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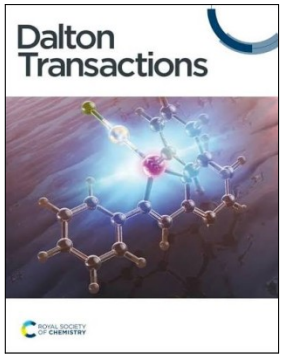
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Title: Rational design strategies for transition metal-amino acid complexes with enhanced antibacterial efficacy

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Abstract: Over the past half-century, antimicrobial agents have advanced healthcare and saved many lives. Now, nevertheless, drug resistance poses a threat to the entire advancement. Pathogenic bacteria are always adapting, so we need new antibiotics with better molecular structures and selectivity to keep up. In this regard, amino acid conjugates have excelled. They differ from conventional antibiotics in that they target bacteria in ways that promote resistance more slowly. The combination of amino acids with transition metals forms a class of compounds known as transition metal–amino acid conjugates. The most intriguing part about these complexes is that, despite repeated exposure, bacteria do not appear to build a tolerance to their potent antibacterial activity. The biological characteristics of peptides, which are chains of amino acids, can be altered by complexing them with transition metals. In light of the growing importance of transition metal complexes produced from amino acid ligands in combating antimicrobial resistance, this study seeks to present a thorough and critical summary of their design methodologies and antibacterial potential. Topics covered include the most up-to-date methods in coordination chemistry for building complexes between transition metals and amino acids, as well as optimisation of geometric structures, ligand selection, and the impact of metal ion identity on antibacterial activity. In essence, it is intended to explain why these conjugates are so important for fighting drug-resistant diseases and dissect the best strategies for designing them.



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