Positively charged residues play a significant role in enhancing the antibacterial activity of calcitermin

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Streszczenie

A systematic study on the human antimicrobial peptide calcitermin (VAIALKAAHYHTHKE) and its carefully designed derivatives was undertaken to verify the impact of divalent copper and zinc ions on the stability, coordination and antimicrobial activity of the formed complexes. In this work we investigate the calcitermin mutants where the alanine in position 7 and 8 is substituted with an arginine residue, with the aim of enhancing the antibacterial activity. Additionally, the analogue where alanine in position 7 is replaced with a histidine is considered, to obtain a chelating sequence with four histidines in alternate position; the aim of this change was to increase the cationic properties of the peptide under acidic conditions and possibly enhance its binding ability towards the metal ions. Through a comprehensive analytical approach involving potentiometric titrations, mass spectrometry, UV–Vis spectrophotometry, NMR and circular dichroism, we delved into the formation equilibria and coordination chemistry of the formed copper(II) and zinc(II) complexes. Antimicrobial assays are also performed to assess the bioactivity of the compounds against a broad spectrum of microorganisms, revealing the pivotal role of positively charged residues in enhancing the antibacterial activity of calcitermin. The obtained results serve as an important stepping stone towards the development of novel metal-based antimicrobial agents.

Słowa kluczowe

Cryptides, Antimicrobial peptides, Calcitermin, Metal coordination, Spectroscopic methods, Antimicrobial activity