

# Structural biology of macromolecular aggregates

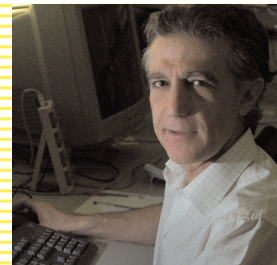
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During the last fifteen years our research has focused on the structure-function relationships of a diversity of proteins and macromolecular complexes directly involved in pathological processes. The systems studied, with over a hundred peer-reviewed publications, range from a number of small protein kinase domains to several intact RNA viruses and in complex with their cellular receptors. To perform our activities, we use mainly X-ray crystallography, often complemented with other techniques including, in particular, mass spectrometry and high resolution cryo-electron microscopy.

Our general goal is first to determine the three-dimensional organisation of a number of molecular systems, and second, to use these data as a framework to examine the biochemical and biological processes in which these molecular systems participate. The development of methodologies required by some of these studies has also been an objective in itself.

At present our main lines of research are: Enzymes related with Oxidative Stress (a) Mono-functional Catalases, b) Bifunctional Catalases-Peroxidases, c) Peroxidases (in particular mammalian peroxidases) and d) Oxygenases; Membrane bound proteins a) Amino-acid transporters and b) Virulence factors (in particular in *Mycoplasmas*); Energetics of protein conformations

## PUBLICATIONS

Calisto BM, Pich OQ, Piñol J, Fita I, Querol E and Carpena X (2005) Crystal structure of a putative type I restriction-modification S subunit from *Mycoplasma genitalium*. *J Mol Biol*, 351:749-762

Carpena X, Wiseman B, Deemagarn T, Herguedas B, Loewen B and Fita I (2006) pH dependence of the structure and activity of catalase-peroxidase KatG from *Burkholderia pseudomallei*. *Biochemistry*, 45:5171-5179

Carpena X, Wiseman B, Deemagarn T, Singh R, Switala J, Ivancich A, Fita I and Loewen P (2005) A molecular switch and electronic circuit modulate activity in catalase-peroxidases. *EMBO Reports*, 6:1156-1162

Chelikani P, Carpena X, Perez-Luque R, Donald LJ, Duckworth HW, Switala J, Fita I and Loewen PC (2005) Characterization of a large subunit catalase truncated by proteolytic cleavage. *Biochemistry*, 44:5597-5605

Deemagarn T, Carpena X, Singh R, Wiseman B, Fita I and Loewen PC (2005) Structural characterisation of the Ser324Thr variant of the catalase-peroxidase

(KatG) from *Burkholderia pseudomallei*. *J Mol Biol*, 345:21-28

Deemagarn T, Wiseman B, Carpena X, Ivancich A, Fita I and Loewen P (2006) Two alternative substrate paths function in catalase-peroxidase KatG from *Burkholderia pseudomallei*. *Proteins: Structure, Function and Bioinformatics*, 66:219-228

Horcajada C, Guinovart J, Fita I and Ferrer JC (2006) Crystal structure of an archaeal glycogen synthase: Insights into oligomerisation and substrate binding of eukaryotic glycogen synthases. *J Biol Chem*, 281:2923-2931

Querol J, Fita I and Verdaguer N (2005) X-ray crystallography of rhinovirus-receptor complexes. *Crystallography Reviews*, 11:73-81

Querol J, Perez-Luque R, Fita I, Lopez C, Gastón JR, Carrascosa JL and Verdaguer N (2005) Preliminary analysis of two and three dimensional crystals of vault ribonucleoprotein particles. *J Struct Biol*, 151:111-115

Ramón-Maiques S, Fernandez-Murga ML, Gil-Ortiz F, Vagin A, Fita I and Rubio V (2006) Structural bases of feedback control of arginine biosynthesis, revealed by the structures of two hexameric N-acetylglutamate kinases, from *Thermotoga maritima* and *Pseudomonas aeruginosa*. *J Mol Biol*, 356:695-713

Rosell A, Valencia E, Borrás, E, Ochoa WF, Fita I, Pares X and Farres J (2005) Structural plasticity in alcohol dehydrogenase: How an NADP(H)-dependent enzyme becomes specific for NAD(H). *Enzymology and Molecular Biology of Carbonyl Metabolism*, 12:181-189

Rovira C, Alfonso-Prieto M, Biarnés X, Carpena X, Fita I and Loewen PC (2005) A first principles study of the binding of formic acid in catalase complementing high resolution X-ray structures. *Chemical Physics*. 323: 129-137

Trapani S, Abergel C, Gutsche I, Horcajada C, Fita I and J. Navaza (2006) Combining experimental data for structure determination of flexible multimeric macromolecules by molecular replacement. *Acta Cryst. D62:467-475*

**RESEARCH NETWORKS AND GRANTS**

*Estructura de enzimas implicados procesos patológico*  
BIO2002-04419-C02-01

Ministerio de Ciencia y Tecnología: 2002-2005

*Estructura y función de hemo-enzimas*

BIO2005-08686-C02-01

Ministerio de Educación y Ciencia: 2006-2008



Ignasi Fita's group, March 2006.