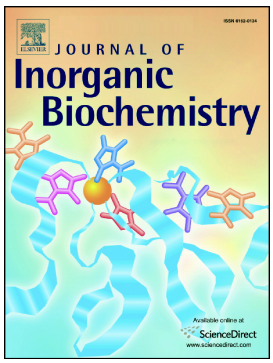

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Simple and mixed complexes of copper(II) with 8-hydroxyquinoline derivatives and amino acids: characterization in solution and potential biological implications

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Abstract

Copper(II) complexes with 8-hydroxyquinoline (8-HQ) and two 8-HQ derivatives, namely clioquinol (CQ) and 5,7-dichloro-2-[(dimethylamino)methyl]quinolin-8-ol (PBT2), were investigated in organic and, where feasible, in aqueous solutions. This class of compounds is of particular interest in neurological disorders since they may act as metal-protein attenuating compounds and may help redistributing metal ions and restoring intracellular metal reserves, which are often perturbed in neurological patients. Several techniques, like potentiometry, UV-Vis absorption, electron paramagnetic resonance (EPR), cyclic voltammetry and electrospray ionisation-mass spectrometry (ESI-MS), were used to obtain information on both the formation of copper(II) complexes in solution as well as on the structure of their species. Multi-wavelength treatment of UV-Vis data clearly indicated the formation of both $[Cu(PBT2)]^+$ and $[Cu(PBT2)_2]$ species; the speciation was also supported by ESI-MS data. The EPR results showed that the mono- and bis-copper(II) complexes with PBT2 have square-based pyramidal structures whilst the bis-copper (II) complexes with CQ or 8-HQ have square-planar o pseudo-octahedral geometries. The formation of copper(II) ternary complexes with 8-HQ, CQ and PBT2 and some selected neurotransmitters (glycine, glutamate and histidine) is also reported. Except for the copper(II) ternary complex with PBT2 and His, almost all ternary complexes have molecular geometries, which are not different from those of the bis-complexes. Interestingly the ternary copper(II) complexes, containing CQ, 8-HQ and PBT2 and glycine, glutamate or histidine turned out to be more soluble in aqueous solution than their binary complexes with parent 8-HQ derivatives; the copper(II) complexes can also be reduced more easily than their parent bis-complexes.

Keywords: Copper, PBT2, ternary complexes, voltammetry, stability constants