Oddziaływanie przeciwdrobnoustrojowych peptydów z jonami metali - Relacja między chemią koordynacyjną, strukturą, termodynamiką a sposobem działania = The interaction of antimicrobial peptides with metal ions - The realationship between coordination chemistry, structure, termodynamics and mode of action

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Streszczenie

Increasing bacterial and fungal drug resistance makes novel, effective
antimicrobial treatments actively sought. Because of the general lack of resistance
towards antimicrobial peptides (AMPs), they are being relied on as a novel class of
therapeutics aimed to conquer drug-resistant bacteria and fungi.
There are numerous ways in which AMPs might interact with pathogens, such
as membrane disruption, production of reactive oxygen species, inhibition of cell
wall, nucleic acid and protein synthesis or by the withdrawal of essential metal ions.
Biologically indispensable metal ions, such as Zn(II) and Cu(II), which are the key
players of this project, have a dual effect on the activity of antimicrobial peptides: (i)
AMPs bind them, so that microbes cannot get enough metals essential for their life
and virulence (withdrawal of metal ions, nutritional immunity) or (ii) AMPs need the
given metal ion as a booster of their antimicrobial activity (metal ions affect the AMP
charge and/or structure).
In this chapter, we discuss the impact of the coordination of Cu(II) and Zn(II) to
several antimicrobial peptides, focusing on the thermodynamics, structure and
coordination chemistry. The comparison of these data to the outcome of biological

Typ publikacji

Artykuł

growth studies (determination of minimal inhibitory concentration (MIC) of metalAMP
complexes and their derivatives allows to draw conclusions about the
relationship between the metal-antimicrobial peptide complex structure, stability
mode of action and efficacy. In the nearest future, the most efficient complexes may
serve as templates for a rational design of novel, more potent AMP-based
therapeutics. Further improvement can be reached through the modification of the
most promising AMP complexes using (i) specifically targeted antimicrobial
peptides, in which the AMP will be covalently linked to a targeting peptide (Figure
1) or (ii) chimeric compounds comprising AMPs bound to conventional
antimicrobials or peptidomimetic modifications (Figure 2).

Słowa kluczowe

antimicrobial peptides, metal coordination, antibiotic resistance

peptydy przeciwdrobnoustrojowe, koordynacja metali, antybiotykooporność