MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA University Lisbon | School of Science and Technology
LAQV-REQUIMTE

RESEARCH GROUP AND URL

"Cultural Heritage and Responsive Materials" group, CHARM
https://laqv.requimte.pt/research/research-groups/112-cultural_heritage_and_responsive_materials

SUPERVISOR (NAME AND E-MAIL)

Zeljko Petrovski
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SHORT CV OF THE SUPERVISOR

Zeljko Petrovski obtained PhD in Chemistry at ITQB-UNL, Oeiras, Portugal in 2004 on synthesis of molybdenum and iron compounds as epoxidation catalysts and cytostatics. As postdoctoral associate from 2005-2005 he worked on Pauson-Khand reaction at IST and then on supercritical carbon dioxide and phase equilibria from 2008-2009 at UNL. As auxiliary researcher at UNL from 2009-2013 he started working also on synthesis of pure ionic liquids containing active pharmaceutical ingredients (IL-APIs) and their investigation as drug delivery tool particularly for reversal of antibiotic resistance. At UFRJ, Brazil in 2015-2016 he also gained experience on synthesis of Covalent Organic Frameworks (COFs) and currently as auxiliary researcher he continues to work on porous material synthesis and catalysis as well as on plastic degradation and pollutant removals.

5 SELECTED PUBLICATIONS

1. “Tailoring amphotericin B as an ionic liquid: an upfront strategy to potentiate the biological activity of antifungal drugs” Hartmann, D.O., Shimizu, K., Rothkegel, M., Petkovic, M., Ferraz, R., Petrovski, Z., Branco, L.C., Lopes, J.N.C., Pereira, C.S. *RSC Adv*., **2021**, *11*, 14441. https://doi.org/10.1039/D1RA00234A

2. “Synthesis and Antibacterial Activity of Ionic Liquids and Organic Salts Based on Penicillin G and Amoxicillin hydrolysate Derivatives against Resistant Bacteria” Ferraz, R., Silva, D., Dias, A. R., Dias, V., Santos, M. M., Pinheiro, L., Prudêncio, C., Noronha, J. P., Petrovski, Z., Branco, L. C. *Pharmaceutics* **2020**, *12*, 221. https://doi.org/10.3390/pharmaceutics12030221

3. “Antimicrobial Activities of Highly Bioavailable Organic Salts and Ionic Liquids from Fluoroquinolones” Santos, M. M., Alves, C., Silva, J. Florindo, C., Costa, A., Petrovski, Z., Marrucho, I. M., Pedrosa , R. Branco, L. C*. Pharmaceutics* **2020**, *12*, 694. https://doi.org/10.3390/pharmaceutics12080694

4. “Antibacterial activity of Ionic Liquids based on ampicillin against resistant bacteria” Branco, L. C., Ferraz, R., Teixeira, V., Rodrigues, D., Fernandes, R., Prudêncio, C., Noronha, J. P.,Petrovski, Z., *RSC (Advances)* **2014**, *4*, 4301- 4307. https://doi.org/10.1039/C3RA44286A

5.“Unravelling the Dermatological Potential of the Brown Seaweed Carpomitra costata”Susano, P., Silva, J., Alves ,C., Martins, A., Gaspar , H., Pinteus , S., Mouga, T., Goettert , M. I., Petrovski, Z., Branco, L. B., Pedrosa, R. *Mar. Drugs* **2021**, *19*, 135.
https://doi.org/10.3390/md19030135

PROJECT TITLE AND SHORT DESCRIPTION

Fighting bacterial resistance by ionic liquids and organic salts containing active pharmaceutical ingredients (OSIL-APIs)

Bacterial resistance has been increasing drastically over last years and unfortunately, recent efforts of big pharma companies to fight it proved disappointing. Previous studies using OSIL-APIs derived from beta-lactam antibiotics already showed that some of these compounds possess significant activity against some resistant *E. coli* and MRSA, unlike original antibiotics. The reversal of bacterial resistance can be attributed to higher API bioavailability and drug delivery or some other specific interaction. However, complementary chemical, microbiological, biophysical studies and modeling are important to fully elucidate the action of OSIL-APIs against resistance mechanisms. Toxicological studies are also necessary in order to determine the most suitable candidates for *in vivo* studies.

The goal of this project is based on further development of OSIL-APIs as efficient and sustainable tools for reversal of bacterial resistance. Organic salts and ionic liquids derived from ineffective antibiotics as active pharmaceutical ingredients (OSIL-APIs) will be prepared and characterized. Detailed comparative *in vitro* microbiological studies with sensitive and resistant bacteria and using novel OSIL-APIs and original APIs will be performed in order to elucidate mechanism of action and find candidates for *in vivo* studies.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Chemistry (CHE)