MOLECULAR BASIS OF INHERITANCE

TRANSCRIPTION

CENTRAL DOGMA OF MOLECULAR BIOLOGY (TRANSCRIPTION UNIT)

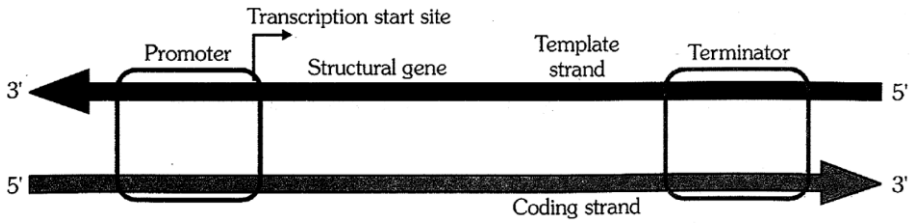
- ❖ Formation of RNA over DNA template is called transcription. Out of two strand of DNA only one strand participates in transcription and called "Antisense strand" or "Template strand".
- ❖ If both strands act as a template during transcription they would code for RNA molecule with different sequence and If they code for proteins the sequence of arninoacid in these protein would be different and another reason that if the two RNA molecule produced they would be complementary to each other and form a ds RNA which prevent translation of RNA.
- ❖ A gene is defined as the functional unit of inheritance. It is difficult to literally define a gene in terms of DNA sequence because the DNA sequence coding for tRNA or rRNA molecule is also define a gene (But information of protein is present on the DNA segment which code mRNA).
- ❖ The segment of DNA which contains signal for the s~thesis of one polypeptide is known as "Cistron " .
- ❖ RNA polymerase enzyme is involved in transcription. In eukaryotes there are three types of RNA polymerases.
- RNA polymerase-I for 28s rRNA 18s rRNA. 5.8s rRNA synthesis.
- RNA polymerase-II for hn-RNA synthesis (Precursor of m-RNA)
- RNA polymerase-III for t-RNA 5s rRNA SnRNA synthesis.

- ❖ Prokaryotes have only one type of RNA polymerase which synthesizes all types of RNAs .
- ❖ RNA polymerase (Core enzyme) of E. Coli has five polypeptide chains 13, 13: a, a and ro .
  - σ polypeptide chain is also known as σ factor (sigma factor).
- ❖ Core enzyne + Sigma factor ⇒ RNA Polymerase

  (β, β; α, α, ω) (σ)

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

(i) A promoter, (ii) The structural gene (iii) A terminator



Following steps are present in transcription -

(1) INITIATION :-

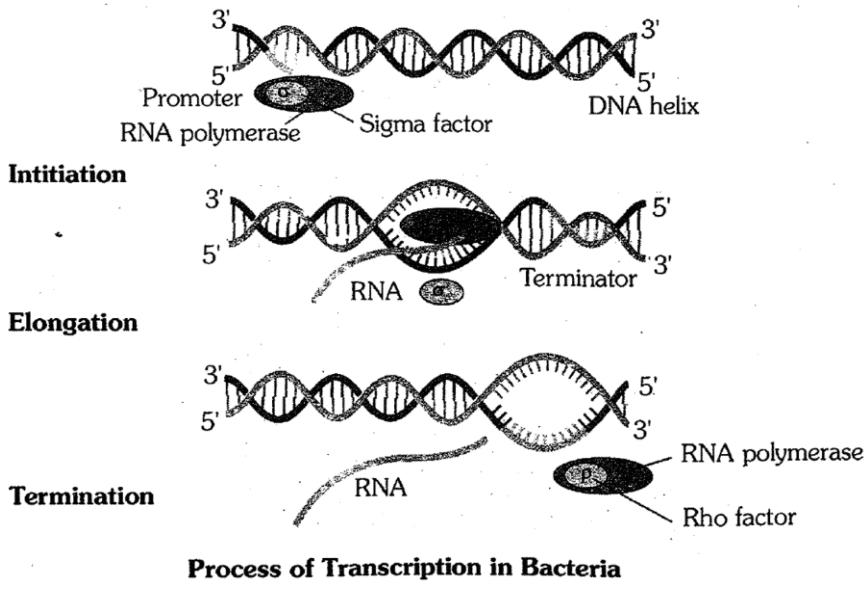
- DNA has a "Promoter site" where RNA polymerase binds and a "Terminator site" where transcription stops.
- Sigma factor (σ) recognises the promoter site of DNA.
- With the help of sigma factor RNA polymerase enzyme attached to a specific site of DNA called "Promoter site".
- In prokaryotes before the 10 N_2 base from. "Starting point" a sequence of 6 base pairs (TATMT) is present on DNA, which is called "Pribnow box".
- In eukaryotes before the 20 N2 base from "Starting point" a sequence of 7 base pairs (TATMM) or (TATATAT) is present on DNA which is called "TATA box or Hogness box"
- At start point RNA polymerase enzyme breaks H-bonds between two DNA strands and separates them.
- One of them strand takes part in transcription. Transcription proceeds in 5' 3' direction.
- Ribonucleoside triphosphate come to lie opposite complementary nitrogen bases of anti sense strand.
- These Ribonucleotides present in the form of triphosphate ATP, GTP, UTP and CTP. When they are used in transcription, pyrophosphatase hydrolyse two phosphates from each activated nucleotide. This releases energy. This energy is used in the process of transcription.

(2) ELONGATION :-

- RNA polymerase enzyme establishes phosphodiester bond between adjacent ribonucleotides.
- Sigma factor separates and RNA polymerase moves along the anti sense strand till it reaches terminator site.

(3) TERMINATION :-

- When RNA polymerase enzyme reaches at terminator site, it separates from DNA templet.
- In most cases RNA polymerase enzyme can recognise the 'Terminator site' and stop the synthesis of RNA chain, but in prokaryotes, it recognises the terminator site with the help of Rho factor (p factor).
- Rho (ρ) factor is a specific protein which helps RNA polymerase enzyme to recognise the terminator site.



Process of Transcription in Bacteria