Investigation of DNA Binding and Intercalation by Ruthenium Pteridinyl-Phenanthroline Complexes

Sharon J. Nieter Burgmayer[1], Shannon R. Dalton[1], Samantha Glazier[2], Lindsay Alaishuski[1] and Courtney Megatulski[1]
[1]Department of Chemistry, Bryn Mawr College and [2]Department of Chemistry, St. Lawrence University

There is a large body of data demonstrating that six-coordinate complexes of ruthenium(II) coordinated to N-heterocyclic ligands of various shapes and sizes can intercalate into DNA, thereby exhibiting novel photophysical properties. Intercalating molecules can distort the helical shape of DNA, inhibiting replication enzymes, and in turn have pharmaceutical applications. We have prepared several new ruthenium(II) *bis*-bipyridine complexes having novel phenanthroline chelates fused to a pteridine. The different pteridine substituents present molecular extensions that complement the nucleic acid bases of DNA. In the presence of calf thymus DNA or plasmid DNA, three of these new complexes show spectroscopic changes indicative of DNA binding and intercalation as compared to known intercalators such as $Ru(bpy)_2(DPPZ)^{2+}$ and ethidium chloride. Reported are the results of viscometry, plasmid unwinding, thermal denaturation and circular dichroism studies which can differentiate between intercalation and surface binding mechanisms. The combination of experimental data from each method show that $[Ru(bpy)_2(phen\text{-}dimethylalloxazine)]^{2+}$, $[Ru(bpy)_2(phen\text{-}alloxazine)]^{2+}$ and $[Ru(bpy)_2(phen\text{-}diaminopteridine)]^{2+}$ do bind to DNA via an intercalative mode.