Background
Among the bioactive metals, silver exhibits the highest toxicity to bacteria, viruses, and other eukaryotic microorganisms. A large number of bioactive Ag(I) coordination compounds with different ligand environment have been reported and, in particular, the derivatives containing weak Ag−O and/or Ag−N bonds can exhibit a high bioactivity, lower light stability, and inferior solubility in water than the compounds with rather strong Ag−S or Ag−P bonds. Herein we describe the synthesis and antimicrobial activity of two new silver(I) compounds that feature the {AgNO} or {AgSO} environments and were derived from semicarbazone and thiosemicarbazone type ligands.

Methods
Organic ligands HL1 [1, 1-((4-nitrophenyl)(phenyl)methylene)-semicarbazone] and HL2 [2, 1-((4-nitrophenyl)(phenyl)methylene)-thiosemicarbazone] were prepared from 4-nitrobenzophenone via a one-step procedure from semicarbazide or thiosemicarbazide. Discrete silver(I) complexes [Ag(HL1) (NO3)] (3) and [{Ag(HL2)(NO3)}6] (4) were obtained in the reaction of AgNO3 with 1 or 2 in acetonitrile-acetone mixture. The Minimum inhibitory and minimum lethal concentration of the organic ligands were tested against Gram positive S. epidermis and S. aureus and Gram negative P. aeruginosa and E. coli. The ability to inhibit biofilm formation was also determined.

Results and conclusion
Two new silver(I) coordination compounds were prepared and fully characterized by standard methods (FTIR, NMR, ESI-MS, elemental analysis) as well as single-crystal X-ray diffraction. Of the 4 tested compounds, only 4 presented antimicrobial activity, including the ability to impair biofilm formation. However, the antimicrobial activity was only observed for the gram-positive bacteria. Further research on the design of other silver(I) coordination compounds and exploration of their antimicrobial potential is currently in progress in our laboratories.

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