Coordination abilities of a fragment containing D^{1} and H^{12} residues of neuropeptide γ and products of metal- catalyzed oxidation.

Autorzy

Teresa Kowalik-Jankowska

Elżbieta Jankowska

F. Kasprzykowski

Rok wydania

2010

Czasopismo

Inorganic Chemistry

Numer woluminu

49

Strony

2182-2192

DOI

10.1021/ic902021j.

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Stoichiometry, stability constants, and solution structures of copper(II) complexes of the (1-2,10-21)NPgamma (D(1)-A(2)-K(10)-R-H(12)-K-T-D-S-F-V-G-L-M(21)-NH(2)) and Ac-(1-2,10-21)NPgamma (Ac-D(1)-A(2)-K(10)-R-H(12)-K-T-D-S-F-V-G-L-M(21)-NH(2)) fragments of neuropeptide gamma were determined in aqueous solution in the pH range 2.5-10.5. The potentiometric and spectroscopic data (UV-vis, CD, EPR) show that an N-terminal Asp residue stabilizes significantly the copper(II) complexes with 1N {NH(2), beta-COO(-)} and 2N {NH(2), beta-COO(-), N(Im)} coordination modes of the (1-2,10-21)NPgamma as the result of coordination through the beta-carboxylate group. In a wide pH range of 4-9, the imidazole nitrogen of His(12) is coordinated to form a macrochelate. The (1-2,10-21)NPgamma peptide consists of 14 amino acid residues and contains an N-terminal amine group and the histidine residue, and as it is suggested, this fragment is able to bind two equivalents of copper(II) ions. The postmortem studies support the involvement of oxidative stress and the production of reactive oxygen species in neurodegenerative diseases. The susceptibility of proteins to oxidative damage is highly dependent on the specific properties of individual proteins, such as unique sequence motifs, surface accessibility, protein folding, and subcelluar localization. Metal-catalyzed oxidation of proteins is mainly a site-specific process in which one or a few amino acids at metal-binding sites on the protein are preferentially oxidized. To elucidate the products of the copper(II)-catalyzed oxidation of the (1-2,10-21)NPgamma and Ac-(1-2,10-21)NPgamma fragments of neuropeptide gamma, the liquid chromatography-mass spectrometry method and the use of Cu(II)/hydrogen peroxide as a model oxidizing system were employed. For both peptides, the oxidation of the methionine residue to methionine sulfoxide for the solutions containing peptide-hydrogen peroxide was observed. The oxidations of the histidine to 2-oxo-histidine and the methionine sulfoxide to sulfone were detected for the Cu(II)-Ac-(1-2,10-21)NPgamma-hydrogen peroxide 1:1:4 molar ratio system. Fragmentations of both peptides near the His residue were observed, supporting the participation of this (His) residue in the coordination of the copper(II) ions.

Adres publiczny

http://dx.doi.org/10.1021/ic902021j.