

TITLE: ANTIBIOFILM ACTIVITY OF THE $[\text{Ru}(\text{phen})_2(\text{bpy-ant})]^{2+}$ IRRADIATED WITH BLUE LED AGAINST *Staphylococcus aureus* AND *Staphylococcus epidermidis* STRAINS

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ABSTRACT:

Antimicrobial resistance is a critical global public health problem, which is increasing the number of deaths caused by multiresistant bacteria. In the face of this problem, the discovery of new classes of antimicrobial compounds, constitutes a target to be reached, to overcome the current problems of resistance to antibiotics. Currently, studies based on ruthenium (II) complexes have shown the antimicrobial activity of these compounds when associated with specific ligands and the photodynamic therapy. Thus, the aim of this study was evaluated the antibiofilm effect of $[\text{Ru}(\text{phen})_2(\text{bpy-ant})]^{2+}$ with and without blue LED irradiation (460 nm) against *Staphylococcus aureus* ATCC 25923, *Staphylococcus aureus* ATCC 700698 (MRSA) *Staphylococcus epidermidis* ATCC 12228 and *Staphylococcus epidermidis* ATCC 35984. To determine the antibiofilm activity, the compound was diluted in ultrapure sterile water in concentrations ranging from 125 to 1.9 $\mu\text{g/ml}$ and dispensed into 96-well plates with each bacterial suspension (2×10^6 CFU/ml) in Trypticase Soy Broth (TSB). The plates were submitted to irradiation with blue LED for 1 hour, and then incubated overnight at 37°C. The susceptibility of the biofilm to ruthenium complex was evaluated by crystal violet (CV) staining and viable cell count. The results showed that the complex $[\text{Ru}(\text{phen})_2(\text{bpy-ant})]^{2+}$ irradiated with blue LED, inhibited the biomass accumulation with reduction ranging from 97 to 100%. The *S. aureus* ATCC 700698 strain was highly sensitive to complex, with biomass reduction of 99% at 1.9 $\mu\text{g/ml}$. The $[\text{Ru}(\text{phen})_2(\text{bpy-ant})]^{2+}$ complex significantly reduced the bacterial biofilms viable cells with reduction ranging from 3 to 7 logs. Studies it has shown that antimicrobial effect the ruthenium (II) complexes combined with photodynamic therapy may be related to DNA damage caused by photogeneration of reactive oxygen species (ROS). In conclusion, the ruthenium (II) complex, when irradiated with blue LED, showed antibiofilm activity against *Staphylococcus* biofilms.

Keywords: biofilm, ruthenium (II) complex, bacteria, blue led irradiation.

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