

TITLE: USE OF *MESO*-TETRAMETHYLPYRIDYL IN THE ANTIMICROBIAL PHOTODYNAMIC THERAPY AGAINST *Salmonella enterica* Serovar Typhimurium

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ABSTRACT:

Antimicrobial Photodynamic Therapy (aPDT) is defined as an oxygen-dependent photochemical reaction that occurs upon light – mediated activation of photosensitizer (PS) a leading to the generation of cytotoxic reactive oxygen species (ROS), predominantly singlet oxygen (1O_2), which at high levels induce cell death. The porphyrin *meso*-tetramethylpyridyl (TMPyP), which is cationic, is one of different PS types were synthesized and studied as aPDT agents. In general, positively charged cationic PSs have been shown to be more efficient in bacterial control because of their electrostatic interaction that occurs with negatively charged functional groups present on the cell surface. Enteric pathogens such as *Salmonella* Typhimurium account for numerous foodborne outbreaks around the world. *Salmonella* is one of the top 5 foodborne pathogens that lead the hospitalizations in the United States. With significant numbers of outbreaks attributed to fresh produce or minimally processed foods, there is an increasing need for effective elimination of this bacterium. In the present study, we examined the antimicrobial effect of TMPyP against *Salmonella* Typhimurium. The bacterial inoculum containing 10^7 CFU.mL⁻¹ was incubated with the TMPyP, separately, in 25 e 50 μ M concentrations for two hours at 37°C under agitation and protected from light. The samples were irradiated during 5, 10, 15 and 20 minutes using an irradiation system (halogen lamp from 400-900 nm and irradiance of 200 mW/cm²). The controls were: samples containing bacteria in the dark conditions with/without PS and the samples irradiated without PS. To evaluate the final viability of *Salmonella*, the treated bacterial samples were plated on brilliant green agar, incubated overnight at 37°C in the dark and made the bacterial count (CFU.mL⁻¹). No significant difference in CFU.mL⁻¹ was observed in all the evaluated controls. The concentration of 50 μ M presented better results when compared to that of 25 μ M, since the bacterial serovar was completely eliminated with 5 and 15 minutes of irradiation, respectively. These results were probably due to the fact that a higher PS concentration facilitates its interaction with the *Salmonella*. In addition, 1O_2 is short-lived, the damaged cellular structures and the pathogens affected in the aPDT are those that are close to the singlet oxygen formation site. Thus, the higher the PS concentration, the more ROS are formed and the pathogen is eliminated more rapidly.

Keywords: aPDT, photoinactivation, photosensitizer, porphyrins, salmonellosis

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