

## REGULATION OF TRANSCRIPTION IN EUKARYOTES:

### Activators, Enhancers, Silencer, Repressors, miRNA mediated gene silencing

**Q.What do you mean by enhancer? Q.What is the role of enhancer in gene regulation?**

In many cases the expression of most genes is regulated by distant DNA elements called, **enhancers**. It has some basic features as follows:

- i)Enhancers typically extends about 200 base pairs (bps) in length and contains multiple binding sites for *sequence-specific transcriptional activators*.
- ii)Number- A typical mammalian gene may have a number of enhancers scattered within the DNA in the vicinity of the gene.
- iii)Specificity- Different enhancers typically bind different sets of transcription factors and respond independently to different stimuli.
- iv)Location-Some enhancers are located thousands or even tens of thousands of bps upstream or downstream from the gene whose transcription they stimulate.

**Q.Is there any role of enhancer on core promoter?**

vi)Even though enhancers and promoters may be separated by large numbers of nucleotides, enhancers are thought to stimulate transcription by influencing events that occur at the **core promoter**. Enhancers and core promoters can be brought into proximity because the intervening DNA can form a loop. DNA can be held in a loop through the interactions of bound proteins (**Figure1**)

vi)Q.If enhancers can interact with promoters over such long distance, what is to prevent an enhancer from binding to an appropriate promoter located even further downstream on the DNA molecule?

A promoter and its enhancers are in essence, “**cordoned off**” from other promoter/ enhancer elements by specialized boundary sequences called **insulators**. Insulator sequences bind to proteins of the nuclear matrix and the DNA segments between insulators correspond to the looped domains.

**Q.How transcriptional activators bound to an enhancer ?**

Transcription factors accomplish this through the action of intermediaries known as **coactivators**. They consists of numerous subunits and can be divided into 2 functional groups—

**(a)That interact with components of the basal transcription machinery (the general factors and RNA polymerase II) : Q.What is mediator?**

i)Transcription is accomplished through the recruitment and subsequent collaboration of large protein complexes. TFIID, one of the GTF (*general transcription factor*)required for initiation of transcription, consists of dozen or more subunits denoted as TAFs. Some transcription factors are thought to influence events at the core promoter by interacting with one or more of these TFIID subunits.

Another conactivators that communicates directly between enhancer-bound transcription-factors and the basal transcription machinery is called **mediator**.

**(b)That act on chromatin, converting it from a state is relatively inaccessible to the transcription machinery to a state that is much more transcription friendly (Figure1).**

This figure shows a schematic portrait of 4 types of conservators, two of each of the major groups. These various types of coactivators work together in an orderly manner to activate the transcription of particular genes in response to specific intracellular signals.

**Q.Coactivators alter chromatin structure— justify.**

i)The DNA in eukaryotic nucleus is not present in a naked state but is wrapped around histone octamers to form nucleosome. The histone molecules of the nucleosome core has a flexible N-terminal tail that extends outside the core particle and past the DNA helix.