ORXX

Repurposed and novel molecules in photodynamic therapy with antimicrobial activity

Francesca Mancusi [a], Elisa Bianchi [a], Giuseppina Vertulli[a], Nidia Maldonado Carmona [b], Giacomo Insero [b], Giovanni Romano [b], Franco Fusi [b], Giacomo Biagiotti [a], Costanza Montis[a], Barbara Richichi[a], Stefano Cicchi [a]

[a] *Department of Chemistry "Ugo Schiff", University of Florence, Via della Lastruccia 3-13, 50019, Sesto Fiorentino (FI), Italy*

[b] *Department of Biomedical, Experimental and Clinical Sciences "Mario Serio", University of Florence, Viale Morgagni 50, 50134, Florence (FI), Italy*

E-mail: francesca.mancusi@unifi.it

Photodynamic therapy (PDT) involves the use of photosensitizer molecules that irradiated with low-power lasers can release radicals that, reacting with oxygen, can kill microorganisms. The main targets of PDT are the external microbial structures, namely the cell wall, cell membrane, capsid, and virus envelope. The great potential of this therapeutic approach to treat bacteria, fungi, viruses, and parasites has increased the number of scientific studies aimed at expanding knowledge in this regard. [1] The goal of our research is both to use photosensitizer molecules already in clinical use and to synthesize new classes of compounds to treat diseases for which current treatments are inefficient or otherwise have various side effects. Rose Bengal, a photoactive molecule already in use for the diagnosis of some ophthalmic diseases, was the starting point. [2] This compound was covalently and noncovalently bonded to nanocellulose, a novel nanometer-sized material that can be extracted from waste sources and/or produced by some bacteria, to realize delivery systems to transport Rose Bengal into nails for the potential treatment of onychomycosis. Our efforts have also been directed toward obtaining new water-soluble photosensitizer compounds with good cell permeability. Taking advantage of the research group's experience in the synthesis of BODIPY core products, organic dyes with interesting optical properties, innovative molecules were synthesized with this scaffold to improve some useful properties for their use as antimicrobial agents.

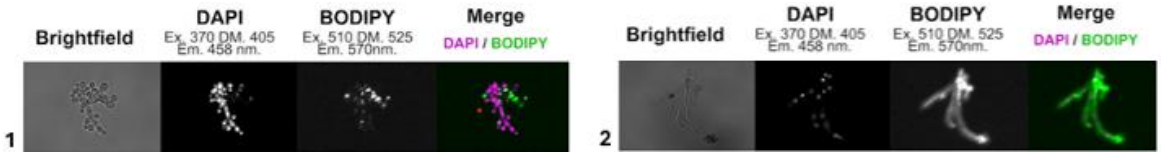

Figure 1: Internalization in C. Albicans of two novel BODIPY scaffolds compounds (**image 1**, **image 2**) using DAPI as a contrast fluorophore

[1] R. Youf et al., *Pharma.* **2021**, *13, 1995.*
[2] J. Houang et al., *J. Biophotonics.* **2021**, *14*

Project funded under the National Recovery and Resilience Plan (NRRP), Investment of Italian Ministry of University and Research funded by the European Union – NextGenerationEU, project title "Tuscany Health Ecosystem – THE"- SPOKE 4 *Nanotechnologies for diagnosis and therapy*.