MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA University Lisbon | ITQB NOVA - Instituto de Tecnologia Química e Biológica António Xavier

RESEARCH GROUP AND URL

Inorganic Biochemistry and NMR
https://www.itqb.unl.pt/labs/inorganic-biochemistry-and-nmr/home

SUPERVISOR (NAME AND E-MAIL)

Catarina M. Paquete
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SHORT CV OF THE SUPERVISOR

Current Position:
Assistant Researcher at Instituto de Tecnologia Química e Biológica António Xavier, Universidade Nova de Lisboa, Oeiras, Portugal

Other Activities:
Teaching Assistant at Instituto Superior de Psicologia Aplicada, Lisbon, Portugal
Responsible for the lab rotation module of the master program "Biotechnology for Sustainability" at ITQB NOVA
Board Member of International Society of Microbial Electrochemical and Technology (ISMET)

Publications:
5 book chapters, 1 preprint and 39 peer-review papers in scientific journals

Research projects:
PI of 5 research projects (1 ongoing) , co-PI of 1 research project (ongoing), and participating member of 12 research projects (1 ongoing)

Supervision:
6 PhD students (3 ongoing), 5 master students (2 ongoing) 7 graduate students and 22 undergraduate students

Communications:
27 invited oral presentations, and more than 65 poster presentations in national and international meetings

Other academic duties:
Jury of 7 thesis, Referee of more than 10 scientific journals, reviewer of scientific proposals in 2 international calls, Editor in 3 scientific journals

- Paquete, C.M.* (2020) "Electroactivity across the cell wall of Gram-positive bacteria" Comp. Struct. Biotechnol. J. 18, 3976-3802 (doi.org/10.1016/j.csbj.2020.11.021)
- Costa, N.L., Hermann, B., Fourmond, V., Faustino, M.M., Teixeira, M., Einsle, O., Paquete, C.M.* and Louro, R.O. (2019) "How Thermophilic Gram-Positive Organisms Perform Extracellular Electron Transfer: Characterization of the Cell Surface Terminal Reductase OcwA" mBio 10(4), e01210-19 (doi: 10.1128/mBio.01210-19)

- Costa, N.L., Clarke, T.A., Philipp, L.-A., Gescher, J., Louro, R.O. and Paquete, C.M.*, (2018) “Electron transfer process in microbial electrochemical technologies: the role of cell-surface exposed conductive proteins.” Bioresour. Technol. 255, 308-317 (doi: 10.1016/j.biortech.2018.01.133)

- Paquete, C.M. and Louro, R.O. "Unveiling the Details of Electron Transfer in Multicenter Redox Proteins" Acc. Chem. Res. 47(1), 56-65. (doi: 10.1021/ar4000696)

- Fonseca, B.M., Paquete, C.M., Neto, S.E., Pacheco, I., Soares, C.M. and Louro, R.O. “Mind the gap: cytochrome interactions reveal electron pathways across the periplasm of *Shewanella oneidensis* MR-1” Biochem. J. 449(1), 101-108. (doi 10.1042/BJ20121467)

PROJECT TITLE AND SHORT DESCRIPTION

Extracellular electron transfer mechanisms: the way *Aeromonas hydrophila* do it!

Extracellular electron transfer (EET) is a strategy for respiration in which electrons generated from metabolism are transferred outside of the cell to reduce terminal electron acceptors, including iron and manganese oxides. Recently this process has been explored for the application of these organisms in biotechnological processes, including bioremediation, biosensing and in the production of energy, biofuels and value-added compounds in the so called bioelectrochemical systems (BES). Indeed, it has been shown that efficient EET is crucial for the sustainable economic development of BES and in the development of other biotechnological processes. It is now well-recognized that multiheme *c*-type cytochromes (MHC) are key proteins in EET of numerous electroactive organisms, being responsible to form an electron transfer conduit that connects the cellular metabolism to the external environment, or vice-versa. As in other electroactive organisms (i.e. organisms capable of exchanging electrons with electrodes), *Aeromonas* spp. contain numerous MHC proposed to be involved in the EET pathway. These organisms are ubiquitous bacteria found in a variety of aquatic environments worldwide, being capable of performing EET to ferric iron, mineral ores, and electrodes in BES. Although most of MHC found in *Aeromonas* are homologous to others found in other organisms, the mode of action of these proteins, as well as the understanding how this organism transfers electrons outside of the cell is still unclear. With this project, the molecular mechanisms responsible for EET in *A. hydrophila* will be unraveled, providing significant knowledge on the factors that control electron transfer to extracellular electron acceptors. Toward this, molecular biology and biochemistry tools, complemented with spectroscopic techniques will be used to characterize structurally and functionally the proteins involved in this EET pathway, and to elucidate how electron transfer occurs. This information is crucial to complement our current knowledge on EET pathways to reduce metals or electrodes in BES, required to design and optimize microorganisms for practical biotechnological applications.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Life Sciences (LIF)