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/research/biological-chemistry/inorganic-biochemistry-and-nmr

SUPERVISOR (NAME AND E-MAIL)

Ricardo O. Louro
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SHORT CV OF THE SUPERVISOR

Leader of the Inorganic Biochemistry and NMR laboratory
Coordinator of the Centre for Magnetic Resonance António Xavier
Co-coordinator of the Molecular Biosciences PhD program
Elected member of the ITQB-NOVA scientific council since 2013
Supervised 5 post-docs, 13 PhD students, and numerous masters and bachelor students.
Invited speaker in more the 50 international scientific conferences
Coordinator of more than 15 national and international research projects of which 3 are currently active.

5 SELECTED PUBLICATIONS

- Trindade IB, Hernandez G, Lebègue E, Barrière F, Cordeiro T, Piccioli M, Louro RO, Conjuring up a ghost: Structural and functional characterization of FhuF, a ferric siderophore reductase from *E. coli*, *J Biol Inorg Chem* (2021) **26**, 313-326, DOI: 10.1007/s00775-021-01854-y

- Trindade IB, Invernici M, Cantini F, Louro RO*, Piccioli M*, PRE-driven Protein NMR Structures: an Alternative Approach in Highly Paramagnetic Systems, *FEBS J*, (2021) **288,** 3010-3023 DOI:10.1111/febs.15615

- Costa NL, Herman B, Fourmond V, Faustino MM, Teixeira M, Einsle O, Paquete C M, Louro RO, How thermophilic Gram-positive organisms perform extracellular electron transfer: characterization of the cell surface terminal reductase OcwA, *mBio* (2019) **10**, e1210-19. DOI: 10.1128/mBio.01210-19

- Ravera E, Gigli L, Czarniecki B, Lang L, Kuemmerle R, Parigi G, Piccioli M, Neese F, Luchinat, C, A quantum chemistry view on two archetypical paramagnetic pentacoordinate nickel(II) complexes offers a fresh look on their NMR spectra Inorg. Chem. 2021, 60, 3, 2068–2075

- Camponeschi F, Muzzioli R, Ciofi-Baffoni S, Piccioli M, Banci L, Paramagnetic 1H NMR spectroscopy to investigate the catalytic mechanism of radical S-adenosylmethionine enzymes, J. Mol. Biol. 2019, 431(22), 4514-4522

PROJECT TITLE AND SHORT DESCRIPTION

Structural and functional characterization of FhuF, a siderophore interacting protein of the structurally uncharacterized family of ferric siderophore reductases

Iron is an essential element for nearly all forms of life, allowing processes such as CO_2 capture in the open ocean and the colonization and infection of eukaryotic hosts by pathogens. However, in the current oxygenated atmosphere its bioavailability is limited and for this reason microorganisms developed iron-capturing mechanisms including the release of siderophores. Siderophores are small molecules that have among the highest known iron-chelating affinities. However, once inside the cell iron needs to be released from these compounds in order to sustain cellular needs. Given the high affinities of siderophores to iron, iron release does not occur spontaneously and this process requires mediation by siderophore interacting proteins (SIPs). SIPs perform this role by transferring electrons to the iron in the siderophore, reducing its affinity and therefore promoting its release inside the cell. There are two families of SIPs, one using flavins (SIPs) and another using iron-sulfur clusters (FSRs) as electron transfer co-factor. No structures of FSRs exist and sequences share very low homology to known proteins although bearing some resemblance with the palm domain of the siderophore synthesizing protein AscD. Given the biological importance of iron, the structural characterization of a member of the FSR family will open a vast array of new scientific and technological opportunities. They are as diverse as strategies for manipulating productivity in the open ocean with the consequent impacts in climate change mitigation strategies, and disturbing iron uptake by pathogens lowering their virulence and capacity to infect their hosts. FhuF is a FSR from *E.coli* of approximately 28 kDa. NMR spectroscopy is uniquely suited for the detailed structural and functional characterization of an enzyme of this size in conditions that mimic the physiological context. Furthermore, we have recently developed methods for the structural characterization of metalloproteins using NMR spectroscopy, opening the way for the success of this project.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Life Sciences (LIF)
Chemistry (CHE)