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The Effect of Photoactivated TMP on *Burkholderia cepacia* Biofilms

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Research & Scholarship SYMPOSIUM

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Burkholderia cepacia is an opportunistic pathogen that causes infections in immunocompromised individuals such as cystic fibrosis patients. *B. cepacia* infections are typically characterized by the formation of complex communities of cells known as biofilms. Because *B. cepacia* biofilms are difficult to eradicate using antibiotics, it is important to pursue alternative treatment methods. Photodynamic therapy (PDT) is a type of therapy that uses light, a photosensitizer, and oxygen to elicit cell death through the production of reactive oxygen species. PDT has been shown in previous studies to be successful in killing both *Pseudomonas aeruginosa* and *Staphylococcus aureus*. In this study, we examined the effect of a cationic porphyrin on *B. cepacia* biofilms by exposing static biofilms to 5,10,15,20-tetrakis(1-methyl-pyridino)-21H,23H-porphine, tetra-*p*-tosylate salt (TMP) followed by irradiation. Standard plate counts of cells recovered from attached biofilms revealed a 0.7-$\log_{10}$ reduction (80.2%) in cell viability in the presence of 225µM of TMP and light. In addition, there was a 2.74-$\log_{10}$ reduction in cell viability when biofilms were treated with TMP and ciprofloxacin in comparison to a 1.96-$\log_{10}$ reduction when biofilms were treated with ciprofloxacin alone. Because surface motility is involved in biofilm formation, we also examined the effects of TMP on swarming motility in *B. cepacia* and *P. aeruginosa*. In the presence of TMP in the dark, there was a substantial increase in swarming motility of both *B. cepacia* and *P. aeruginosa*. These results suggest that photoactivated TMP not only kills biofilm-associated cells, but may promote biofilm disruption through pre-dispersion behavior in the absence of light.