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Supramolecular Self-Assembling Cyanine as an Alternative to Ethidium Bromide Displacement in DNA–Drug Model Interactions during High Throughput Screening

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Supramolecular self-assembling cyanine and spermine binding to genomic DNA was a model for DNA–drug interactions during high throughput screening. Spermine competitively inhibited the self-assembly of cyanine upon DNA scaffolds as signaled by decreased fluorescence from the DNA–cyanine J-aggregate. The sequence of DNA exposure to cyanine or spermine was critical in determining the magnitude of inhibition. Methanol potentiated spermine inhibition by >10-fold. The IC_{50} and association constant (K_a) in 16% methanol were 0.35 ± 0.03 μM and 2.86×10^6 M^{-1} respectively, relative to 3.97 ± 0.47 μM and 0.25×10^6 M^{-1} respectively, in buffer. Increasing concentrations of cyanine overcame spermine inhibition, demonstrating the reversibility of DNA–drug interactions. λDNA interacted similarly with spermine and cyanine, confirming system flexibility. The model drug, dye and methanol effects are discussed in detail. Cyanine might be a safer alternative to the mutagenic ethidium bromide for investigating DNA–drug interactions.

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