INTERACTOMICS IN PHYSIOPATHOLOGY: PROTEINS, PEPTIDES AND MEMBRANES

ALEX PERÁLVAREZ MARÍN

PROFILE

Alex Perálvarez-Marín, Ph.D. is a faculty member of the Biophysics Unit of the Department of Biochemistry and Molecular Biology at the UAB, acting as Associate Professor (Professor Agregat) since September 2016. Alex graduated in Biological Sciences in 1999 (UAB), and he finished his Ph.D. in Biochemistry and Molecular Biology with Honors in 2005 (UAB). Alex did a first postdoctoral visit at Stockholm University (2005-2009) and then he was awarded a Marie Curie IOF Fellowship to continue his research at Harvard University (2009-2011). Since 2012 Alex joined the Biophysics Unit at UAB creating the *"Interactomics in Physiopathology: Proteins, Peptides, and Membranes" Lab (also call APM Research Group).*

At UAB you may find Alex teaching to Biomechanics, Thermodynamics, Membrane Biophysics, and other very interesting Biophysics-related subjects at the Biochemistry, Biomedicine, Medicine and Physical Therapy degrees undergraduate (B.Sc.) and graduate students (M.Sc.) at the School of Medicine and the School of Biosciences, besides supervising Ph.D. students in the APM Research Group.

RESEARCH

RESEARCH INTERESTS

In humans, cells and cellular compartments use membrane proteins (MP) as the first sensors and actuators towards the environment. Cells communicate with other cells, pathogens, or the media by means of membrane proteins. Thus, it is key to know how membrane proteins exert their function, especially considering that most of the pharma industry therapeutic targets are membrane proteins, such as ion channels, GPCRs, transporters, etc. Structure and function of membrane proteins are intrinsically related, and membrane protein structural biology is a challenge, thus out-of-the-box strategies are required to understand the interactions of proteins and membranes and the implications in pathophysiology. In order to gain this knowledge, we propose a multidisciplinary and multiperspective approach combining wet and dry lab experiments.

STRATEGIC OBJECTIVES

1. Computational aided drug design (CADD) together with experimental methods to allow the identification of new ligand binding sites and new ligands for TRPV channels.

2. Cross-interactions of endogenous neuropeptides in membrane environments related to amyloid and neurodegenerative disorders

MAIN RESEARCH LINES

1. TRP CHANNELS PHARMACOLOGY AND PATHOPHYSIOLOGY

2. AMYLOID AND MISFOLDING

3. MEMBRANE PROTEIN STRUCTURAL BIOPHYSICS

LAB FEATURED PUBLICATIONS:

The TRPV4 channel links calcium influx to DDX3X activity and viral infectivity. Doñate-Macián P, Jungfleisch J, Pérez-Vilaró G, Rubio-Moscardo F, Perálvarez-Marín A, Diez J, Valverde MA. **Nat Commun**. 13;9(1):2307 (2018)

A TRPV2 interactome-based signature for prognosis in glioblastoma patients. Doñate-Macián P, Gómez A, Dégano IR, Perálvarez-Marín A. **Oncotarget**. 9(26):18400-18409 (2018)
Structural determinants of 5, 6-epoxyeicosatrienoic acid binding to and activation of TRPV4 channel. A Berna-Erro, M Izquierdo-Serra, RV Sepúlveda, F Rubio-Moscardo, Doñate-Macián P, Serra SA, Carrillo-Garcia J, Perálvarez-Marín A, González-Nilo F, Fernández-Fernández JM, Valverde MA**. Scientific reports** 7 (1), 10522 (2017)

Molecular and topological membrane folding determinants of transient receptor potential vanilloid 2 channel. P Doñate-Macian, M Bañó-Polo, JL Vazquez-Ibar, I Mingarro, A Perálvarez-Marín. **Biochemical and biophysical research communications** 462 (3), 221-226 (2015)

Dissecting domain-specific evolutionary pressure profiles of transient receptor potential vanilloid subfamily members 1 to 4. P Doñate-Macián, A Perálvarez-Marín. **PLoS One** 9 (10), e110715 (2014)

What do we know about the transient receptor potential vanilloid 2 (TRPV2) ion channel? A Perálvarez-Marín, P Doñate-Macian, R Gaudet. **FEBS journal** 280 (21), 5471-5487 (2013)

AMYLOID AND MISFOLDING

Secondary structure conversions of Alzheimer's Abeta(1-40) peptide induced by membrane-mimicking detergents. **FEBS Journal**, 275, 5117-5128 (2008)

Time-resolved infrared spectroscopy of pH-induced aggregation of the Alzheimer Abeta(1-28) peptide**. Journal of Molecular Biology**, 379, 589-596 (2008)

Influence of residue 22 on the folding, aggregation profile, and toxicity of the Alzheimer's amyloid beta peptide. **Biophysical Journal**, 97, 277-285 (2009)

In silico analysis of the apolipoprotein E and the amyloid beta peptide interaction: misfolding induced by frustration of the salt bridge network. **PLoS Computational Biology**, 6,e1000663 (2010)

Amyloid-β Peptide Nitrotyrosination Stabilizes Oligomers and Enhances NMDAR-Mediated Toxicity. **Journal of Neuroscience** 36, 11693-11703 (2016)

MEMBRANE PROTEIN STRUCTURAL BIOPHYSICS

Helical unwinding and side-chain unlocking unravel the outward open conformation of the melibiose transporter.. LY Wang, VM Ravi, G Leblanc, E Padrós, J Cladera, A Perálvarez-Marín**. Scientific reports** 6, 33776 (2016)

3D Mapping of the SPRY2 Domain of RyR1 by Antibody Labeling and Single-Particle cryo-EM. A Peralvarez-Marin, HS Tae, PG Board, MG Casarotto, AF Dulhunty, ... **PLos One** (2011)