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Synthesis, Characterization and in vitro DNA Binding and Cleavage Studies of Cu(II)/Zn(II) Dipeptide Complexes

Authors : A. Jamsheera, F. Arjmand, D. K. Mohapatra

Abstract : Small molecules binding to specific sites along DNA molecule are considered as potential chemotherapeutic agents. Their role as mediators of key biological functions and their unique intrinsic properties make them particularly attractive therapeutic agents. Keeping in view, novel dipeptide complexes Cu(II)-Val-Pro (1), Zn(II)-Val-Pro (2), Cu(II)-Ala-Pro (3) and Zn(II)-Ala-Pro (4) were synthesized and thoroughly characterized using different spectroscopic techniques including elemental analyses, IR, NMR, ESI–MS and molar conductance measurements. The solution stability study carried out by UV–vis absorption titration over a broad range of pH proved the stability of the complexes in solution. In vitro DNA binding studies of complexes 1–4 carried out employing absorption, fluorescence, circular dichroism and viscometric studies revealed the binding of complexes to DNA via groove binding. UV–vis titrations of 1–4 with mononucleotides of interest viz., 5´-GMP and 5´-TMP were also carried out. The DNA cleavage activity of the complexes 1 and 2 were ascertained by gel electrophoresis assay which revealed that the complexes are good DNA cleavage agents and the cleavage mechanism involved a hydrolytic pathway. Furthermore, in vitro antitumor activity of complex 1 was screened against human cancer cell lines of different histological origin.

Keywords : dipeptide Cu(II) and Zn(II) complexes, DNA binding profile, pBR322 DNA cleavage, in vitro anticancer activity
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