Chromatin Hydrodynamics

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Abstract

We describe the chromatin and the surrounding nucleoplasm as a active viscoelastic fluid which is stirred by ATP-driven local vector forces and scalar osmotic pressures. We use the two-fluid model of polymer (chromatin) plus solvent (nucleoplasm) in order to construct the non-Newtonian hydrodynamics of this viscoelastic fluid and to relate the velocity correlation functions (flow spectral density) recently measured by Zydowska et al., to the statistical properties of the active forces, via the frequency (and wave-vector) dependent susceptibility of the fluid. We show that the temporal features of the experimental data can be captured reasonably well by simple models of this susceptibility, and discuss the possible sources for the discrepancy between the predicted q-dependence and experiment.

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