Synthesis, structural characterization, high resolution mass spectrometric studies and antimicrobial assays of a silver complex with sulfisoxazole

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The discovery of the antibacterial activity of sulfonamides and their applications in the treatment of various infections changed the antimicrobial therapy that we know today, bringing a significant improvement in quality of life.[1,2] However, the excessive and indiscriminate use of sulfa drugs and other classes of antimicrobial agents led to the emergence of antibiotic-resistant bacteria, turning the search for new drugs extremely important.[1-4] One of the strategies to develop new antibacterial agents, is the coordination of drugs with metals, both showing recognized antibacterial activities.[1, 2, 4] In this context, the present work describes the synthesis, structural characterization and biological assays of a new silver(I) complex with the sulfa drug sulfisoxazole (SIZ). Elemental, thermal and high resolution mass spectrometric studies (ESI-QTOF-MS) led to a 1:1 metal/ligand composition, suggesting the minimal formula $AgC_{11}H_{12}O_3N_3S{\cdot}0.5H_2O$ (Ag-SIZ). Infrared and solution state NMR spectroscopic measurements indicated ligand coordination to Ag(I) by the nitrogen atoms of the SO_2N and NH_2 groups. This hypothesis was confirmed by crystallographic studies, which shows the formation of a dimer with two Ag(I) bridging between two SIZ molecules. Antibacterial assays indicated that the Ag-SIZ complex is effective against Gram-negative (*E. coli* and *P. aeruginosa*) and Gram-positive (*S. aureus*). The complex was shown to be more active against the Gram-positive bacterial strain.

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