The Eicosanoid Research Division

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State of the art

Ours is a lipid research group. We combine a wide range of chemical, biochemical, pharmacological, and molecular cell biology techniques to study lipid-related illnesses such as chronic inflammatiory diseases, diabetes and obesity. Furthermore, lipids are in many ways the most important of the biomolecules because they are the ultimate controllers and regulators of our bodily processes: they are key to signalling events in cells. For lipid-related diseases to be cured, we must know what the lipids involved are and what they specifically do.

Main lines of research

Lipid signalling in obesity and inflammation.
Metabolomics and metabolipidomics: the identification and quantification of cellular lipidomes by mass spectrometry.
Fatty acid metabolism: incorporation into and redistribution between phospholipids and neutral lipids.
Intracellular signalling leading to eicosanoid biosynthesis, the roles of phospholipase A_2s and cyclooxygenases.

Areas of expertise

Lipid chemistry and biochemistry: the separation, identification and quantification of glycerolipids and sphingolipids by liquid chromatography/mass spectrometry.
Molecular cell biology: the use of fluorescent-tagged proteins related to lipid metabolism for subcellular localization studies utilizing confocal microscopy.
Enzymology and pharmacology: manipulation of the activity of lipid-signalling enzymes both *in vivo* and *in vitro* by utilizing structurally defined compounds

Achievements in 2008

Identification by state-of-the-art mass spectrometry of 1,2-diarachidonoyl-glycerophosphoinositol as a novel, short-lived acceptor of arachidonic acid in mammalian cells.
The discovery of the key regulatory role of group IVA cytosolic phospholipase A_2 in lipid droplet biosynthesis.

Future challenges

Subcellular dynamics of lipins (magnesium-dependent

phosphatidate phosphatases) and elucidation of the putative signalling role (or roles) for this family of enzymes.
Studies on the involvement of various members of the acyl transferase families of proteins (GPAT/AGPAT and MBOAT) in glycerolipid biosynthesis (phospholipids and triglycerides).
The identification of the metabolic pathway involved in the biosynthesis of diarachidonoyl-containing phospholipids and neutral lipids.

Publications

Balboa MA, Pérez R, Balsinde J. Calcium-independent phospholipase A_2 mediates proliferation of human promonocytic U937 cells. *FEBS J*, **275**, 1915-1924 (2008)

Balgoma D, Montero O, Balboa MA, Balsinde J. Calcium-independent phospholipase A_2-mediated formation of 1,2-diarachidonoyl glycerophosphoinositol in monocytes. *FEBS J*, **275**, 6180-6191 (2008)

Cubells L, Muga SV, Tebar F, Bonventre JV, Balsinde J, Pol A, Grewal T, Enrich, C. Annexin A6-induced inhibition of cytosolic phospholipase A_2 is linked to caveolin-1 export from the Golgi. *J Biol Chem*, **283**, 10174-10183 (2008)

Gubern A, Casas J, Barceló M, Barneda D, de la Rosa X, Masgrau R, Picatoste F, Balsinde J, Balboa MA, Claro E. Group IVA phospholipase A_2 is necessary for the biogenesis of lipid droplets. *J Biol Chem*, **283**, 27369-27382 (2008)

Herrero AB, Astudillo AM, Balboa MA, Cuevas C, Balsinde J, Moreno S. Levels of SCS7/FA2H-mediated fatty acid 2-hydroxylation determine the sensitivity of cells to antitumor PM02734. *Cancer Res*, **68**, 9779-9787 (2008)

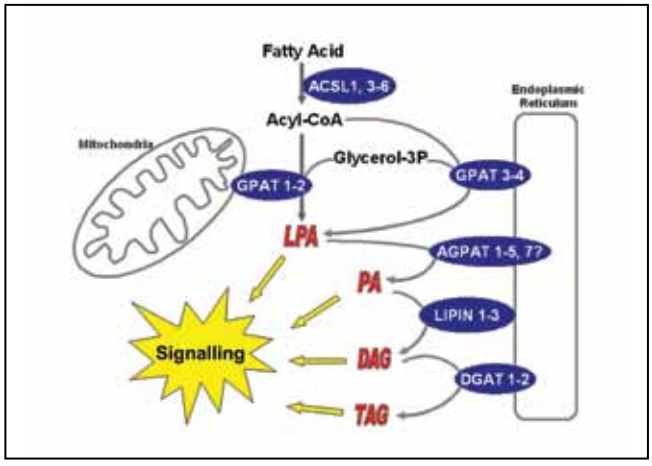
Research networks and grants

Inflamación y obesidad: dos procesos metabólicos regulados por una misma enzima; la fosfatasa de ácido fosfatídico dependiente de magnesio
Ministerio de Ciencia e Innovación, SAF2007-60055: 2007-2010
Research director: María A Balboa

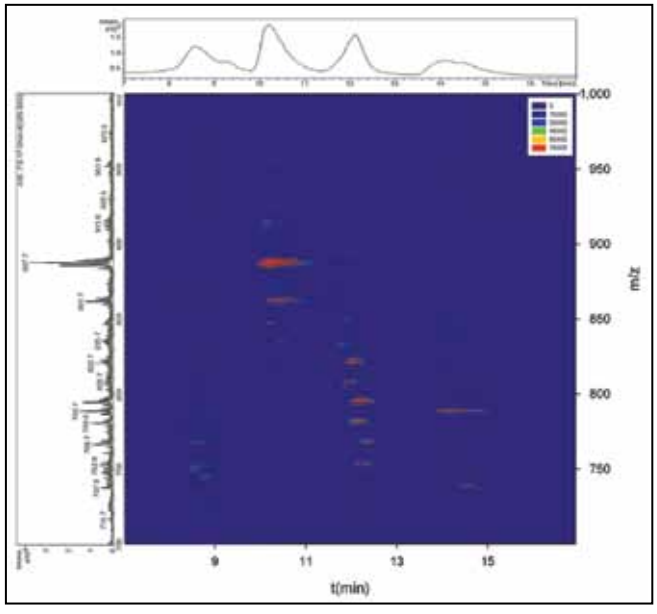
Una aproximación de lipidómica al estudio de la respuesta inmune innata: mecanismos que gobiernan la disponibilidad y metabolismo oxidativo de ácido araquidónico en macrófagos
Ministerio de Ciencia e Innovación, BFU2007-67154: 2007-2010
Research director: Jesús Balsinde

Other funding sources

Regulacion de la expresión y actividad de ciclooxigenasa-2
Fundación La Caixa, BM05-248-0: 2005-2008
Research director: Jesús Balsinde



Pathways of glycerolipid biosynthesis showing signalling-related intermediates and the enzymes that produce them.



Two-dimensional liquid chromatography/mass spectrometry (LC/MS) map of glycerophospholipids of a U937 cell extract. Abscissa: LC separation (retention time); ordinate: MS identification (mass/charge ratio, m/z).

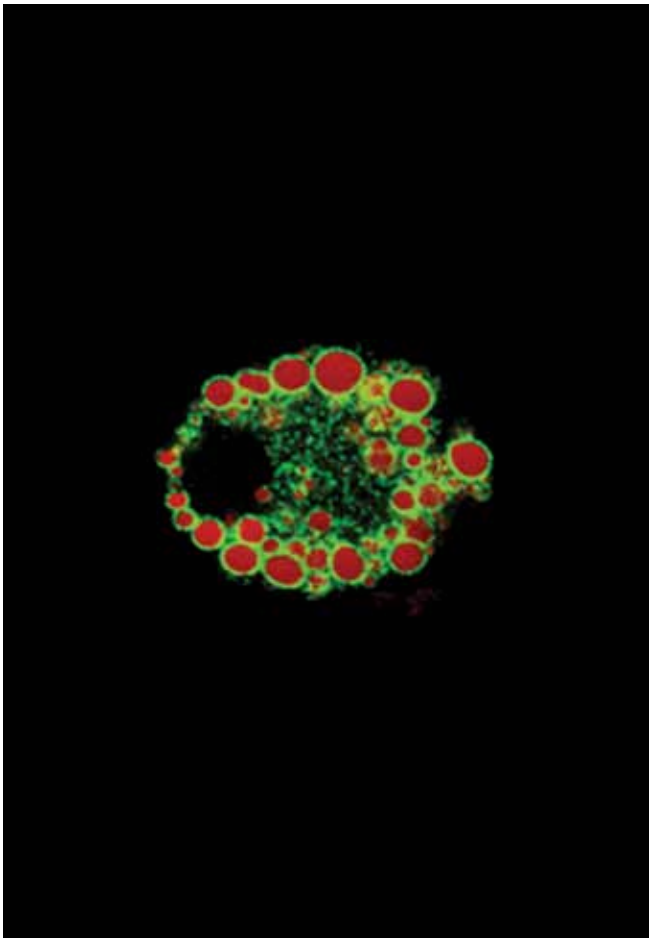
Effects of PM02734 on the lipid metabolism of cell lines
PharmaMar SA: 2007-2008
Research director: Jesús Balsinde

Collaborations

Phospholipase A_2 regulation of lipid droplet formation
Enrique Claro, Departament de Bioquímica i Biologia Molecular, Universitat Autònoma de Barcelona (Barcelona, Spain)

Sphingolipid metabolism in mammalian cell lines
Sergio Moreno, Centro de Investigación del Cáncer, CSIC-Universidad de Salamanca (Salamanca, Spain)

Regulation of lipin-1 in dendritic cells
Martin Thurnher, Department of Urology, Medizinische Universität Innsbruck (Innsbruck, Austria) ■



EGFP-Lipin1 localizes in human macrophages (green) in the periphery of lipid droplets (stained in red).