Bismuth meets siderophores: Thermodynamic insights into Bi(III) complexes with Desferrioxamine B and E

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Bismuth has been used in medicine for centuries and is currently essential for eradicating *Helicobacter pylori* while also restoring antibiotic sensitivity in multi-drug-resistant strains. Its efficacy is based on a Trojan Horse mechanism where Bi(III) ions enter bacterial cells by mimicking iron, which allows them to interfere with primary metabolic pathways. As siderophores may help to overcome bismuth's low bioavailability, our research focuses on the determination on chelating properties of desferrioxamine B (DFOB) and desferrioxamine E (FOXE) toward Bi(III) ions. In this study, the stoichiometry, thermodynamic stability and speciation of the resulting complexes were determined across a broad pH range using electrospray ionization mass spectrometry (ESI-MS), potentiometry and UV–Vis spectroscopy. This approach effectively resolves the difficulties of Bi(III) aqueous chemistry, particularly its extensive hydrolysis and limited spectral information. The proposed model identifies mononuclear di- and trihydroxamate complexes for both ligands, with results indicating that FOXE is a stronger chelator than DFOB. Based on stability constants and calculated pBi values, both siderophores are identified as efficient Bi(III) chelators with potential for targeted antimicrobial delivery and as candidates for radiolabeling with ^{213}Bi radioisotope in advanced infection treatment.

Słowa kluczowe

Bismuth(III), Siderophores, Desferrioxamine B, Desferrioxamine E, Coordination chemistry, Bismuth chelators

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