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Strong impact of chloro substituent on TOTO and YOYO ds-DNA/RNA sensing

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Abstract:

Introduction of chloro-substituent at cyanine chromophore of well-known DNA stains TOTO and YOYO resulted in a significant difference of DNA and RNA recognition in respect to parent compounds (TOTO; YOYO), as well as in respect to corresponding monomers (Cl-TO and Cl-YO). Studied novel compounds showed strong, submicromolar affinity to all ds-polynucleotides, with minor differences in binding constant between various DNA and RNA. The Cl-YOYO revealed a specific fluorimetric recognition of ds-RNA in respect to ds-DNA by the fluorimetric response at 570 nm, which was attributed to particular aggregation property of dye, not present in corresponding Cl-TOTO analogue. The Cl-TOTO, unlike YO-analogue, showed ICD band at 520 nm only upon binding to alternating DNA sequences (both, GC-GC and AT-AT), which was not observed for homo-DNA and homo-RNA. Such recognition pattern was attributed to structural differences between polynucleotides, whereby only alternating-DNAs have a typical B-helical structure in which Cl-TOTO molecule could self-fold to give particular ICD band at 520 nm. Thus, both Cl-analogues show intriguing novel recognition properties in respect to parent TOTO and YOYO, which combined with negligible cytotoxicity offer potential for development of novel dyes for biochemical and biomedical applications.

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