Measuring the forces between DNAs in solution

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Quantifying the forces between DNAs is essential to improve our understanding of many fundamental biological processes. Using the small angle X-ray scattering (SAXS) technique, we have probed the effective forces between isolated DNAs (25 base pair, 48 bare charge) in solution by measuring the inter-DNA interference, from which the inter-DNA pair potentials are obtained following the generalized one-component method (GOCM). We report the measured effective interaction charges under varying DNA concentrations, counterion concentrations and valences. Notably, we observed the onset of an intriguing attractive force at rather low divalent Mg^{2+} concentrations >16mM, which was successfully modelled as a short range attraction. Our quantitative measurement of the effective inter-DNA forces should provide valuable comparisons to future theoretical studies.

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