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**Active microrheology of a model of the nuclear micromechanical environment** HENRY BYRD, MARIA KILFOIL, Univ of Mass - Amherst — In order to successfully complete the final stages of chromosome segregation, eukaryotic cells require the motor enzyme topoisomerase II, which can resolve topological constraints between entangled strands of duplex DNA. We created an in vitro model of a close approximation of the nuclear micromechanical environment in terms of DNA mass and entanglement density, and investigated the influence of this motor enzyme on the DNA mechanics. Topoisomerase II is a non-processive ATPase which we found significantly increases the motions of embedded microspheres in the DNA network. Because of this activity, we study the mechanical properties of our model system by active microrheology by optical trapping. We test the limits of fluctuation dissipation theorem (FDT) under this type of activity by comparing the active microrheology to passive measurements, where thermal motion alone drives the beads. We can relate any departure from FDT to the timescale of topoisomerase II activity in the DNA network. These experiments provide insight into the physical necessity of this motor enzyme in the cell.

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