World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:14, No:03, 2020

Dwindling the Stability of DNA Sequence by Base Substitution at Intersection of COMT and MIR4761 Gene

Authors : Srishty Gulati, Anju Singh, Shrikant Kukreti

Abstract : The manifestation of structural polymorphism in DNA depends on the sequence and surrounding environment. Ample of folded DNA structures have been found in the cellular system out of which DNA hairpins are very common, however, are indispensable due to their role in the replication initiation sites, recombination, transcription regulation, and protein recognition. We enumerate this approach in our study, where the two base substitutions and change in temperature embark destabilization of DNA structure and misbalance the equilibrium between two structures of a sequence present at the overlapping region of the human COMT gene and MIR4761 gene. COMT and MIR4761 gene encodes for catechol-O-methyltransferase (COMT) enzyme and microRNAs (miRNAs), respectively. Environmental changes and errors during cell division lead to genetic abnormalities. The COMT gene entailed in dopamine regulation fosters neurological diseases like Parkinson's disease, schizophrenia, velocardiofacial syndrome, etc. A 19-mer deoxyoligonucleotide sequence 5'-AGGACAAGGTGTGCATGCC-3' (COMT19) is located at exon-4 on chromosome 22 and band q11.2 at the intersection of COMT and MIR4761 gene. Bioinformatics studies suggest that this sequence is conserved in humans and few other organisms and is involved in recognition of transcription factors in the vicinity of 3'-end. Non-denaturating gel electrophoresis and CD spectroscopy of COMT sequences indicate the formation of hairpin type DNA structures. Temperature-dependent CD studies revealed an unusual shift in the slipped DNA-Hairpin DNA equilibrium with the change in temperature. Also, UV-thermal melting techniques suggest that the two base substitutions on the complementary strand of COMT19 did not affect the structure but reduces the stability of duplex. This study gives insight about the possibility of existing structurally polymorphic transient states within DNA segments present at the intersection of COMT and MIR4761 gene.

Keywords : base-substitution, catechol-o-methyltransferase (COMT), hairpin-DNA, structural polymorphism
Conference Title : ICFNACANA 2020 : International Conference on Frontiers in Nucleic Acid Chemistry and Artificial Nucleic Acids
Conference Location : Miami, United States
Conference Dates : March 12-13, 2020