Photoreactions of a Water Soluble Poly-Isoquinolpyrrole with Plasmid DNA

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Photoreactions of a water soluble poly-isoquinolopyrrole with plasmid DNA
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Introduction/Background

- Photodynamic Therapy (PDT) uses light, a photosensitizer and O2 to kill tumor cells

As a potential anticancer agent PDT works by one of three mechanisms, all resulting in DNA damage and ultimately cell death.

Electronic and Electrochemical Properties

The figures below display the UV/Vis and Fluorescence of the poly-isoquinolopyrrole compound. The red band is the UV/Vis of the compound. The blue band is the UV/Vis of the compound in acid. The green band is the fluorescence of the compound. The compound displayed great absorption properties so even though we didn’t create the porphyrin, the compound is very promising.

The figure below shows the UV/Vis and Fluorescence of the methylated compound. The red band is the UV/Vis and the blue band is the fluorescence. The absorption properties are clearly not affected negatively by the addition of the methyl groups.

Conclusions

The initial desired compound was not obtained, instead a novel compound with an extended conjugated system has been synthesized in high yield and with great absorption properties. Ruthenation of the compound has been shown to photocleave plasmid DNA when irradiated with wavelengths greater than 420 nm. When irradiated with wavelengths greater than 550nm the rutheniums have been shown to quench the absorption properties and disrupt the ability of the molecule to photocleave the plasmid DNA. Methylation of the compound yielded a compound that was water soluble with great absorption and fluorescence in the PDT window. The methylated compound photoincided plasmid DNA at wavelengths longer than 550 nm which means that the addition of the methyl groups do not quench the absorption of the ligand. Further studies are being performed to elucidate the mechanism of the reaction with the goal of understanding what is happening chemically and to synthesize more of these novel compounds to be used in PDT. Also, to determine the PDT effectiveness of the compound in normal cells and cancer cells.