ATOMIC FORCE MICROSCOPY IMAGING OF STRUCTURE AND DYNAMICS OF INTRAMOLECULAR TRIPLEX DNA

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Although the predominant DNA structure is a B-DNA double helix, several alternative structures have been discovered that may play important biological roles. An intramolecular triplex DNA or H-DNA formed by homopurine-homopyrimidine (Pu·Py) tracts is one biologically important alternative DNA structure. Potential biological roles of H-DNA are supported by a statistical overrepresentation of Pu·Py tracts in the genomes of eukaryotes and prokaryotes We applied atomic force microscopy (AFM) for direct imaging of H-DNA formed by mirror-repeated purine-pyrimidine repeats and stabilized by negative DNA supercoiling. H-DNA appears in AFM images as a clear protrusion with a different thickness than DNA duplex. Consistent with the existing models, H-DNA formation results in a kink in the double helix path. The kink forms an acute angle so that the flanking DNA regions are brought in close proximity. Time-lapse single molecule AFM was utilized for direct visualization of the H to B transition. The process of H-DNA dissociation induced by the pH shift was observed. Interestingly, this local transition was linked with a change in the overall shape of the DNA molecule. The role of the structure and dynamics of H-DNA in promoter-enhancer interactions and other DNA transactions will be discussed.