Synthesis of Cyanine Dyes and Their Use as Duplex DNA PhotoCleavage Agents

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Cyanine dyes consist of two terminal heterocyclic rings with nitrogen centers with one bearing a positive charge and are connected *via* an odd number polymethine chain. With current synthetic methods, the conjugated system of the compounds can be altered to assume specific absorption and fluorescence spectra within the range of 400 to 1000 nm. Structural diversity is achieved by varying the polymethine chain, the substituents on the nitrogens and the heterocycles themselves. Photodynamic therapy (PDT) is one of the medicinal applications of DNA intercalation. In PDT, when a photosensitizer is injected into the body and concentrates at the tumor site, it can be activated by light of a specific wavelength. Consequently, the cancer cells are killed selectively with minimal side effects. This therapy has been widely used as a treatment option for age related macular degeneration, acne, and cancer. However, recently we found a series of chromophores that can cleave DNA with various extent in the absence of light and/or an external reducing agent. It becomes crucial to investigate this property, because chromophores from this category automatically damage DNA without selectivity resulting severe side effects.