Editorial

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Reading in Loops to Get Different Tails with RNA Polymerase II

Alekhya Thirunahari*

Department of Biotechnology, Osmania University, Hyderabad, Telangana, India

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***Corresponding author:**
Alekhya Thirunahari

thirunaharialekhya151315@gmail.com

Department of Biotechnology, Osmania University, Telangana, India.

Tel: 551832291000

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The DNA-loops are required for the RNA polymerase to be recycled during the numerous transcription rounds of a gene. To become an mRNA, the nascent transcript must be 3'-end processed: Cleaved in a precise point and given a 3'-end poly (A)-tail. Genes undergo 3 -end RNA processing at various sites under controlled settings. As a result of this Alternate Polyadenylation (APA), mRNA molecules may have various stabilities and regulated destinies. Alternative DNA loop creation is a crucial step in obtaining the APA.

RNA polymerase II is a multi-subunit enzyme that produces messenger RNA by transcripting protein-coding genes in eukaryotic cells (mRNA). Cleavage and polyadenylation are two crucial stages in eukaryotic mRNA synthesis for proper 3'-end processing. This is required to produce a message that can be recognised by the proteins that correctly export it to the cytosol, as well as to be efficiently translated by ribosomes or to mediate its turnover. But, after the first round of transcription, what happens to the RNA polymerase? For a fresh round of transcription, the RNA polymerase must be recycled back to the promoter.

However, the Carboxy-Terminal Domain (CTD) of the primary subunit of the RNA polymerase II has several repeats of a seven amino-acid sequence (YSTPSPS), each location can be covalently changed, and there are various combinations available. The polymerase's CTD Code will change numerous times while riding the loop and its CTD must be hypo phosphorylated before it can be recycled back to the promoter.

Many calcium transport proteins, such as Transient Receptor Potential Vanilloid Type 5 (TRPV5), Transient Receptor Potential Vanilloid Type 6 (TRPV6), Plasma Membrane Ca^{2}+ ATPase (PMCA), Parvalbumins (PVs), Calbindin-D9K (CaBP-9K), Calbindin-D28K (CaBP-28K), Calretinin (CR), and Sodium-Calcium Exchanger 1 (NCX1), CaBP-9K and CaBP-28K are the two calcium-binding proteins that are vitamin D dependent. Vitamin D, CaBP-9K, and CaBP-28K all play essential roles in calcium homeostasis modulation, including intestinal calcium absorption, urine calcium excretion, and bone production. The vitamin D endocrine system and its modes of action have been the subject of numerous reviews.

While riding the loop, the polymerase's CTD Code will change several times, and its CTD must be hypo phosphorylated before it can be recycled back to the promoter. We recently demonstrated in a similar study to this point that alternate DNA-loops can develop for genes with controlled APA. The predominant loop also includes the primary processing region. Changes in RNA polymerase II positioning or the CTD phosphatase Ssu72 also correlate with both, the loop and APA predominance. From the data attained for a gene with APA, it is clear the dependence of RNA processing in DNA-loop formation and, as indicated in the title, the RNA polymerase has to read the different loops in order to get messages with different tails which will depend on the cellular requirements.