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Cationic porphyrins: interesting photosensitizers for coronavirus inactivation via antimicrobial photodynamic therapy

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Given the urgent necessity to develop novel therapeutic strategies for COVID-19 treatment, particularly due to the limited availability of effective antiviral agents, new compounds are under investigation for their potential virucidal activity. Porphyrin compounds, known as photosensitizers in Antimicrobial Photodynamic Therapy (aPDT), have demonstrated antiviral efficacy against viruses such as Herpes and Influenza in the literature and may represent promising candidates for the treatment of COVID-19 caused by SARS-CoV-2.[1] The murine Coronavirus MHV-A59, due to its significant genetic and structural homology with SARS-CoV-2, serves as an excellent alternative model that can be utilized in conventional biosafety laboratories.[2,3] In this study, the objective was to assess the virucidal efficacy of eight cationic meso-tetrakis(4-N-alkylpyridinium-3-yl)porphyrin derivatives, including three new compounds, activated by green light. The porphyrin derivatives were synthesized and characterized using UV-Vis electronic absorption spectroscopy, Nuclear Magnetic Resonance, Electrospray Ionization Mass Spectrometry, and Elemental Analysis. The virucidal activity was evaluated by exposing a suspension of these green light-activated compounds to MHV-A59 and performing serial dilutions of each suspension/treatment on a monolayer of L929 cells. The dilutions were prepared to a concentration of 10^{-4} and inoculated in duplicate in 24-well plates. Following 48 hours of incubation, the cells were fixed and subsequently stained with Crystal Violet.[3] Enumeration of the lysis plaques in each treatment revealed potent virucidal activity in four of the eight compounds tested, especially for compound 8 (Figure 1), an N-hexylated cationic porphyrin. These findings allowed the identification of new compounds with potential anti-coronavirus activity and further investigations will be conducted to evaluate the efficacy of these compounds against SARS-CoV-2.

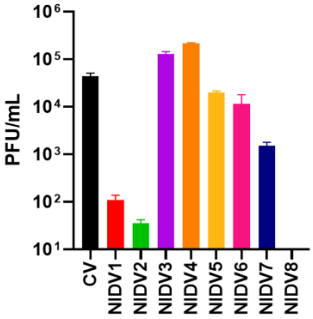

Figure 1. Virucidal activity of cationic porphyrins against murine Coronavirus MHV-A59. CV: control.

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