Sensing of nucleic acid and associated cellular components with organic fluorescent chemosensors

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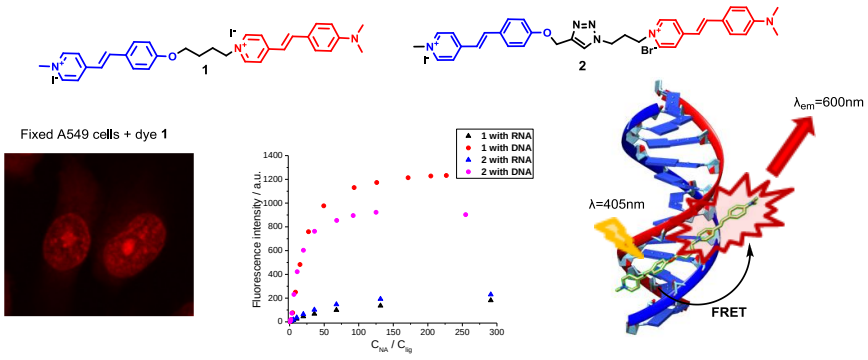
Cyanine dyes, in particular styryl dyes, exhibit remarkably high affinity towards nucleic acids along with a significant change of their photophysical properties upon DNA binding. These properties are used for DNA detection and quantification in a variety of methods and techniques such as the polymerase chain reaction, DNA fragment sizing, DNA staining, DNA damage detection, flow cytometry, and evaluation of biological activity. Although interactions of several styryl dyes with DNA have already been described, only relatively few investigations include sufficient data to deduce the binding modes. In this respect, DNA-binding properties of mono- and bis-styryl dyes were investigated in the presence of calf thymus DNA. To access the factors that influence the DNA association in the series of these ligands, the structure of the molecules was varied by either changing size of the heterocyclic moiety or altering the position of the styryl substituents. The major binding mode for the monostyryl dyes is intercalation, for bisstyryl dyes the interaction with DNA through the minor groove binding was found.



Recently, we showed that asymmetric bi(styryl) dyes are fluorescence turn-on probes for intracellular DNA/RNA distribution. These fluorogenic dyes possess the properties of highly soluble in water, cell permeable, high photoresistance and not toxic to cells thus being promising dyes for biological and biochemical non-toxic applications.

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