

Difference Between Transcription and Reverse Transcription

www.differencebetween.com

Key Difference – Transcription vs Reverse Transcription

Transcription and translation are two major processes involved in gene expression. There can be two different types of transcription according to the function and the enzyme used. They are transcription and reverse transcription. In transcription, a mRNA molecule is formed using a DNA template and the enzyme used is RNA polymerase. Reverse transcription, mostly used by retroviruses, involves the formation of a complementary DNA strand (cDNA) using an RNA template. The enzyme used in the reverse transcription is reverse transcriptase. This is the key difference between transcription and reverse transcription.

What is Transcription?

Transcription is considered as the first step of gene expression. This process is involved in making a mRNA molecule by copying the DNA sequence of a gene. The end result of gene expression is making of a functional molecule – a protein. In eukaryotes, before the translation process commences, the transcripts will undergo different processing steps. The key enzyme used in transcription is RNA polymerase. It utilizes a template of single-stranded DNA to synthesize a complementary mRNA strand. RNA polymerase functions in the 5' to 3' direction, adding new nucleotides to the 3' end.

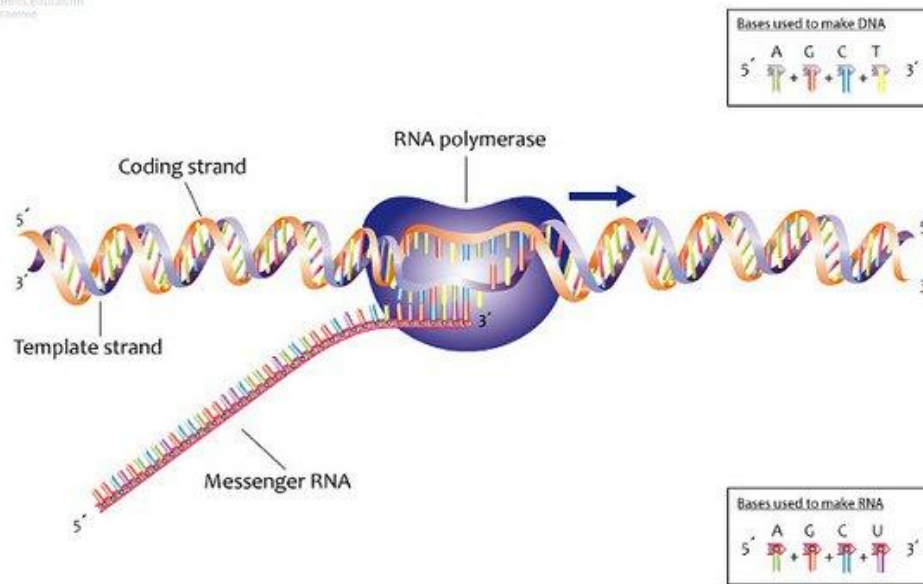


Figure 01: Transcription

Transcription is a process of 03 steps: initiation, elongation, and termination. [Eukaryotic transcription](#) is slightly advanced than prokaryotic transcription. During the initiation step of prokaryotic transcription, RNA polymerase binds to a special region of the gene, a sequence of DNA known as the promoter. RNA polymerase then facilitates the separation of the double-stranded structure into two single strands, which provides a single strand template for transcription. During elongation, RNA polymerase read the sequence of the single strand DNA (template strand), adding nucleotides according to complementary base pairing. This process occurs from 5' to 3' end. The transcript will possess the same genetic information similar to the coding strand of DNA with a single exception, the presence of the base [uracil](#) instead of thymine. A terminator sequence present in the gene will terminate the process. The transcript will be removed from RNA polymerase and directly act as mRNA. Eukaryotic transcription contains few different steps once the primary transcript pre mRNA is formed. A 5' cap and a 'poly A' tail are added to the pre mRNA strand. The pre mRNA also undergo a process known as splicing which eliminates the non-coding regions ([introns](#)) and keeps the coding regions ([exons](#)) which will finally code for a functional protein.

What is Reverse Transcription?

Reverse transcription is a process by which the synthesis of a complementary DNA (cDNA) occurs from an RNA template. This usually occurs in retroviruses, but also in some non-retroviruses such as [Hepatitis B](#) virus.

Reverse transcription is facilitated by the presence of RNA dependent DNA polymerase, more commonly referred to as reverse transcriptase. Reverse transcriptase of retroviruses is composed of three sequential biochemical activities: RNA dependent DNA polymerase activity, ribonuclease H activity, and DNA dependent DNA polymerase activity. The three sequential processes are utilized by retroviruses in the conversion of single-stranded RNA to a double-stranded cDNA. This double-stranded cDNA could be incorporated into the host genome that will cause long-term effects. Similar to other types of DNA polymerases, reverse transcriptase is dependent on templates and primers. The ribonuclease H activity of reverse transcriptase will facilitate the degradation of the RNA strand once the first DNA strand is synthesized. Then the enzyme uses the synthesized strand as a template to form a new strand which forms the double strand DNA molecule. Since reverse transcriptase doesn't have 3' to 5' exonucleolytic activity, reverse transcription process is error-prone.

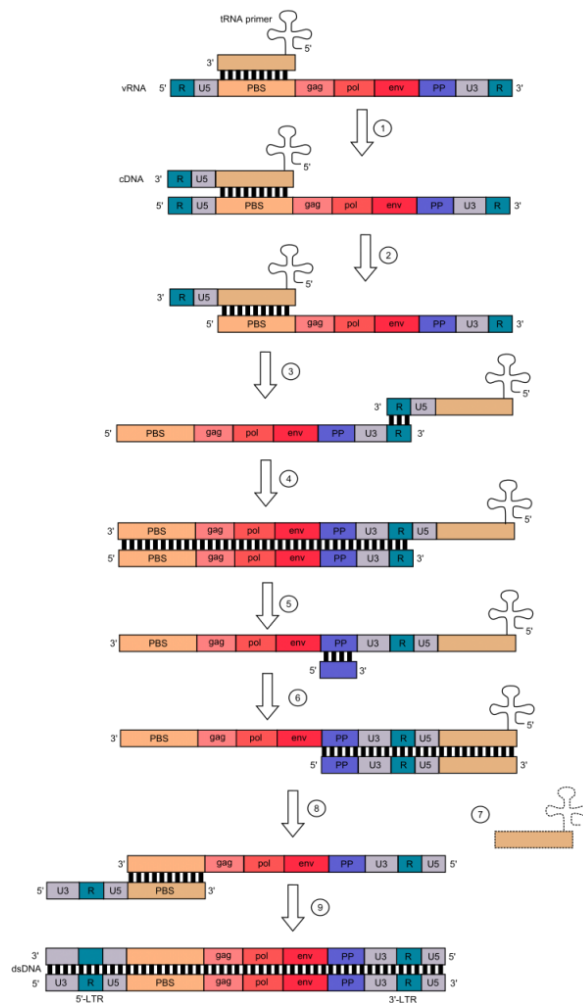


Figure 02: Reverse Transcription

What are the similarities between Transcription and Reverse Transcription?

- Both are involved in the process of gene expression that results in the production of a functional gene product.
- Both processes are enzyme mediated.
- Both processes take place in the nucleus of eukaryotes and cytoplasm of prokaryotes.

What is the difference between Transcription and Reverse transcription?

Transcription vs Reverse transcription	
Transcription is the process by which the information in a strand of DNA is copied into a new molecule of messenger RNA (mRNA).	Reverse transcription is the process which synthesizes cDNA from an RNA template in retroviruses.
Enzymes Involved	
RNA polymerase is involved in transcription.	Reverse transcriptase is involved in reverse transcription.
End Product	
The end product of transcription is mRNA.	End product of reverse transcription is complementary DNA.
Function	
The function of transcription is to synthesize mRNA to be translated into proteins.	The function of reverse transcription is to synthesize complementary DNA; this process is used in vivo to identify the coding sequences of DNA and to prepare cDNA libraries.

Summary – Transcription vs Reverse transcription

Transcription and reverse transcription are two processes which facilitate gene expression. Transcription is the first stage of gene expression. During transcription, a mRNA molecule is formed using a DNA template. The enzyme involved in this synthesis is RNA polymerase. Reverse transcription is a process used by retroviruses more commonly. During this process, a cDNA molecule is formed using an RNA template. Retroviruses use this mechanism to incorporate their genes into the host genome. Reverse transcriptase is enzymes utilized in this process. This is the difference between transcription and reverse transcription.

Reference:

1. "Reverse Transcription." Reverse Transcription | NEB, [Available here](#). Accessed 14 Sept. 2017.
2. "Overview of transcription." Khan Academy, [Available here](#). Accessed 14 Sept. 2017.

Image Courtesy:

1. "Reverse transcription" By Filip em This vector image was created with Inkscape. – Own work ([CC BY 3.0](#)) via [Commons Wikimedia](#)
2. "Process of transcription" by [Genomics Education Programme \(CC BY 2.0\)](#) via [Flickr](#)

How to Cite this Article?

APA: Difference Between Transcription and Reverse Transcription. (2017, September 25). Retrieved (date), from <http://www.differencebetween.com/difference-between-transcription-and-vs-reverse-transcription/>

MLA: "Difference Between Transcription and Reverse Transcription" Difference Between.Com. 25. September 2017. Web.

Chicago: "Difference Between Transcription and Reverse Transcription." Difference Between.Com. <http://www.differencebetween.com/difference-between-transcription-and-vs-reverse-transcription/> (accessed [date]).



Copyright © 2010-2017 Difference Between. All rights reserved.