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The local dynamics of unfolded versus folded tRNA in comparison to synthetic polyelectrolytes and the role of electrostatic interactions JOON HO ROH, University of Maryland and Johns Hopkins University, MADHU TYAGI, NIST Center for Neutron Research and University of Maryland, ROBERT M. BRIBER, University of Maryland, SARAH A. WOODSON, Johns Hopkins University, ALEXEI SOKOLOV, University of Tennessee — The local dynamics of RNA is strongly coupled to biological functions such as ligand recognition and catalysis. We have used quasielastic neutron scattering spectroscopy to follow the local motion of RNA and a synthetic polyelectrolyte as a function of Mg2+ concentration. We have observed that increasing Mg+2 concentration increases the picosecond to nanosecond dynamics of hydrated tRNA while stabilizing the tRNA folded structure. Analyses of the atomic mean-squared displacement, relaxation time, persistence length, and fraction of mobile atoms showed that unfolded tRNA is more rigid than in the folded state. This same behavior was observed for sulfonated polystyrene indicating that the increased dynamics in arises from charge screening of the polyelectrolyte rather than specific interactions. These results are opposite to what is observed for proteins for the relationship between the unfolded/folded states and the internal dynamics where the folded state is observed to be more rigid than the unfolded state. We conclude that the local dynamics for both bio- and synthetic polymers are strongly influenced by the electrostatic environment.

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