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Effects of Crowder Structure and Salt on DNA Mobility and Conformation in Crowded Environments[1] STEPHANIE M. GORCZYCA, RAE M. ROBERTSON-ANDERSON, University of San Diego — Biological cells are crowded environments in which DNA must move through to perform specific functions. We study how the properties of crowded cell-like environments impact DNA dynamics by tracking individual 115 kbp ring and linear DNA in different crowded environments using single-molecule fluorescence microscopy. We determine the role of crowder structure and salt on DNA diffusion and conformation by measuring the mean-squared center-of-mass displacements, as well as the conformational shape, size, and fluctuations of each molecule. Previously, we used 10 and 500 kDa dextran as crowders and showed that mobility of both ring and linear DNA decreased exponentially with increased crowding, but rings compact while linear DNA elongate. These effects were dependent solely on the reduction in available volume for DNA rather than size or number of crowders. Here we use crowders of similar molecular weight, but different structure to dextran (10 kDa PEG and 400 kDa Ficoll). We find that DNA mobility reduction is independent of crowder structure and that ring and linear DNA undergo more significant compaction. Finally, we characterize the role of salt on DNA mobility and conformation to determine the relative roles of enthalpic versus entropic effects on crowding-induced DNA dynamics.

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