

Transcription

TRANSCRIPTION

Transcription is the process of synthesizing RNA molecule on DNA template. During the process of transcription, adenosine pairs with uracil and guanine with cytosine. In transcription, only a segment of DNA from the template strands is copied into RNA.

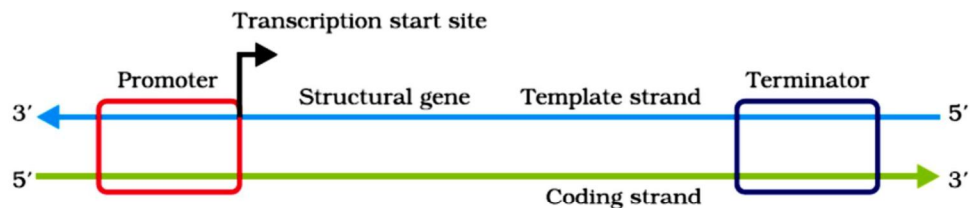
Only one strands of DNA is transcribed because:

1. Both strands code for different RNA molecule with different sequences (because of complementarity), and in turn, they code for proteins with different the sequence of amino acids. Hence, one segment of the DNA would be coding two different proteins, which would complicate the genetic information transfer machinery.
2. The two RNA molecules, if produced simultaneously, would be complementary to each other, hence they would form a double stranded RNA. This would prevent the synthesis of protein from RNA that make the transcription futile.

Transcription Unit

A transcription unit in DNA is defined primarily by the three regions in the DNA:

- (i) A Promoter
- (ii) The Structural gene
- (iii) A Terminator



Since the two strands of the DNA have opposite polarity and the DNA-dependent RNA polymerase catalyse the polymerisation in 5'→3' direction only, hence the template strand has the polarity of 3'→5'. The other strand which has the polarity (5'→3') and the sequence same as RNA (except thymine at the place of uracil), is displaced during transcription. This displaced strand is called non-template strand or coding strand as its sequence is similar to RNA molecule synthesized. All the reference point while defining a transcription unit is made with coding strand. To explain the point, a hypothetical sequence from a transcription unit is represented below:

3'-ATGCATGCATGCATGCATGC-5' Template Strand

5'-TACGTACGTACGTACGTACGTACG-3' Coding or non-template Strand

5'-UACGUACGUACGUACGUACGUACG-3' RNA Strand

The promoter and terminator flank the structural gene in a transcription unit. The promoter is located towards 5'-end (upstream) of the structural gene. Promoter is a DNA sequence that provides binding site for RNA polymerase. It is the presence of a promoter in a transcription unit that defines the template and coding strands. By switching its position with terminator, the definition of coding and template strands could be reversed.

The terminator is located towards 3'-end (downstream) of the coding strand. It usually defines the end of the process of transcription. There are additional regulatory sequences that may be present further upstream or downstream to the promoter.