Zoo-342 Molecular biology

Lecture 8

# Prokaryotic transcription

## Terminator sequences and transcription termination:

- **Two** types of terminator sequences exist in ***E. coli***:

1)Rho-dependent terminators: require a specific RNA structure and the p-protein.

2)Rho-independent terminators: require a specific RNA structure, but not the p-protein.

- Both types of terminators require the same type of RNA structure which is **inverted repeat** sequence **5'AAAGGCTCC3'**.
- This sequence is present in both the coding strand and the template strand. A **4** nucleotide sequence (UUUU) separates the inverted repeats.
- Inverted repeats can form a **stem-loop structure** at the 3' end of the RNA by pairing complementary bases within the transcribed mRNA (Figure 1).

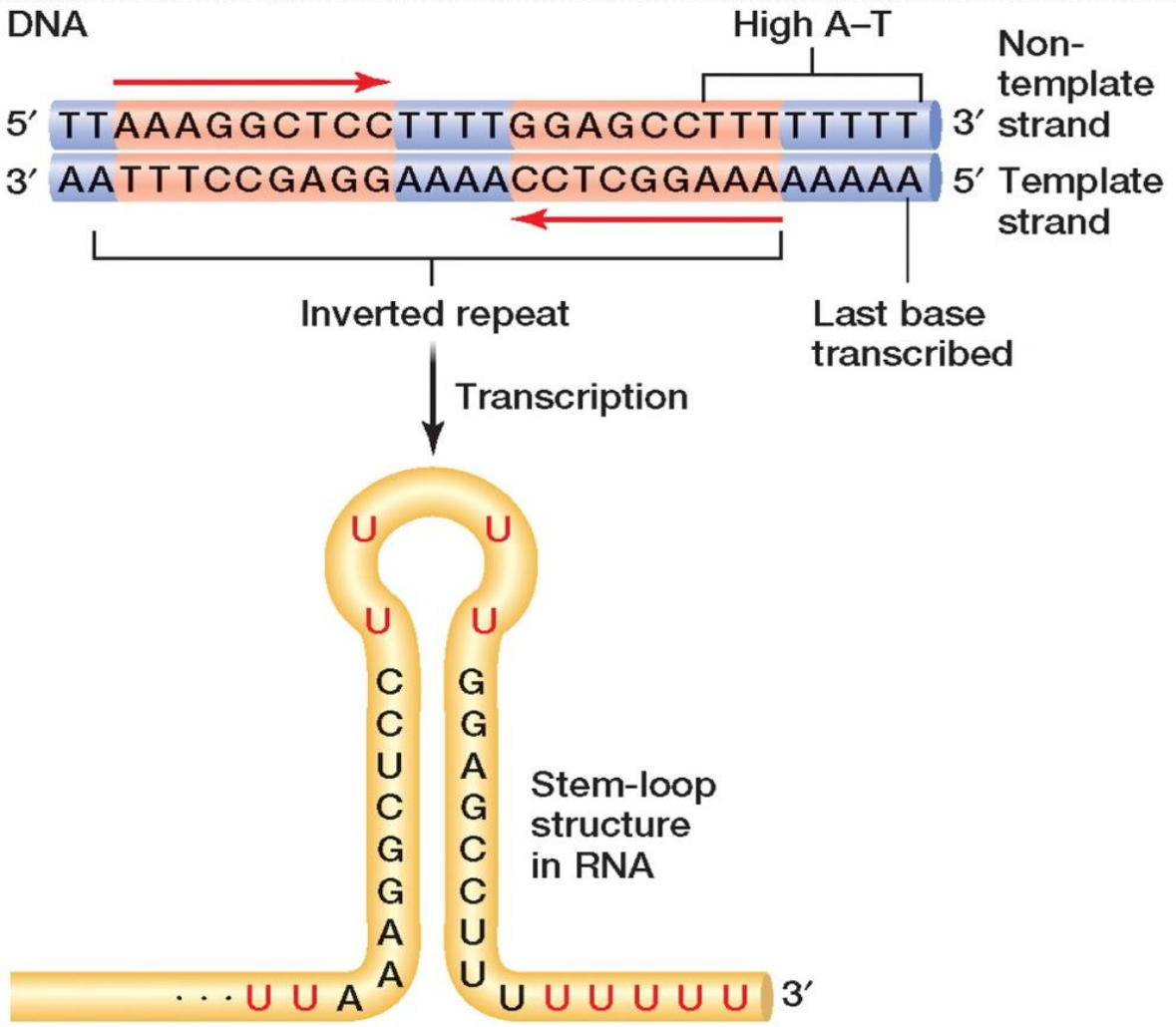


**Figure 1:** An inverted-repeat base sequence characterizes terminator regions of DNA transcription

## A summary of bacterial transcription:

- The RNA transcript contains a sequence complementary to the template strand of the gene's DNA produce either a messenger (mRNA) that is translated to protein or a functional RNA (tRNA or rRNA) that is not translated.
- An mRNA transcript contains nucleotide sequences that are to be translated into amino acids-coding segment as well as noncoding segments before and after.
- The rejoin of the mRNA that will be translated is termed the **open reading frame** (ORF).
- The ORF always **begins** with three-base sequence, **AUG** in the mRNA and **ATG** in the DNA, which is known as a translation initiation codon (**start codon**) and ends with one of the three-base sequences **UAA**, **UAG**, or **UGA**, known as translation termination codons (**stop codons**).

- The length of mRNA that begins from the **first** nucleotide transcribed **(+1)** to the start codon (AUG) is referred to as **5' untranslated rejoin (5' UTR).**
- The length of mRNA from the stop codon (UAA, UAG or UGA) to the last nucleotide transcribed is the **3' untranslated rejoin (3' UTR).**
- The **5' and 3' untranslated rejoins play a role in:**

1) Ensuring the structural stability of the mRNA.
2) Regulate translation at the ribosome.

- The promoter sequences (-10 and -35) are located upstream of where transcription will begin (+1) and are not present on the mRNA.
- In figure 2, the transcript represents only one gene and has a single ORF that extends from the AUG to the UAA codons.
- Many prokaryotic, however, contain the information for several genes.
- An **operon** is several genes that encode proteins and are expressed on a **single mRNA** under the control of **a single promoter**.

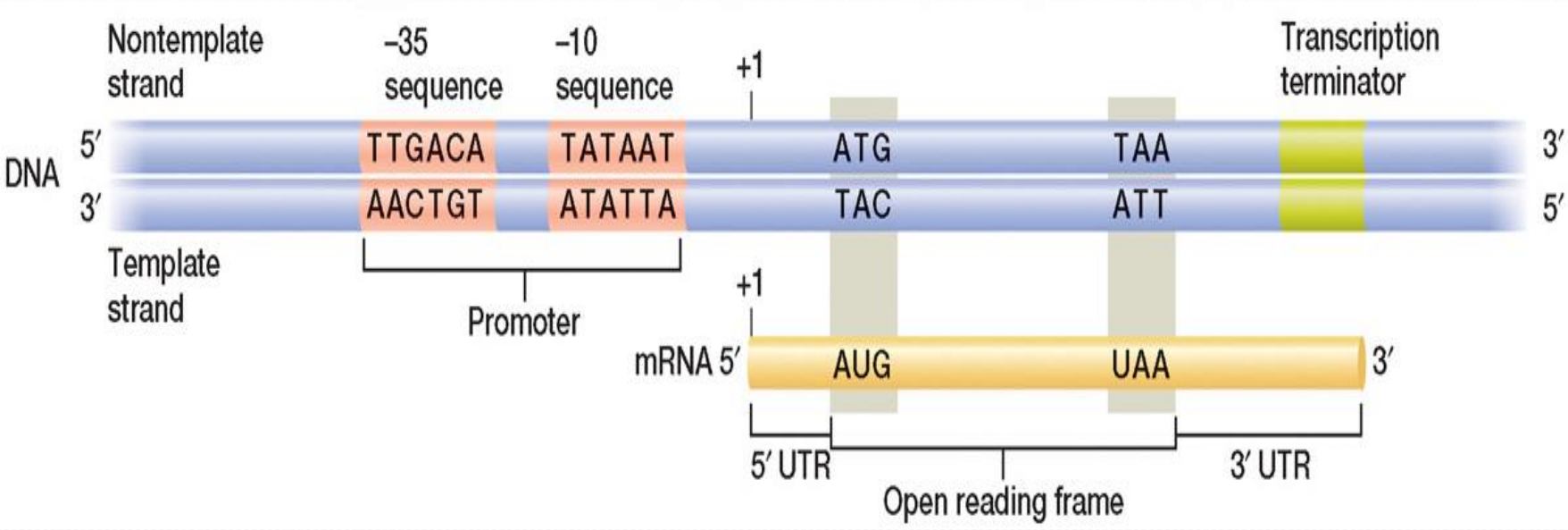


**Figure 2:** Relationship between a bacterial mRNA and its DNA

http://highered.mheducation.com/sites/007298760x/student_view0/chapter10/mrna_synthesis__quiz_1_.html

http://highered.mheducation.com/sites/007298760x/student_view0/chapter10/stages_of_transcription.html

http://highered.mheducation.com/sites/007298760x/student_view0/chapter10/transcription.html