

Conferencia:

Advanced homo-FRET modelling in biophysics – Exact analytical solutions on structural studies of the KcsA channel

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Title: “Advanced homo-FRET modelling in biophysics – Exact analytical solutions on structural studies of the KcsA channel.

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Abstract

Donor decay ensemble average in FRET studies of biological systems usually only allow qualitative information about topology and structure. However, in systems of high symmetry, exact analytical solutions containing information about specific distances can be obtained, and used to fit high quality time-resolved data (usually within a global analysis methodology).

In this study, the tetrameric potassium channel KcsA was engineered in order to have only a single tryptophan per monomer. An exact solution for homo-FRET within a square geometry was derived and fitted to anisotropy decays. The recovered distances will be compared with the ones from diffraction data, in both closed and open states, and for different ions. The advantage of this methodology over X-ray diffraction will be discussed.

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Prémios e distinções:

2013- Professor Excelente – Conselho Pedagógico, IST
2013- “Distinguished Visitor”- Universidad Nacional de Córdoba, Argentina (Resolution HCD/13)
2012- Professor Excelente – Conselho Pedagógico, IST
2011 – Membro Honorário - Sociedad Biofísica de España
2008- Prémio Científico UTL/Santander Totta- Reitoria da UTL
2007- “Prémio Científico UTL / Santander Totta”- Biofísica e Física – Menção Honrosa, Universidade Técnica de Lisboa
2006- Prémio União Latina, Reitoria Universidade Técnica de Lisboa, Portugal
2005- Estímulo à Excelência- Fundação para a Ciência e Tecnologia (Portugal)

Análise bibliométrica

ISI Web of Knowledge 16/Setembro/2017:

202 publicações; Número de citações: 4478; Ano (número de citações) dos 5 artigos mais citados: 2003 (542), 2005 (202), 2003 (161), 2008 (118), 2007 (111).

Capítulos de livros: 12

Colaboração com organismos internacionais

- Membro do Comité Executivo e “Past-President” da EBSA (European Biophysical Societies' Association)
- Membro do “Scientific Committee” de “Science Europe” (Physical, Chemical and Mathematical Sciences, including Materials Sciences (PHYCHEMA)) (2013-2015)
- Membro da FEBS (Federation of the European Biochemical Societies) “Publications Committee” (2009-2013).
- “Faculty Member” da “UNESCO Chair of Biophysics and Molecular Neurobiology”, Bahía Blanca, Universidad Nacional del Sur, Argentina.
- “International Mentor” da Biophysical Society, USA.
- Membro do “Council of IUPAB (International Union of Pure and Applied Biophysics)” (2005-2011).
- Presidente –Eleito da IUPAB (International Union of Pure and Applied Biophysics)” (2017/).
- Membro da Direcção da LaFebS (Latin-American Federadtion of Biophysical Societies)

Atividade Editorial

- “Biochimica Biophysica Acta - Biomembranes” – Membro do Corpo Editorial
- “Chem. Phys. Lipids” - Membro do Corpo Editorial
- “Biophysical Reviews” (2009-2011) - Membro do Corpo Editorial
- “Frontiers in Membrane Physiology and Biophysics” – Editor Associado
- “The Scientific World Journal” - Membro do Corpo Editorial

Publicações representativas

-L. Loura, M. Prieto. Fluorescence and FRET in Membranes. In Encyclopedia of Biophysics. Ed. by Gordon C. K. Roberts, Anthony Watts. Elsevier (2018), in press

- E. Da Silva; N. Moura; M. G. Neves; A. Coutinho; M. Prieto; C. Silva, J. Faria. 2018. Novel hybrids of graphitic carbon nitride sensitized with free-base meso-tetrakis(carboxyphenyl) porphyrins for efficient visible light photocatalytic hydrogen production. *Applied Catalysis B: Environmental*. 221 (2018), 56-59

- T.P.T. Dao, M. Fauquignon , F. Fernandes, E. Ibarboure, A. Vax, M. Prieto, and J. F. Le Meins. 2017. Membrane properties of giant polymer and lipid vesicles obtained by electroformation and PVA gel-assisted hydration methods, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 533(2017), 347-353

- Dao, T. P. T., Brûlet, A., Fernandes, F., Er-Rafik, M., Ferji, K., Schweins, R., Chapel, J.-P., Fedorov, A., Schmutz, M., Prieto, M., Sandre, O., Le Meins, J.-F. 2017. "Mixing block copolymers with phospholipids at the nanoscale: from hybrid polymer/lipid worm-like micelles to vesicles presenting lipid nano-domains". *Langmuir*, 2017, 33 (7), 1705–1715

- A. R. P. Varela, A. E. Ventura, A. C. Carreira, A. Fedorov, A. H. Futerman, M. Prieto, L. C. Silva. Pathological levels of Glucosylceramide change the biophysical properties of artificial and cell membranes. 2017. *Phys. Chem. Chem. Phys.*, 2017, **19**, 340-346

- T. Dao, F. Fernandes, E. Ibarboure, K. Ferji, M. Prieto, O. Sandre and J. Le Meins. 2016. Modulation of Phase Separation at micron scale and nanoscale in Hybrid Polymer/Lipid Giant Unilamellar Vesicles (GHUVs) *Soft Matter*, 2016

- Thi Phuong Tuyen Dao, Khalid Ferji, Fabio Fernandes, Manuel Prieto, Sébastien Lecommandoux, Emmanuel Ibarboure, Olivier Sandre, Jean-François Le Meins, Chapter 27 In *The Giant Vesicle Book*, Ed. Rumiana Dimova, Carlos Marques, in press (CRC Press) (2016)

- M. J. Sarmiento, S. N. Pinto, A. Coutinho, M. Prieto, F. Fernandes. 2016. Accurate quantification of inter-domain partition coefficients in GUVs exhibiting lipid phase coexistence. *RSC Advances* (in press)

- A. R. Varela, A. S. Couto; A. Fedorov, T. Futerman, M. Prieto, L. Silva. 2016. "Glucosylceramide reorganizes cholesterol-containing domains in a fluid phospholipid membrane", *Biophys. J.*, 110, 612-622.

- T. Sousa, R. E. Castro, S. N. Pinto, A. Coutinho, S. D. Lucas, R. Moreira, C. M.P. Rodrigues, M. Prieto, F. Fernandes. 2015. Deoxycholic acid modulates cell death signaling through changes in mitochondrial membrane properties *J. Lip. Res.* 56:(11) 2158-2171

- F. Fernandes, A. Coutinho, M. Prieto, L. M. S. Loura. 2015. Electrostatically driven lipid-protein interaction: Answers from FRET. *Biochim. Biophys. Acta*, 1848 (9), 1837-1848

- Dao, T., Fernandes, F., Er-Rafik, M., Salva, R., Schmutz, M., Brulet, A., Prieto, M., Sandre, O., Le Meins, J.-F. 2015. Phase separation and nanodomain formation in hybrid polymer/lipid vesicles. *ACS Macro Letters* 4 (2), pp 182–186

- M. Amaro, R. Šachl, P. Jurkiewicz, A. Coutinho, M. Prieto, M. Hof. 2014. Time-Resolved Fluorescence in Lipid Bilayers: Selected Applications and Advantages over Steady-State. *Biophys. J.* 107 (12):2751-2760
- A. Melo, A. Fedorov, M. Prieto, A. Coutinho. 2014. Exploring homo-FRET to quantify the oligomer stoichiometry of membrane-bound proteins involved in a cooperative partition equilibrium. *Phys. Chem. Chem. Phys.* 16 (34), 18105 -18117
- A. Varela, A. Gonçalves da Silva, A. Fedorov, A. Futerman, M. Prieto, L. Silva. "Influence of intracellular membrane pH on sphingolipid organization and membrane biophysical properties" 2014. *Langmuir* 30(14):4094-104
- C. Suárez-Germà, J. Hernández-Borrell, M. Prieto, L. M.S. Loura. 2014. Modeling FRET to investigate the selectivity of lactose permease of *Escherichia coli* for lipids. *Mol. Membr. Biol.* 31(4):120-30
- B. M. Castro, M. Prieto, L. C. Silva. 2014. Ceramide: a simple sphingolipid with unique biophysical properties. *Prog. Lipid Res.* 54, 53-67
- A.M. Melo, M. Prieto, A. Coutinho. 2014. Quantifying lipid-protein interaction by Fluorescence Correlation Spectroscopy (FCS). *Methods Mol Biol.* 1076:575-95
- S. N. Pinto, E. L. Laviad, J. Stibanb, S. L. Kellyc, A. H. Merrillc, M. Prieto, A. H. Futerman, L. C. Silva. 2014. Changes in membrane biophysical properties induced by sphingomyelinase depend on the sphingolipid N-acyl chain. *J. Lipid Res.* 55(1):53-61
- A. Melo, L. Loura, F. Fernandes, J. Villalaín, M. Prieto, A. Coutinho. 2014. Electrostatically Driven Lipid-Lysozyme Mixed Fibers Display a Multilamellar Structure without Amyloid Features. *Soft Matter* 10 (6), 840 - 850
- M.J. Sarmiento, A. Coutinho, A. Fedorov, M. Prieto, F. Fernandes. 2014. Calcium Induces Phosphatidylinositol-(4,5)-Bisphosphate Clusters at Physiological Conditions. *Biochim. Biophys. Acta*, 1838(3), 822-830
- S. N. Pinto, F. Fernandes, A. Fedorov, A. H. Futerman, L. C. Silva, M. Prieto. 2013. A combined fluorescence spectroscopy, confocal and 2-photon microscopy approach to re-evaluate the properties of sphingolipid domains *Biochim. Biophys. Acta* 1828 (9):2099-2110
- Suárez-Germà, C.; Loura, L.; Prieto, M.; Domenech, O.; Campanera, J.; Montero, M.T.; Borrell, J. 2013. Phospholipid-Lactose Permease Interaction as Reported by a Head Labeled Pyrene Phosphatidylethanolamine: A FRET Study. *J. Phys. Chem B.* 117(22):6741-8