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Probing Conformational Changes in DNA by Force-Induced Melting of Double-Stranded DNA CARLOS JEZIEL GONZALEZ, AHMED TOUHAMI, University of Texas at Brownsville — The goal of this research is to study the thermodynamics and dynamics of conformational changes in double-stranded DNA (dsDNA) by single molecule stretching experiments using optical tweezers microscopy. Individual dsDNA molecules are attached to a chemically functionalized cover-slip and the force applied to the DNA, as a function of the extension, is measured via the motion of a trapped microsized bead. If a single dsDNA molecule is stretched to forces of about 65 pN, one observes a plateau in the force-extension curve. Very little additional force is required to stretch the molecule from its normal B-DNA contour length by a factor of 1.7 and more. The structural transition that occurs in this plateau is termed "overstretching transition" and is a transition from dsDNA to single-stranded DNA (ssDNA), closely similar to the thermal melting transition. However, the two strands do not separate completely at the end of the overstretching transition, but only at the much larger force of at least 150 pN. Our focus here is to investigate the helix-coil transition in dsDNA under various conditions. Our methodology provides an unprecedented opportunity for quantitative investigation of a wide range of physiologically important phenomena associated with DNA helix-destabilization.

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