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Modification of amino-acid sequence of cosmetic peptide *Eyeseryl* enhances the affinity towards copper(II) ion

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Streszczenie

Demographic changes in the world (the population aging) have resulted in increased efforts of many scientific groups to prevent the aging process and to develop safe and effective cosmetics and medicines for the elderly. For this reason, for over 40 years, skincare peptides have been the subject of interest for many research groups. From time to time, new peptides are introduced to the cosmetics industry as they are promising and attractive active ingredients in the growing and innovative cosmetics market. We report herein the results of a study on the interactions between Cu^{2+} ions and two tetrapeptides: a) peptide with sequence Ac -$_{\beta}$AHSH-OH (B1), having cosmetic potential which is used in a preparation called Eyeseryl, and b) a new derivative of B1 with the following sequence: Ac-HAEH-OH (B2). Potentiometric titration was used to study acid-base properties as well as the binding properties of the investigated peptides. Furthermore, the stoichiometry of the peptide complexes with Cu^{2+} ions was evaluated by the isothermal titration calorimetry and mass spectrometry. Additionally, based on the density functional theory (DFT) calculations, we propose the most likely structures of the complexes of the peptides B1 and B2 with Cu^{2+} ions. It was found that both peptides are not toxic against human fibroblasts and keratinocytes and form thermodynamically stable complexes with the Cu^{2+} cation. A modification in the Eyeseryl sequence enhances the affinity of the investigated peptides towards Cu^{2+}. The longer distance between histidine residues favors the formation of the main peptide chain in the complex without an excessive backbone tension and also has an impact on the stability of formed complexes.

Słowa kluczowe

Cosmetic peptide, Cu(II) complexes, Coordination properties, Isothermal titration calorimetry, Potentiometric titration method, DFT

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