

Interaction of a new Pd(II)-piperidine complex with CT-DNA using fluorescence spectroscopy

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While the platinum-based anticancer agents have great therapeutic utilities [1], the types of cancer that can be cured with these agents are limited and the drugs exhibit side effects and resistance phenomena. Thus, bioinorganic synthetic chemists are continually trying to prepare non-platinum-based complexes bearing more effective, less toxic, target-specific and interact non-covalently with DNA as a target molecule in the cancer cells [2]. Recently, numerous Pd(II) complexes having higher anticancer activity and lower toxic side effects have been reported [3]. In this study, a new Pd(II) complex with the formula *cis*-[Pd(pip)₂Cl₂], in which pip is the piperidine ligand, was synthesized and characterized. The interaction of the complex with double stranded calf thymus DNA (CT-DNA) was studied by a competitive binding fluorescence experiment using ethidium bromide (EB) as a probe. This study was done at three different temperatures of 298, 305 and 310 K. In these experiments, the fluorescence intensity of EB bound to DNA was quenched considerably on addition of the Pd(II) complex. This indicates that the intercalated EB molecules on ds-DNA could be replaced partially by the Pd(II) [4]. The binding constant (K_b) values in the interaction of the studied complex with CT-DNA were calculated to be 4.5×10^4 , 1.7×10^5 and $6.1 \times 10^5 \text{ M}^{-1}$ at 298, 305 and 310 K, respectively. The number of binding sites (n) on DNA for this complex was found to be about 1. The obtained results indicate a moderately strong interaction between the Pd(II) complex and CT-DNA, which is probably occur via groove binding. The thermodynamic parameters ΔH° , ΔS° and ΔG° in the interaction of the metal complex with CT-DNA were also determined using the results obtained from the fluorescence spectroscopy, which indicate a spontaneous hydrophobic interaction between the Pd(II) complex and DNA.

Keywords: Palladium(II) complex, DNA interaction, Fluorescence spectroscopy Thermodynamic parameters

References

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