Single-Molecule Manipulation of DNA

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Abstract:

During DNA interactions, DNA is often stretched and stabilized by coupling with DNA binding proteins to serve as an intermediate state. The conformational and energetic changes of stretched DNA is of great interests because of their relevance in biological functions. Direct manipulation of DNA has yielded much of the information about the mechanical properties of DNA without the complication of interacting molecules. Stretching ssDNA has provided direct measurement of the base stacking mechanics and energetics. For example, polydA has been shown to have two transitions during overstretching. Using AFM, we have observed two pathways during the second transition. We have observed "hopping" between these two pathways during constant-force measurements. We have also observed an intermediate state during the double-stranded DNA overstretching transition. We will discuss the implications of such transition and its significance in biological functions.