Redox behavior of β-amyloid-Cu^{2+} complexes involved in Alzheimer's Disease

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Alzheimer's disease (AD) is the most common cause of dementia in the world, affecting more than 30 millions elders. The hallmark of AD is a progressive loss of cholinergic neurons with deterioration of memory and cognition, associated to the abnormal extracellular deposition of β-amyloid (Aβ) aggregates, and high concentrations of transition metal ions such as Cu, Fe and Zn in the brain. Aβ displays a high binding affinity for Cu^{2+}. In addition, Aβ-metal complexes have been proposed to participate in the generation of reactive oxygen species (ROS), which in turn cause neuronal damage [1]. The coordination properties of Cu^{2+} binding sites in Aβ have been extensively studied, as reviewed in [2]. This study focuses in the electrochemical characterization of the different Aβ-Cu^{2+} complexes that are formed, as a function of pH and relative Cu:protein concentrations. Cu^{2+} coordination to different variants of the Aβ(1-16) fragment were characterized by spectroscopic techniques such as electron paramagnetic resonance, electronic absorption and circular dichroism in the UV-Vis region. The redox properties of these Aβ-Cu complexes were evaluated using cyclic voltammetry, revealing that different Cu^{2+} coordination modes display different redox behaviors. These results add to the few electrochemical studies reported for Aβ-Cu^{2+} complexes [3-7], and they give further insight into the redox relevance of Aβ-Cu^{2+} interactions.

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