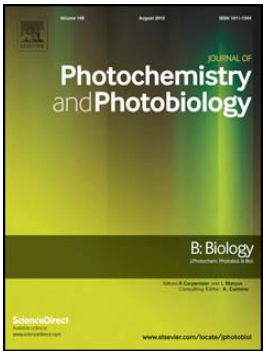

Photodynamic inactivation of planktonic and biofilm growing bacteria mediated by a *meso*-substituted porphyrin bearing four basic amino groups

L. Mamone, D.D. Ferreyra, L. Gándara, G. Di Venosa, P. Vallecorsa, D. Sáenz, Gustavo Calvo, A. Batlle, F. Buzzola, E.N. Durantini, A. Casas

PII: S1011-1344(15)30239-6
DOI: doi: 10.1016/j.jphotobiol.2016.05.026
Reference: JPB 10399

To appear in:

Received date: 27 December 2015
Revised date: 15 May 2016
Accepted date: 30 May 2016

Please cite this article as: L. Mamone, D.D. Ferreyra, L. Gándara, G. Di Venosa, P. Vallecorsa, D. Sáenz, Gustavo Calvo, A. Batlle, F. Buzzola, E.N. Durantini, A. Casas, Photodynamic inactivation of planktonic and biofilm growing bacteria mediated by a *meso*-substituted porphyrin bearing four basic amino groups, (2016), doi: 10.1016/j.jphotobiol.2016.05.026

Photodynamic inactivation of planktonic and biofilm growing bacteria mediated by a *meso*-substituted porphyrin bearing four basic amino groups

L. Mamone[a], D. D. Ferreyra[b], L. Gándara[a], G. Di Venosa[a], P. Vallecorsa[a], D. Sáenz[a], Gustavo Calvo[a], A. Batlle[a], F. Buzzola[c], E. N. Durantini[b] & A. Casas[a]

[a] Centro de Investigaciones sobre Porfirinas y Porfirias (CIPYP). CONICET and Hospital de Clínicas José de San Martín, University of Buenos Aires. Córdoba 2351 1er subsuelo; Ciudad de Buenos Aires, CP1120AAF, Argentina
[b] Departamento de Química, Facultad de Ciencias Exactas, Físico-Químicas y Naturales, Universidad Nacional de Río Cuarto, X5804BYA Río Cuarto, Córdoba, Argentina.
[c] Instituto de Investigaciones en Microbiología y Parasitología Médica (IMPaM), CONICET-UBA.

Corresponding author
Dr. Adriana Casas
Viamonte 1881 10 A
(1056) Ciudad de Buenos Aires
Argentina
FAX: 54 11 4811 7447
E-mail: adricasas@live.com

Abbreviations
CFU: colony forming units; CSLM: confocal scanning laser microscopy; DMF: dimethylformamide; PDI: Photodynamic Inactivation, PS: photosensitizer; SEM: scanning electronic microscopy; TAPP: 5,10,15,20-tetrakis[4-(3-*N*,*N*-dimethylammoniumpropoxy)phenyl]porphyrin; TAPP-PDI: TAPP mediated photodynamic inactivation; Tetra-Py+-Me: 5,10,15,20-tetrakis(1-methylpyridinium-4-yl)porphyrin tetraiodide; $TMAP^{4+}$: 5,10,15,20-tetrakis(4-*N*,*N*,*N*-trimethylammoniumphenyl) porphyrin; TB: Toluidine blue; TMPyP: 5,10,15,20-tetrakis(1-methyl-4-pyridinium)porphyrin tetra-(*p*-toluenesulfonate); TSA: Trypticase Soy agar; TSB: Trypticase Soy Broth.

Keywords
Photodynamic inactivation, porphyrin, bacteria, *Staphylococcus aureus*, biofilm, planktonic.

ABSTRACT

Biofilm-associated diseases account for 80% of all infections in humans. Due to the emergence of antibiotic resistances, alternative therapies such as Photodynamic Inactivation (PDI) of microorganisms have emerged. Porphyrins with intrinsic positive charges have been proposed as successful photosensitizers (PSs) against microorganisms. We have recently designed the new synthetic porphyrin 5,10,15,20-tetrakis[4-(3-*N*,*N*dimethylammoniumpropoxy)phenyl]porphyrin (TAPP) containing four basic amine groups in the periphery of the tetrapyrrolic macrocycle, which can acquire positive charges at physiological pH, thus favouring the interaction with biomembranes.
Illumination of planktonic cultures of *Staphylococcus aureus* at 180 J/cm^2 in the presence of 2.5 μM TAPP induced complete bacteria eradication.