Synthesis, characterization and *in vitro* evaluation of the antibacterial activity of a silver(I)-imidazole derivative complex

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Silver is known since ancient times for its antimicrobial activity. Nowadays silver sulfadiazine is one of the most used drug worldwide for the treatment of burn wounds and skin ulcers.[1] The success of this drug led to the idea that silver could be a viable alternative to antibiotics. The replacement of a common antibiotic by other alternatives is driven by the rise of resistant bacteria.[2] Silver is an interesting alternative because it has several different modes of action[3] thus silver resistant bacteria are rare. Additionally, silver(I) complexes can show synergistic or additive antibacterial action if they are complexed with bioactive ligands. Imidazole and thiophene are especially interesting ligands for the development of metallodrugs as these groups are usually found in several commercial drugs.[4,5]

A novel silver(I) complex with the ligand 2-thiophen-2-il-imidazole was synthesized and fully characterized. The composition found for this complex is $[Ag(C_7H_6N_2S)]NO_3$ being a cationic complex with a nitrate counter ion. Single crystal X ray diffraction (XRD) was used to solve its structure, showing that each ligand coordinates to the silver atom by the imine nitrogen of the imidazole ring with linear geometry (Figure 1). The molecules are connected via strong hydrogen bonds between the imidazole's amine hydrogen and the nitrate ion. Infrared spectroscopic analysis and solution and solid-state nuclear magnetic resonance spectroscopic analyses were also performed and confirmed the coordination sites of the ligand to the metal. The complex showed antibacterial activity against *S. aureus*, *E. coli* and *P. aeruginosa*, whereas the ligand showed no activity.

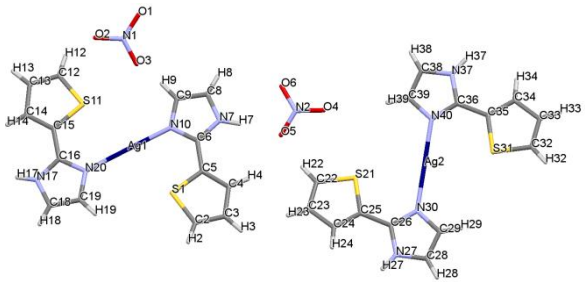

Figure 1. Asymmetric unit of Ag-Thim complex.

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