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Mechanical unraveling of nucleosomes assembled on heterogeneous DNA using core histones, NAP-1, and ACF DOUGLAS E. SMITH, GREGORY J. GEMMEN, RONALD SIM, KARL A. HAUSHALTER, PU-CHUN KE, JAMES T. KADONAGA, Univ. California, San Diego — Nucleosomes were assembled on lambda DNA using core histones, the histone chaperone NAP-1, and ATP-dependent chromatin assembly and remodeling factor (ACF). The mechanical properties of these complexes were interrogated with optical tweezers. Abrupt events releasing 55 to 95 base pairs of DNA, attributable to the unraveling of individual nucleosomes, were frequently observed. This finding is comparable to previous results on nucleosomes assembled by salt dialysis on repeating positioning elements but differs from findings on complexes formed by exposing single DNA molecules to Xenopus extracts. Unraveling events occurred over a wide range of forces, which we attribute to variation in nucleosome stability with DNA sequence. The mean unraveling force decreased from 31 to 24 pN with NaCl increasing from 5 to 100 mM. Elasticity fits yielded an average persistence length of 18 nm and stretch modulus of 770 pN in 100 mM NaCl. Spontaneous DNA re-wrapping events were occasionally observed during force relaxation.

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