

TITLE: ANTIMICROBIAL ACTIVITY OF THE RUTHENIUM (II) COMPLEXES IRRADIATED WITH BLUE LED AGAINST CLINICALLY RELEVANT BACTERIA

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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 this element when associated with specific ligands and the photodynamic therapy, thus representing an alternative for microbial control. Thus, the aim of this study was evaluated the antibacterial effect of the $[\text{Ru}(\text{dppz})\text{ant}(\text{biot})]^{2+}$, $[\text{Ru}(\text{dppz})\text{anCl}_2]$, $[\text{Ru}(\text{bpy})_2\text{dppz}]$ and $[\text{Ru}(\text{bpy})\text{ant}(\text{phn})]$, with and without blue LED irradiation against *Staphylococcus aureus* ATCC 25923, *Staphylococcus epidermidis* ATCC 35984, *Pseudomonas aeruginosa* ATCC 10145 and *Escherichia coli* ATCC 11303. To determine the antibacterial activity, the compound was diluted in ultrapure sterile water in concentrations ranging from 500 to 7.8 $\mu\text{g/mL}$ and dispensed into 96-well plates with each bacterial suspension (1×10^6 CFU/mL) in Trypticase Soy Broth (TSB). The plates were submitted to irradiation with blue LED for 1 hour or dark, and then incubated overnight at 37°C. The susceptibility of the bacteria to ruthenium complexes was evaluated by minimum inhibitory concentration (MIC) and the minimum bactericidal concentration (MBC). The results showed that the complexes when irradiated with blue LED exhibited antibacterial effect against Gram-positive and Gram-negative bacteria with MIC values ranging from 7.8 to 125 $\mu\text{g/mL}$ and MBC from 7.8 to 250 $\mu\text{g/mL}$. Moreover, the complexes without blue LED irradiation, only Gram-positive bacteria were sensitive. The $[\text{Ru}(\text{bpy})_2\text{dppz}]$ and $[\text{Ru}(\text{bpy})\text{ant}(\text{phn})]$ complexes showed lower MIC and MBC values, exhibited effect even on *P. aeruginosa* and *E. coli*, bacteria considered by World Health Organizations as a critical level for the development of new antimicrobial agents. Studies it has shown that antibacterial 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) complexes showed antibacterial activity against bacteria related to infections, mainly when irradiated with blue LED.

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

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