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Direct Observation of Multiple Overstretching Pathways of poly dA by Atomic Force Microscopy WUEN-SHIU CHEN, WEI-HUNG CHEN, CHING-HWA KIANG, Physics & Astronomy, Rice University, CHING-HWA KIANG TEAM — During DNA interactions, single-stranded DNA (ssDNA) is often stretched and stabilized by coupling with ssDNA binding proteins to serve as an intermediate state. The conformational and energetic changes of stretched DNA are of great interest because of their relevance in biological functions. Poly dA has been shown to have unique over-stretching transitions among single-stranded DNA. We used atomic force microscope to stretch poly dA mechanically to study their phase transition under external force. In addition to the equilibrium pathway showing two pronounced plateaus indicating conformational transitions, multiple high energy pathways above the plateau were observed. We constructed a two states model and suggest the nonequilibrium pathways are kinetically trapped metastable states of the backbone conformation. Moreover, we have observed hopping between two states with constant force measurements. The finding may have implications in detailed mechanisms in DNA replication and transcription, and other protein-DNA interactions.

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