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Conformational Dynamics and Interactions of a DNA Aptamer Observed by Single Molecule Spectroscopy JAMES TAYLOR, QUSAI DARUGAR, AJISH POTTY, RICHARD WILLSON, CHRISTY LANDES — Single molecule fluorescence resonance energy transfer (FRET) and fluorescence correlation spectroscopy (FCS) are used to study the interactions and structural dynamics of a DNA aptamer. Studies are performed both in the the presence of and in the absence of the aptamer's binding target, the dimeric form of vascular endothelial growth factor (VEGF) protein. FRET and FCS experiments are conducted to determine the characteristics of conformational fluctuations by the "anti-VEGF" aptamer (aV) under the two protein conditions, as well as under differing counterionic conditions. It is shown that aV in the absence of VEGF has conformational fluctuations on a relatively fast time scale (single milliseconds to tens of milliseconds), and that these fluctuations are largely counterion dependent, being especially sensitive to Mg^{2+} concentration. While these fluctuations also occur in the presence of VEGF, results show that the dynamics occur on a slower time scale (hundreds of milliseconds to single seconds), indicating that there is indeed an interaction between the aV aptamer and its binding target, VEGF.

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