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Effects of Crowding on DNA Self-Diffusion Using Single Molecule Methods STEPHANIE M. GORCZYCA, University of San Diego, COLE D. CHAPMAN, University of California, San Diego, RAE M. ROBERTSON-ANDERSON, University of San Diego — Using single molecule fluorescence microscopy and particle-tracking, we examine the effects of crowding on the self-diffusion coefficients (D) of large, double-stranded DNA molecules. To determine D, we track the mean squared displacement of single fluorescent-labeled DNA molecules embedded in solutions of dextran, a common crowding agent. We determine the dependence of DNA self-diffusion on factors such as the level of crowding (volume fraction of dextran), molecular weight of the crowding agent, and DNA length (11 and 115 kilobasepairs). Previously, sub-diffusive motion has been reported in crowded environments; however, despite its strong resemblance to cellular conditions, relatively few studies have examined DNA in crowded environments, with conflicting results. By examining the self-diffusion of DNA over a broad parameter space we hope to illuminate the underlying mechanisms responsible for the complex molecular behavior observed within in vitro crowded environments and biological cells.

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