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Dynamics of RNA string and hnRNP compactions

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The dynamics of RNA transcription involves in protein binding and RNA compaction. Co-transcriptional mechanisms involve with hnRNPs and other processing factors such as capping enzyme, and components of spliceosomal complexes. And transport of the complexes are well established. The hnRNP formations are observed in perichromatin fibrils, perichromatin granules, interchromatin granules and granules at the nuclear pore. These granules are ~22-24 nm in diameter and composed of hnRNA and hnRNPs. Larger spliceosomal particles are also observed. In vitro reconstitution of hnRNP revealed the stoichiometry of ~700-800 nucleotide RNA and 48 hnRNPs (A112, A212, B14, B24, C112, and C24). Observation of the reconstituted 40S particles showed a diameter ranging 22-24 nm. The RNA of 700-800s nucleotide may measure 400-500 nm in length. It is interesting to observe a model, where a simple enclosing accommodation of the RNA length for the circumference of the 40S particle would force to undergo 6-7 times of wrapping around. Therefore, a logical requirement of the particle model would be secondary foldings to satisfy the compact nature of hnRNP particles. It has been known that single stranded RNA tends to make small stem-loop structures and their free energy can be readily evaluated for thermodynamic applications. In order to find a best fitting molding pattern, various model studies were made to evaluate configuration of hnRNPs using 25-hydroxyvitamin D3 1 α hydroxylase, insulin, FMR1 and ovomucoid transcripts by Q-fold program. The hnRNA folding patterns are uniform in all 4 different hnRNAs as shown in the Table.

Transcript	nt/loop	nt/stem	nt in spacer	Frequency
(1) Insulin	4.6	7.4	3.5	15.5
(2) HDHGT	5.8	7.0	4.9	17.6
(3) FMR1	5.0	6.8	3.4	15.3
(4) Ovomucoid	5.6	7.0	3.7	16.0

Initial compaction ratio is 3-9 and 1 stem-loop is formed every 15-18 nucleotides. It is in good agreement with calculated chain of 15-17 nucleotides per hnRNP protein in reconstituted particles.

Biography

Tae Suk Ro-Choi did MD (1962) from Korea University, College of Medicine; MS (1964) from Baylor College of Medicine; PhD (1968) from Baylor College of Medicine; ECFMG (1984), Houston, TX. She is a Professor (2014) Department of Pharmacology, Dong A University College of Medicine.

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