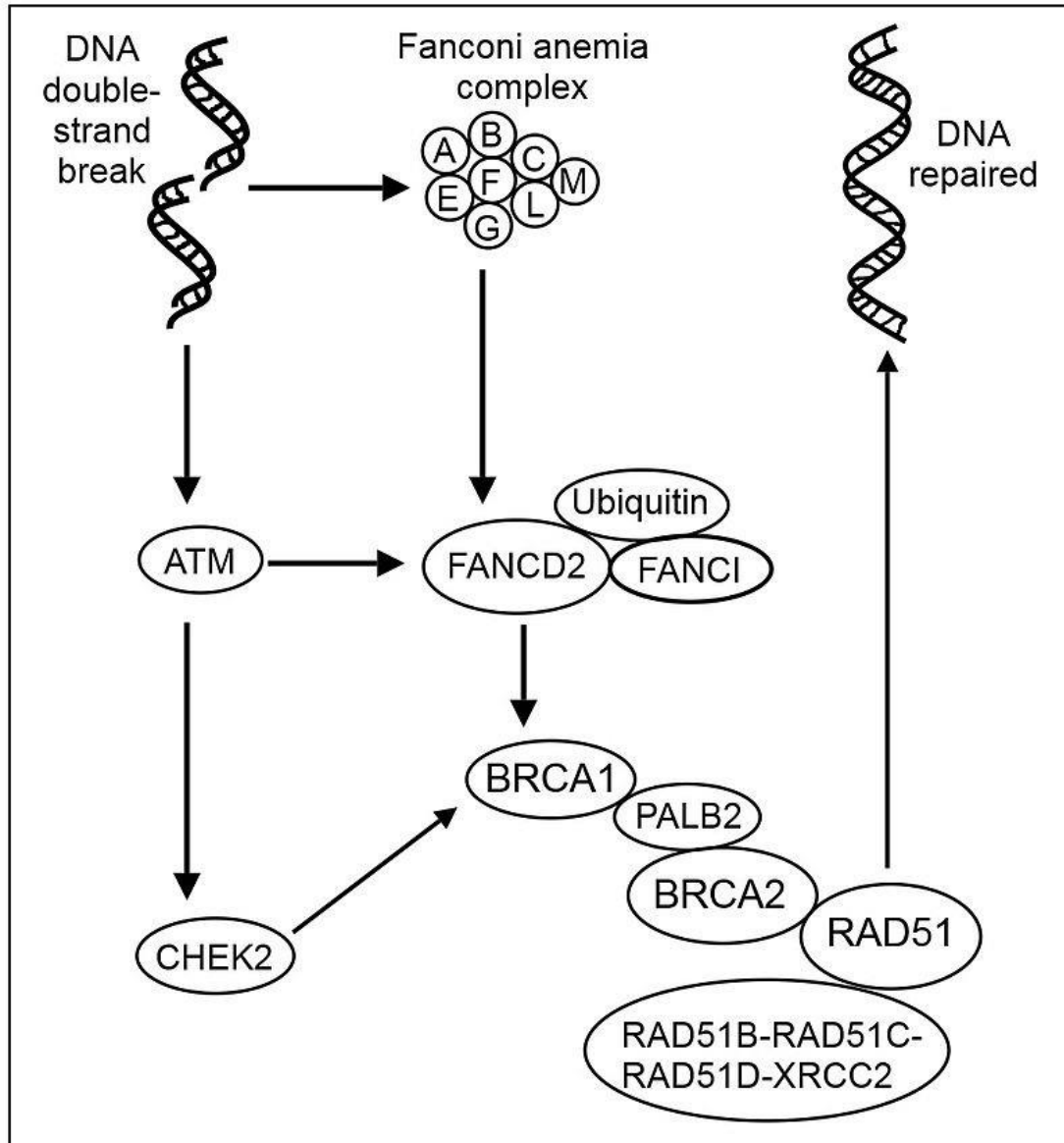


**Figure 01: Single Strand Break**

There are different factors that cause single strand breaks such as Ionizing radiation, UV, hazardous chemicals, free radicals etc.

## What is Double Strand Break?

Double strand break is another type of DNA damage seen in the genetic material of organisms. Both of the strands of the double helix get altered or broken down in this type of DNA damage. Sugar-phosphate backbone of both strands breaks at one point. If they happen, it created detrimental effects. And they are difficult to repair by the normal repair mechanisms. However, some of the damages can be repaired by the excision repair mechanisms such as double-strand break repair, nucleotide excision repairs etc. If double-strand breaks are not repaired, they can cause a mutation that leads to cell death. And also broken strands can lead to deletions, translocations etc. Deletions and translocations can be caused by serious health issues or diseases such as cancers due to genomic rearrangements.



**Figure 02: DNA Double Strand Break**

Compared to the single strand breaks, double strand breaks rarely occur in living cells. Double strand breaks are due to different reasons such as UV radiation, chemicals, [irradiation](#), ionizing radiation etc.

## What are the Similarities Between Single Strand Break and Double Strand Break?

- Single strand break and double strand break are two types of DNA damages occur in living cells.
- In both types, sugar-phosphate backbone breaks.

- Both can be lead to mutations.
- Both types of damages can be repaired by cellular repair mechanisms.

## What is the Difference Between Single Strand Break and Double Strand Break?

Single Strand Break vs Double Strand Break	
Single strand break is the DNA damage that occurs in one strand of the DNA double helix.	Double strand break is the DNA damage that occurs in both strands of the DNA double helix.
Occurrence	
Single strand breaks are very common.	Double strand breaks are comparatively rare.
Repairing	
Single strand breaks can be easily repaired by the cellular repair mechanism.	Double strand breaks cannot be easily repaired by the cellular repair mechanisms.
Effect	
Single strand breaks are not lethal.	Double strand breaks are lethal since they cause different diseases.
Sugar-Phosphate Backbone	
Sugar-phosphate backbone of one strand is broken into single strand	Sugar-phosphate backbones of both strands are broken into double strand

## Summary - Single Strand Break vs Double Strand Break

DNA damages are various types and happen at high frequency in cells. Single strand break and double strand break are two types of DNA damages. When one strand is broken, and the chemical structure is altered in one strand, this type of damage is known as single strand break. Sugar-phosphate backbone of one strand is broken in single strand break. When both strands are broken due to the

damages occur for the sugar-phosphate backbone of both strands, this type of damage is known as double strand break. Single strand breaks are the most common type of DNA damage, and they are repaired by the repairing mechanisms easily. However, double strand breaks are rare, and they result in detrimental effects if not repaired immediately. They can cause mutations, cell death, cancers etc. This is the difference between single strand break and double strand break.

**Reference:**

- 1.Nature News, Nature Publishing Group. [Available here](#)
- 2.Caldecott, K W. “Single-Strand break repair and genetic disease.” Nature reviews. Genetics., U.S. National Library of Medicine, Aug. 2008. [Available here](#)

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