

Difference Between General and Specific Transcription Factors

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Key Difference - General vs Specific Transcription Factors

Transcription factors are required by RNA polymerase to act on the DNA template strand in synthesizing mRNA. There are different types of transcription factors. These transcription factors form a complex with the DNA strand. They either change the confirmation of the template strand or increase the affinity of the RNA polymerase enzyme towards mRNA synthesis in the process of called transcription. There are two main types of transcription factors. They are General or Basal transcription factors and the Specific Transcription factors. The General transcription factors are the factors used to form the pre-initiation complex during the process of transcription. They are present in almost all the eukaryotes, and in prokaryotes, they form a less complicated complex. The Specific transcription factors are either enhancers or repressors, which are specific DNA sequences that activate or repress the general transcription process. Some specific transcription factors may alter the DNA sequence itself. The **key difference** between the general transcription factors and the specific transcription factors is based on the functionality. **General transcription factors are involved in the formation of apre-initiation complex of the transcription process, whereas specific transcription factors participate in either activating or repressing the transcription process.**

What are General Transcription Factors?

General or Basal transcription factors are the factors that are involved in the formation of the initiation complex during transcription. They are essential for the transcription process hence, they play a vital role in the successful transcription. There are six key general transcription factors. They are; TFIID, TFIIB, TFIIH, TFIIE, TFIIF, and TFIIA. They play different roles during the formation of the initiation complex.

1. TFIID – This transcription factor (TF) is involved in recognizing the promoter sequence (TATA box).
2. TFIIB – The promoter /TFIID complex is recognized by TFIIB. This provides a signal for the binding of the main catalyzing enzyme RNA polymerase.

3. TFIIF – This transcription factor is bound to the RNA polymerase. TFIIF thus participates in the process by recruiting the RNA polymerase to the correct location.
4. TFIIE and TFIIH – The binding of these transcription factors mark the end of the formation of the pre-initiation complex. Binding of these increases the efficiency of the formation of the pre-initiation complex.
5. TFIIA promotes the binding of TFIID to the TATA box.

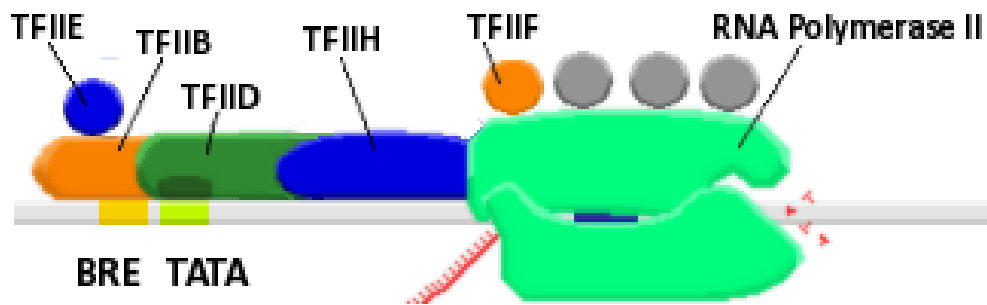


Figure 01: General Transcription Factors

The above mentioned general transcription factors are specific for RNA polymerase II, which is the type of RNA polymerase that elongates the mRNA strand. There are general transcription factors involved with RNA polymerase I and III. General transcription factors may also differ according to the type of cell to which it acts on.

What are Specific Transcription Factors?

Specific Transcription Factors are regions that are situated in the DNA sequences as well. They are mostly either enhancers or repressors. Specific transcription factors are the specific cis-acting elements in the template DNA strand that undergo transcription. Activation of these specific enhancers and repressors participate in increasing the affinity of the enzyme by altering the orientation of the DNA molecule or by acting as signaling regions. Specific transcription factors are also used to induce modifications to the DNA template strand. These modifications mainly involve covalent modifications such as [methylation](#). Thereby, methylated DNA regions act as special enhancers or repressors of the transcription process.

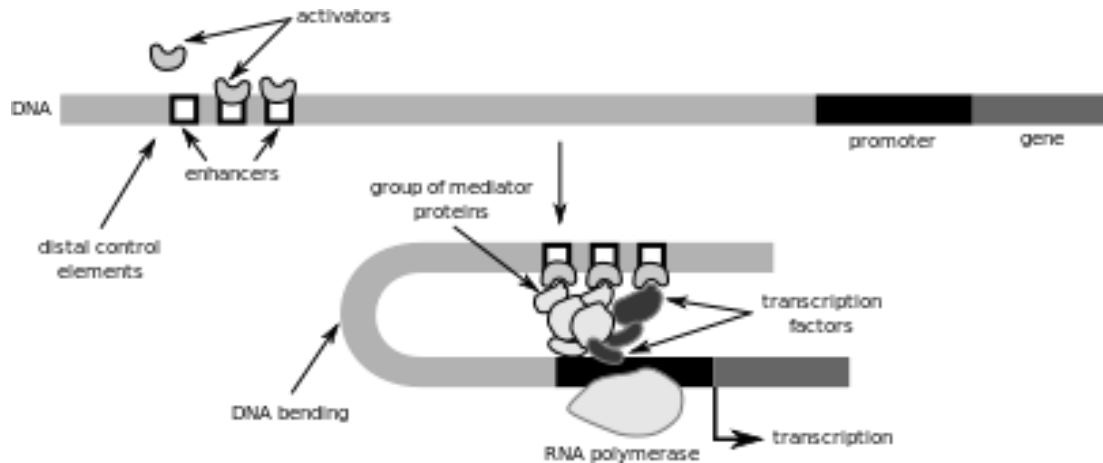


Figure 02: Specific Transcription Factors

The specific Transcription factors depend on the type of species and are not commonly found in all eukaryotes. These transcription factors are activated by different metabolic conditions via signal transduction pathways. Upon activation, they regulate the expression of the gene at a transcriptional level.

What are the Similarities Between General and Specific Transcription Factors?

- Both factors are required in the process of transcription.
- Both factors affect the gene expression of an organism.
- Both factors help to regulate the function of RNA polymerase in the transcription process.
- Both factors are found mostly in eukaryotes.

What is the Difference Between General and Specific Transcription Factors?

| General vs Specific Transcription | |
|--|---|
| The General transcription factors are the factors which are used to form the pre-initiation complex during the process of transcription. | The Specific transcription factors are either enhancers or repressors, which are specific DNA sequences that activate or repress the general transcription process. |
| Type of Molecule | |
| General transcription factors are | Specific transcription factors are nucleotide |

| | |
|--|--|
| protein-based. | sequences. |
| Formation | |
| General transcription factors form the pre-initiation complex during the transcription initiation. | Specific transcription factors act as enhancers or repressors of transcription. |
| Types | |
| There are six main types; TFIID, TFIIB, TFIIF, TFIIH, TFIIE, and TFIIA of general transcription factors. | Specific transcription factors are mainly categorized as enhancers and repressors. |

Summary - General vs Specific Transcription Factors

Transcription factors are essential for the transcriptional regulation and are required for the increased efficiency and accuracy of the process. Transcription factors are two main types; General /Basal and Specific. General transcription factors are involved in the formation of the pre-initiation complex during transcription, whereas specific transcription factors are regions in the DNA itself which act as enhancers or repressors. General transcription factors are protein based and required by all eukaryotes. It is not varied widely and remains as uniform molecules. A specific transcription factor can vary widely and depends upon the individuals' genetic makeup. This is the difference between general and specific transcription factors.

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Image Courtesy:

- 1.'Preinitiation complex' By ArneLH - Own work, [\(CC BY-SA 3.0\)](#) via [Commons Wikimedia](#)

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