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Institut de Biotecnologia
i de Biomedicina

ANNUAL REPORT

2015

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Parc de Recerca UAB, Mòdul B – Bellaterra (Cerdanyoladel Vallès) 08193
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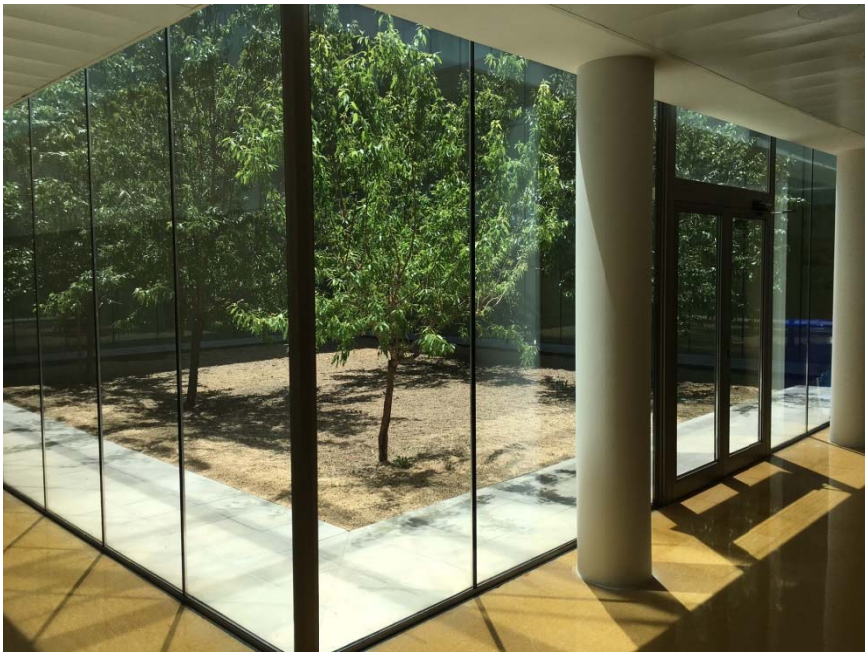
Administrative Structure

Director:	Xavier Daura Ribera
Vicedirector:	Laura Masgrau Fontanet
Manager:	Eva Vila Morros
Administrative Support:	Natividad Infante Cabrera
	Manuela Romero Chávez
	Rosa Calzada Calvo
	María Teresa Jiménez Batista
	Alicia Zorrilla Guinot
Technical Support:	Almudena Merino Palomar
	Francesca Mestres Folch
	Monica Serrano García
	Fernando Hernández Escoriza



Genome Integrity and Instability

Group Leader	Rosa Miró Ametller
Senior Members	Montserrat García Caldés
	Aurora Ruíz-Herrera
	Ignasi Roig
	Immaculada Ponsa
Postdoctoral Fellow	Rosa Ana Sanchez Guillén
PhD Students	Marina Marcet Ortega
	Guillem Borràs Gas
	Laia Capilla Pérez
	Helena Castillo Ecija
	Ana Martínez
	Andros Maldonado Linares
	Covadonga Vara González

Overview

Our group's research focuses on three topics related to genome instability. Firstly, we study the mechanisms implicated in the origin of chromosome instability associated to solid tumors, in particular to colon and bladder cancer. We analyze the mechanisms involved in chromosome reorganizations and aneuploidy origin occurring in tumor cells. Secondly, we explore the implication of chromosome rearrangements as a possible source for the existing mammalian karyotype diversity and the involvement of meiotic recombination in these processes. Finally, we try to understand the mechanisms that control meiotic recombination in mammalian meiosis. Specially, we focus on identifying key players from the pathways that control double strand break repair and genome silencing during meiotic prophase.

Projects

Explorando la plasticidad estructural del genoma de los mamiferos. CGL2014-54317-P. 2015-2017. PI: Aurora Ruiz-Herrera.

Estudio de los mecanismos que regulan la progresion de la profase meiotica en mamiferos. BFU2013-43965-P. MICINN 2013-2015. PI: Ignasi Roig.

Others

PhD thesis

Laia Capilla. On the role of chromosomal rearrangements in evolution: Reconstruction of genome reshuffling in rodents and analysis of Robertsonian fusions in a house mouse chromosomal polymorphism zone. 2015. Directors: A.Ruiz-Herrera, J.Ventura.

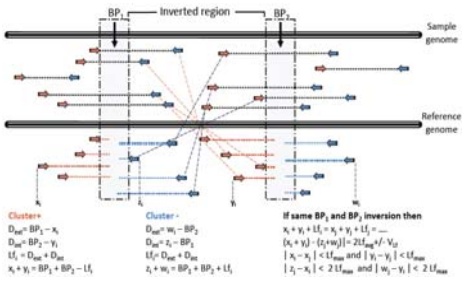
Sarai Pacheco. Estudi de la funció d'ATR durant la gametogènesi de mamífers. 2015. Directors: I.Roig

Comparative and Functional Genomics

Group Leader	Mario Cáceres Aguilar
Postdoctoral Fellow	Sònia Casillas Viladerrams
	Marta Puig Font
	Roser Zaurin Quer
PhD Students	Sarai Pacheco Piñol
	David Castellano Esteve
	Carla Giner Delgado
	Jon Lerga Jaso
	Isaac Noguera Guixà
Lab Technicians	David Izquierdo Fontanils
	Mº Alejandra Delprat Obeaga
	Sergi Villatoro Gómez

Overview

Our laboratory is focused in the study of genome evolution and the genetic changes associated with individual and species differences, applying state of the art techniques and the wealth of available genomic data. In particualr, a great degree of structural variation has been described in multiple organisms. In addition, we have information on the variation of expression levels of thousands of genes in different tissues and individuals. However, very little is known about the functional consequences of these changes and their role during evolution. To address these two questions, we use humans as a model and take a multidisciplinary approach that combines experimental and bioinformatic analysis, to generate results of interest in diverse fields.



Projects

La interpretacion de la variacion genomica desde la secuencia nucleotidica al fenotipo en drosophila y humanos. BFU2013-42649-P. 2013-2016. IP: Mario Caceres

Others

MSc Thesis

Jon Lerga Jaso. Landscape and functional impact of polymorphic inversions on the human genome. 2015. Director: Mario Caceres

Maria Bellet Coll. Validation of differences in gene expression related to human polymorphic inversions. 2015. Director: Mario Caceres

Organized meetings

Organization of the Seminar Series on Research in Genomics and Evolution at the Universitat Autònoma de Barcelona.

Patent

M. Cáceres, S. Villatoro, C. Aguado. An in vitro method of genotyping multiple inversions". EU Patent Application EP13382296.5.

Members of:

Coordinator of the Genomics and Proteomics Section of the Societat Catalana de Biologia.

Editorial work

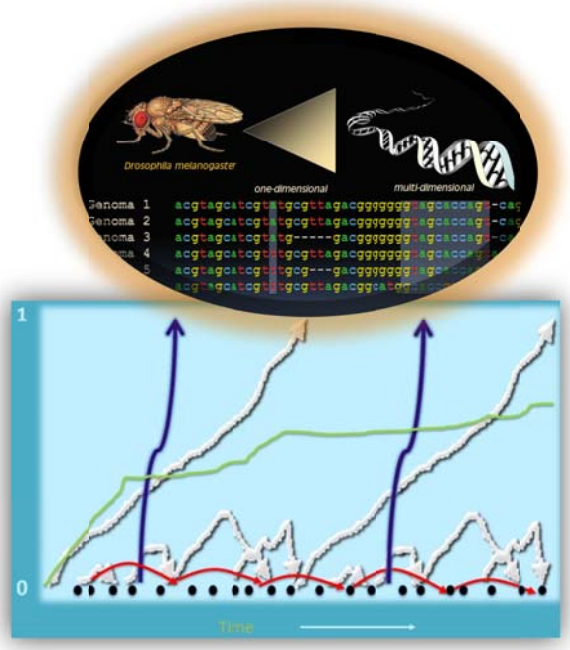
BMC Genomics Associate Editor.

Bioinformatics of Genomics Diversity

Group Leader	Antonio Barbadilla Prados
PhD Students	Sergio Hervás Fernández
	Marta Coronado Zamora
Lab Technicians	David Castellano Esteve

Overview

In our research we develop and implement population genetics models and estimators to analyze and interpret the pattern of genomic variation. Among the most recent achievements, we have charted the first high resolution map of the trail of natural selection along the genome.



Key words:

- Population Genomics
- Natural selection mapping
- Bioinformatics Genome Variation
- Genome Wide Association (GWA)
- Genome Variation Browsers

Projects

BFU2013-42649-P. Understanding genome variation from nucleotides to phenotypes in Drosophila and humans. Ministerio de Ecolomía y Competitividad. IP: Dr. Antonio Barbadilla i Dr. Mario Cáceres. 2014-2016.

UNAB13-74E-2138. Plataforma Big Data para el análisis bioinformático. IP: Dr. Antonio Barbadilla i Dr. Mario Cáceres. 2013-2015.

Others

PhD thesis

Miquel Ramia. Visualisation, description and analysis of the genome variation of a natural population of drosophila melanogaster. 2015. Director: A. Barbadilla

Maite Barron. Patrones de variación nucleotídica y cartográfica de los bloques de selección ligada en el genoma de Drosophila Melanogaster. 2015. Director: A. Barbadilla

Members of:

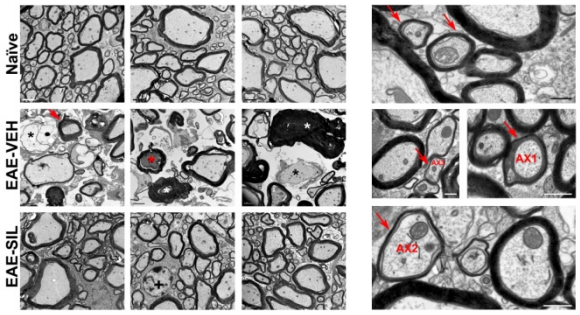
Director of Bioinformatics Platform of campus UAB and UAB sphere Instituts of Health

Promoter of a spin-off of Bioinformatics

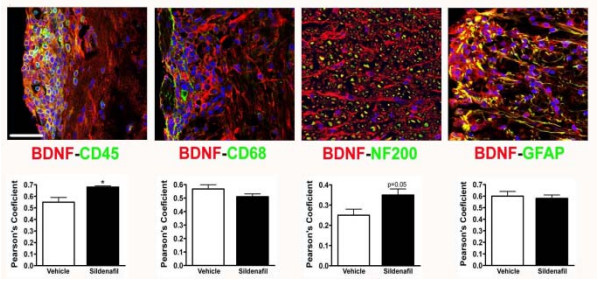
Neuroimmunology

Group Leader	Agustina García Sánchez
Senior Member	Maria Antonia Baltrons Soler
Postdoctoral Fellow	Beatriz Moreno Bruna
Predoctoral Fellow	Daniela del Valle Diaz Lucena

Overview



Selective cyclic GMP phosphodiesterase 5 (PDE5) inhibitors, such as sildenafil (Viagra®), widely used for treatment of erectile dysfunction and pulmonary arterial hypertension, have been recently shown to exert neuroprotective actions in animal models of CNS injury and neurodegenerative diseases. Our group has demonstrated beneficial effects of PDE5 inhibitors in animal models of focal brain injury and of multiple sclerosis (MS) that are associated to down-regulation of neuroinflammation. In the later case, we have also shown that PDE5 inhibition can prevent demyelination and promote remyelination.



At present, we are investigating the mechanisms of the anti-inflammatory and remyelinating effects of PDE5 inhibitors in the animal model of MS, experimental autoimmune encephalomyelitis (EAE), as well as in immune cells from humans. Our final goal is to to provide evidences that will support the notion of PDE5 as a therapeutic target for MS, taking it to a preclinical stage. The group is also investigating if regulation of neuroinflammation is involved in the beneficial effects of sildenafil in cognition and β-amyloid burden reported by other groups in animal models of Alzheimer's disease.

Projects

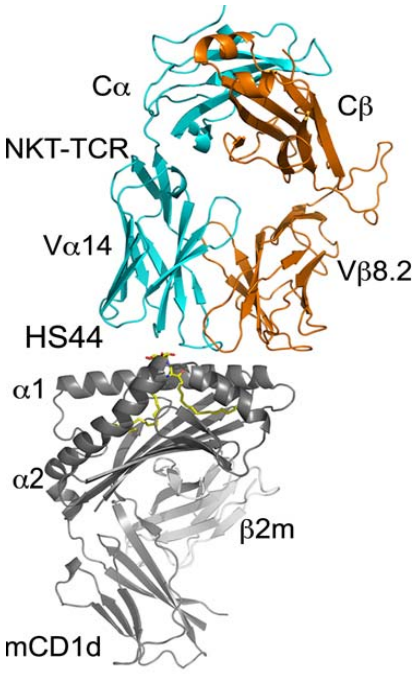
Mecanismos celulares y moleculares del efecto neuroprotector y remielinizante del sildenafilo en la encefalomielitits autoinmune experimental. (SAF2013-44671-P). Ministerio de Ciencia e Innovación. (2014). PI: Agustina García.

Molecular Immunology

Group Leader	Ángel Raúl Castaño
Postdoctoral Fellow	Alari Pahissa, Elisenda
Predoctoral Fellow	Ignasi Esteban
	Noemí Saavedra Ávila

Overview

Activation of iNKT cells by CD1d-ligands is a immunotherapeutic tool under intensive investigation. α-GalCer is the prototypic agonist, but its excessive potency with contradictory activities hampers its potential therapeutic use. In search for novel ligands capable of overcoming these handicaps, we have obtained a series of synthetic analogs aiming for a controlled activation of the immune response



In vitro and in vivo studies demonstrate that some of these analogs are recognized by iNKT activating the immune response. One of them induces a robust IFN-g production, without the characteristic cytokine storm induced by α-GalCer. Consequently, HS44 induces a very efficient antitumoral response in B16 tumor animal model able to completely avoid the establishment of lung metastasis. On the contrary, it is unable of inducing allergic responses making it suitable as immunotherapeutic reagent for future clinical applications.

New analogs aimed to further increase cellular Th1 response are being assayed as immune stimulants in “in vivo” models. Systemic induction of Th1 responses are being studied by wide spectrum serum cytokine analysis and their expected improved antitumoral capacities tested, and so far proved in one case, in tumor models. Cellular mechanism subjacent to their activation on the immune system, linking iNKT activation and antitumoral effectors, including movilization of innate cells from limfoid organs and the chemokines directing such traficking are ongoing efforts in our lab.

Projects

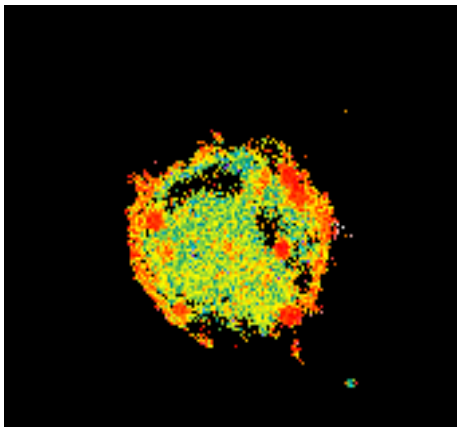
TV32013-130910. Antitumor activity of iNKT activators analogs of the a-GalactosylCeramide: towards immunotherapeutical reagents. IP: Raul Castaño 2014-2016.

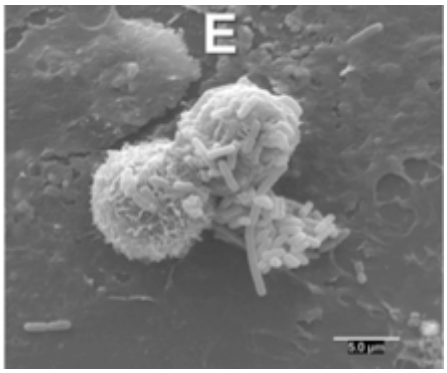
Applied Immunology

Group Leader	Paz Martínez Ramírez
Senior Member	José Ramón Palacio
PhD Student	Carlos de la Haba
Lab Technician	Josefa Murillo

Overview

The group follows 3 main research lines:





1.- **Oxidative stress and inflammation in Reproduction.** Chronic inflammation together with oxidative stress modify the molecules which are involved in the materno-fetal dialogue during early embryo implantation. The study of antioxidant and/or anti-inflammatory therapies may contribute to the increase of implantation and pregnancy rates in assisted reproductive techniques.

2.- **Oxidative stress and biomembranes.** Lipid peroxidation may influence plasma membrane fluidity in cells from the innate and adaptative immune system (macrophages, lymphocytes). By using two-photon microscopy, a high resolution technique which allows the study of lipid dynamics *in vivo,* in individual cells, we detect how oxidative stress induces membrane changes so that the binding efficiency of ligand-receptor decreases, raft formation is prevented and cell activation may be inhibited.

A preliminary study on the relationship between oxidative stress, the biological age and quality of life in elderly people was performed. The influence of oxidative stress on membrane fluidity of immune cells, and how oxidative damage can modify the immune response is of great interest in the evaluation of disability in aging.

3.- **Nutrition and Immunology**. Probiotic and prebiotics have a protective role on several bacterial infections, so that they have been proposed as an alternative to the use of antibiotics and they are used in animal feeding to prevent neonatal diarrhea. We have investigated the protective effect of the probiotic *Saccharomyces cerevisae* and a new developed prebiotic b-galactomannan, on epithelial intestinal cells and in a porcine model, and their immunomodulation ability in bacterial infections.

Others

Members of:

Soci ordinari de la Sociedad Española de Bioquímica, desde 1984.

Membre ordinari de la "European Society of Human Reproduction and Embryology", des de 1987.

Membre de la "International Society for Immunology of Reproduction" (I.S.I.R.) des de 1988.

Membre de la "American Society for Immunology of Reproduction" (A.S.I.R.) des de1992.

Soci numerari de la Sociedad Española de Inmunología des de 1992.

Membre fundador de la European Society of Reproductive & Developmental Immunology (ESRADI)

Soci numerari de la Acadèmia de Ciències Mèdicas de Catalunya i de Baleares des de 1996.

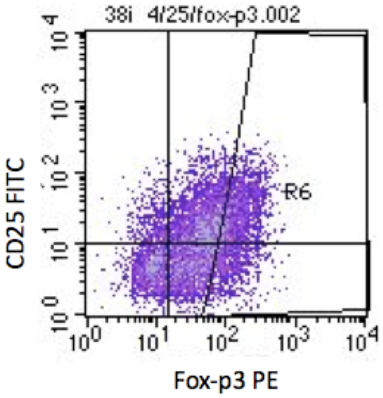
Directora científica del Servicio científico-técnico Cultivos Celulares, Producción de Anticuerpos y Citometría" de la UAB desde Junio de 2009

Celular Immunology

Group Leader	Dolores Jaraquemada
Senior Members	Mercè Martí Ripoll
	Iñaki Alvarez Pérez
	Carme Roura Mir
PhD Students	Teresa Ciudad
	Carolina Guitart
	Erika M. Scholz
	Lorena Usero
	Cristina Xufré
Lab Technician	Annabel Segura
	Anna Mestre Ferrer

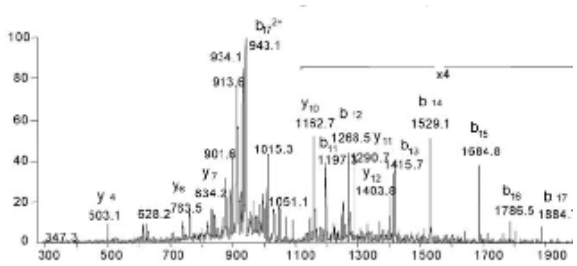
Overview

The group's research interests are centered in the study of central tolerance, antigen processing, auto-antigen presentation and recognition in autoimmune diseases.



Specific lines include:

- Auto-antigen presentation in target organs.
- Autoreactive and regulatory T cells in autoimmunity.
- NKT Cells in Autoimmunity.
- Antigen processing in tolerance and autoimmunity.



Projects

SAF2012-35344 (subprogram MED, CICYT, Spanish Science Ministry). From antigens to TCR. A systematic approach to the immune response in type 1 diabetes. IP: Dolores Jaraquemada. 2012 – 2015.

Others

PhD thesis

Teresa Ciudad. Autoantigen processing. How immunodominant thyroglobulin peptides are generated and presented by HLA-DR molecules. 2015. Director: Dolores Jaraquemada.

MSc Thesis

Ana Sánchez. Pancreatic b-cells under cellular stress generate self-antigens recognized by iNKT cells. 2015. Dolores Jaraquemada.

Marta Castroviejo Bermejo. 2015. A systematic approach to insulin processing and presentation by T1d-associated hla-dr alleles. Dolores Jaraquemada.

María Sabater Arcís. 2015. Estudio de la capacidad adyuvante y su aplicación en la respuesta antitumoral del agonista de células iNKT AC11. Dolores Jaraquemada.

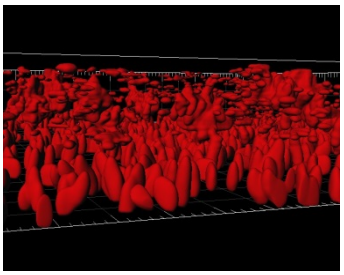
Bacterial Molecular Genetics and Pathogenesis

Group Leader	Isidre Gibert Gonzàlez
Postdoctoral Fellows	Daniel Yero Corona
PhD Students	Celeste Gómez Camacho
	Pol Huedo Moreno
	Sonia Martínez Servat
	Alba Sáez Fernández
	Pablo Rodríguez Fernández
	Roser Márquez Gómez

Overview

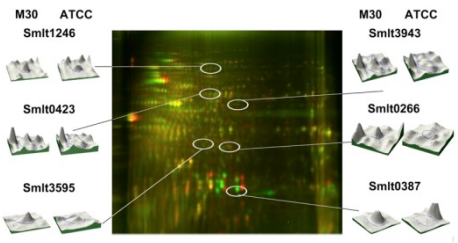
The main research interests of our group are:

- The molecular basis of bacterial pathogenesis and antimicrobial resistance.
- The identification and validation of new antimicrobial targets for Gram-negative pathogens.



Other research interest:

- Host-pathogen interactions and infection models: mouse, C. elegans and Zebrafish
- Bioinformatic approach to identify new potential candidates for vaccine and/or drug targets.



Keywords

Bacterial Pathogenesis, Virulence, Host-Pathogen Interactions Molecular Genetics, Genomics, Proteomics, Gene Expression, Antimicrobial Resistance, Antimicrobial Drug

Projects

Convenis de transferència i prestació de serveis en relació a programes de qualitat microbiològica amb Sociedad Española de Bioquímica Clínica y Patología Molecular i Fundació pel control de qualitat dels laboratoris clínics.

Procesos biológicos no esenciales en stenotrophomonas maltophilia como dianas para el diseño de nuevas estrategias antimicrobianas. BIO2015-66674-R. PI: Isidre Gibert and Xavier Daura

Others

MSc Thesis

Gutiérrez Barragán, Sara. Sistemas de Quórum Sensing y estrategias anti-Quórum sensing como control de la formación de biopelículas bacterianas. 2015. Director del treball: Isidre Gibert

Ana Fernandez Carrascal. Utilidad de las técnicas de secuenciación en el estudio de Staphylococcus aureus resistente a la meticil·lina. 2015. Director del treball: Isidre Gibert

Evolutive Immunology

Group Leader	Nerea Roher Armentia
PhD Students	Debora Torrealba Sandoval
	Angels Ruyra Ripoll
	Jie Ji
	Jofre Gasion
	Eva Vallejos

Overview

- **Development of nanovaccines for fish species of commercial interest**

It's been a central focus of our work. We are searching for non-toxic, non-stressful and effective systems to protect commercial fish from diverse pathogenic challenges. Taking into account the particularities of the fish immune system, we have recently completed a nanoformulation (Ruyra et al., 2013) able to increase the survival of bacterial challenged fish (Ruyra et al, manuscript in preparation). The development of sustainable aquaculture, a strategic sector to feed the ever-increasing human population (Khan et al, 2011), relies on disease prevention through the implementation of preventive immunostimulation and effective vaccination strategies (Evensen et al., 2009).In particular, fish immunologists face now a major challenge trying to prevent the massive economic losses caused by viral diseases. Development of novel vaccines to protect fish from viral diseases such as Spring Viremia Carp Virus, SVCV or Viral haemorrhagic septicemia viruses, VHSV (Gomez-Casado et al., 2011) will be a major goal of our research efforts during the next years. In collaboration with a fish virologist (Dr. A. Estepa) we aim to encapsulate plasmids coding for antigenic viral proteins into nanoliposomes and characterise them in zebrafish to finally, test the formulations in the real host. A hallmark of our work in the next five years would be to design and develop new nanovaccines against SVCV and VHSV.

- **The evolution of pathogen recognition in vertebrates**

In the last 7 years we have been investigating the molecular basis of the fish immune system, and we have been trying to decipher the particularities of its innate immune response. Most fish species lack the TLR4 receptor that senses the LPS presented in the outer membrane of bacterial cells.We are

interested to tackle the characterization of the molecule responsible for LPS sensing and why fish are less sensitive to the toxic and pro-inflammatory effects of LPS. Genomic tools have been of great importance for the fish research field during the last years. Fish genomes such as fugu, puffer fish, medaka, cod or salmon among others start to be available to the scientific community. A major achievement in fish biology has been the completion of the zebrafish reference genome sequence, with publication of the Zv9 assembly. The Sanger Institute provides the research community with a high-quality zebrafish genome sequence.The number of identified protein-coding genes in the zebrafish genome now stands at around 24000 and fish supplied by the Zebrafish Mutation Resource (Sanger Institute) can be used to study a wide range of biological processes such as response to pathogens, cancer, diabetes etc. Our lab will be provided with INFφ and IL-1b mutant fish that will be used to investigate the anti-viral and the inflammatory response respectively. Our fish facility is open to house other mutants of interest for the research of groups in the IBB-MRB.

- **Defense mechanisms in *Branchiostoma lanceolatum***

Lastly, besides the above mentioned research lines, we will have an additional long-term research line aimed to explore the defense mechanisms in a non-vertebrate marine organism, the amphioxus (Branchiostoma lanceolatum) that would allow us for a better understanding of the vertebrate immune system. From an evolutionary point of view the amphioxus is an excellent living organism to study what was going on before vertebrates arose. The amphioxus is a cephalochordate with a small genome and simple body architecture that makes it very suitable for evolutionary studies. In collaboration with Dr. Bayes (IIB, Hospital de Sant Pau) we will study different aspects of amphioxus biology such as nervous system architecture, defense mechanisms or tolerance and biodistribution of nanoliposomes.

Projects

Desarrollo de nanoliposomas como vehículos de inmunoestimulantes/vacunas en especies de interés para la acuicultura. AGL2012-33877 (01/01/2013 – 31/12/2015).

Others

MSc Thesis

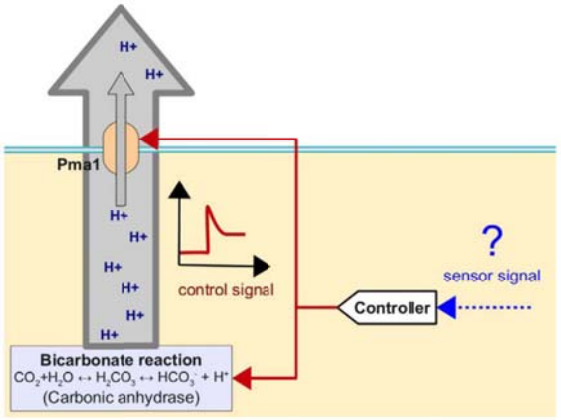
Lorena Luque. The regulation of the respiratory burst responses induced by Poly (I:C) and the gene expression of α7 nicotinic acetylcholine (nACh) receptor in different tissues of rainbow trout (Oncorhynchus mykiss). Master de Acuicultura 2014-15. Directora del treball: Nerea Roher

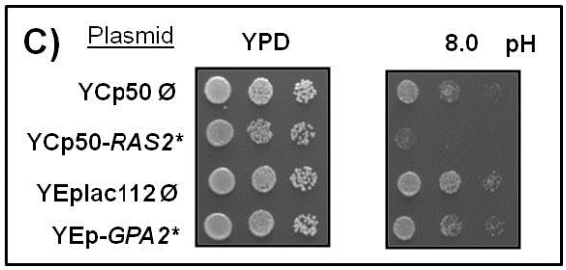
Yeast Molecular Biology

Group Leader	Joaquin Ariño Carmona
Senior Member	Antonio Casamayor Gracia
Postdoctoral Fellows	Maria López
PhD Students	Carlos Calafí
	Laura Tatjer Recordà
	Albert Serra Cardona
	Cristina Molero Merinero
	David Canadell i Sala
	Diego Velázquez
	Chun-Yi Zhang
	Carlos Santolaria Bello
Lab Technician	Montse Robledo Costas

Overview

Our group is interested in different aspects of the biochemistry, molecular biology and genomics of the yeast *Saccharomyces cerevisiae*, particularly in those involving cell signaling via phospho-dephosphorylation processes. This includes research on ion homeostasis, response to various forms of stress or cell cycle regulation. Particular emphasis is give to the interaction between ion and nutrient homeostases. The ultimate goal is to obtain a comprehensive view of the yeast response to perturbations in their environment that may lead to a deeper insight into the biology of this organism, as well as to new biotechnological applications. As an example, we are carrying out a project to develop new strains tolerant to acetic acid, to improve the fermentative processes involved in the generation of bio-alcohol from plant debris.





Projects

Exploración de los mecanismos de homeostasis de cationes monovalentes como nueva diana antifúngica. (Ref. BFU2014-54591-C2-1-P). PI: Joaquin Ariño.

Others

PhD thesis

Albert Serra. PHO89 i ENA1 comparteixen una xarxa de regulació que permet el seu acoblament funcional en resposta a l'alcalinització ambiental". 2015. Director: J. Ariño.

David Canadell. La resposta dels llevats a la manca de potasi revela noves funcions del potassi. 2015. Director: J. Ariño.

Laura Tatjer. Aproximacions genètiques per l'estudi de les funcions de la proteïna fosfatasa PTC1 en S. Cerevisiae. 2015. Director: J. Ariño.

MSc Thesis

Daniel Martínez Manuel. Dianas presentes en hongos patógenos como posibles candidatas para el desarrollo de terapias antifúngicas (Máster oficial en Bioquímica y Biología Molecular, UAB). 2015. Joaquin Ariño.

Carlos Calafí Pascual. Anàlisi funcional dels mutants ARTs en la degradació de Pho89. antifúngicas (Máster oficial en Bioquímica y Biología Molecular, UAB). 2015. Joaquin Ariño.

Members of:

Joaquín Ariño ha sido nombrado miembro del Editorial Board de la nueva revista Microbial Cell (http://microbialcell.com/), editada por Shared Science Publishers OG.Editorial work.

Award to “Excelencia en Investigación 2010”, Universitat Autònoma de Barcelona. (2010-2014)

Computational Biology

Group Leader	Xavier Daura Ribera
PhD Students	Michael Cristòfol Clough
Lab Technician	Oscar Conchillo Solé

Overview

The group's trajectory has been, until recent years, largely based on the use of molecular-dynamics simulation methods to study biomolecular systems at atomic resolution, mostly in connection with the process of polypeptide folding. Since 2007, however, the group has expanded its scope towards the proteomic analysis of pathogenic bacteria for the identification of antigens and putative drug targets. This expansion has been enabled by the incorporation of new members with expertise on additional computational and experimental techniques, and by teaming up with IBB's Bacterial Molecular Genetics group. Currently, the group has active projects, often intertwined, in the following topics:

- Study of biophysical properties of peptides and proteins by molecular-dynamics simulation methods.
- Computational compound screening and redesign for drug discovery.
- Bioinformatic and experimental identification and characterization of proteins of pathogenic bacteria for vaccine and antibacterial-drug development.

In general each of these topics is being developed within the context of a collaborative project.

Projects

Procesos biológicos no esenciales en stenotrophomonas maltophilia como dianas para el diseño de nuevas estrategias antimicrobianas. BIO2015-66674-R. PI: Isidre Gibert and Xavier Daura

Others

Institutional responsibilities

Director of the Institute of Biotechnology and Biomedicine (IBB) of UAB

Commissions of trust

Member of Three Delegate Commissions of UAB's Governing Council: Research (since 2011), Knowledge Transfer and Strategic Projects (since 2012) and Doctorate (since 2013).

Project evaluation for EU's H2020, since 2014.

Project evaluation for the Italian Association for Cancer Research (AIRC), Italy, since 2011.

Project evaluation for the Partnership for Advanced Computing in Europe (PRACE), EU, since 2012.

Peer rewiew for several journals, including Journal of the american Chemical society, Andgewandte Chemie International Edition, PLoS Computational Biology, Journal of Chemical Theory and Computational, Bioinformatics, etc.

Patent

D. Yero, M. Indarte, O. Conchillo, I. Gibert, X. Daura. Enhanced antibiotic composition.

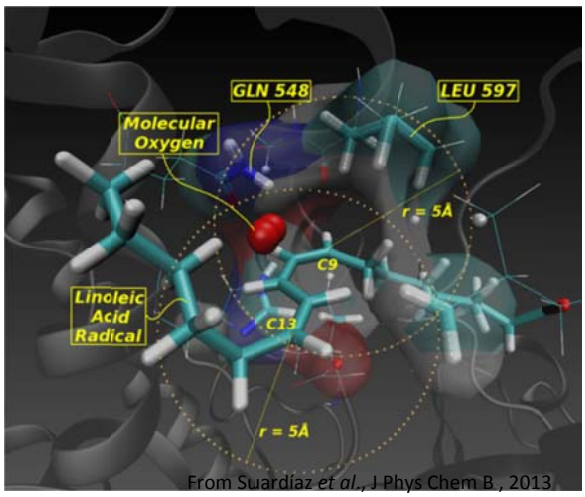
Theoretical Molecular Biology

Group Leader	Josep M. Lluch
Senior Members	Àngels González Lafont
	Mireia García Viloca
	Laura Masgrau
Postdoctoral Fellow	Patricia Saura Martínez
PhD Students	Ayax Pérez Gallego
	Maria Fernanda Mendoza

Overview

In the Theoretical Molecular Biology group we are interested in understanding how enzymes work at the atomic/molecular level. We are particularly specialized on the theoretical study of the chemical reactions taking place inside enzymes and in identifying the main actors that make possible these exquisite catalytic processes. Among other mechanistic aspects, for example, we analyse how the high regio and stereospecificity of this biological catalysis is achieved. Our final aim is to use all that knowledge to force conveniently modified enzymes to work in the way we need to achieve outstanding biomedical anb biotechnological applications.

To do this, we apply and develop Theoretical and Computational Chemistry methods, including hybrid quantum mechanics/molecular mechanics methods on the solvated enzyme-substrate(s) system, molecular dynamics simulations, free energy calculations, the EA-VTST/MT scheme and protein-ligand dockings.

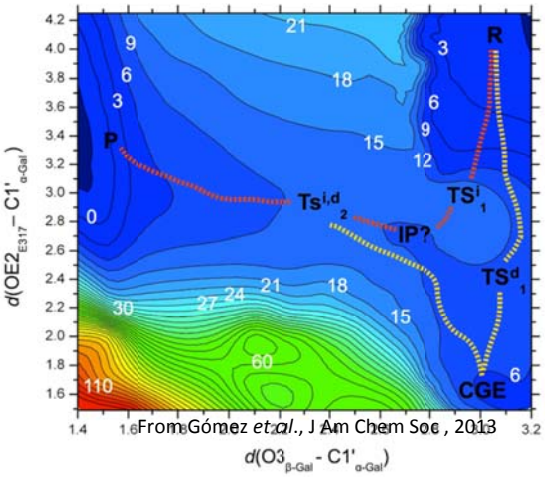


From Suardíaz *et al.*, J Phys Chem B , 2013

Our current main lines of research focus on:

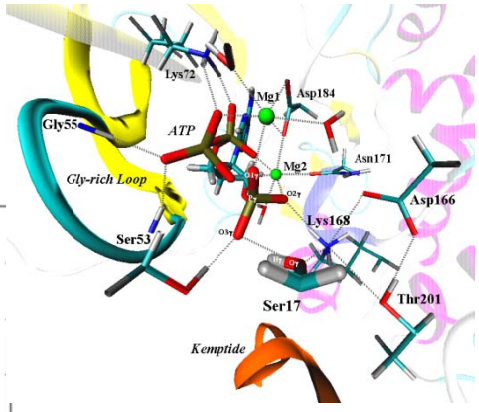
- **Mammalian lipoxygenases** (LOs): LOs are implicated in the pathogenesis of inflammatory and hyperproliferative diseases. Moreover, some isoforms like the 15S-LO, are highly regio and stereosecific in the hydroperoxidation reaction they catalyse; specificity required for its correct physiological function. We have been analysing the possible causes of this regiospecificity in the oxygen attack step catalysed by rabbit 15S-LO. Our results conclude that, among the different possibilities proposed in the literature, the steric-shielding hypothesis seems to be the operating one in this enzyme. On another hand, we have started the study of the hydrogen abstraction step.

- **Computational chemical glycobiology:** the biosynthesis of glycans has been the focus of this research line. In particular, we are providing computational evidences that are helping clarify the catalytic mechanism used by retaining glycosyltransferases, a matter that has been under debate for the last decades and has remained as one of the unanswered fundamental questions in glycosciences. We have studied *in silico* several of these enzymes, some of these works being compiled in the PhD thesis of H. Gómez, defended in October 2013.

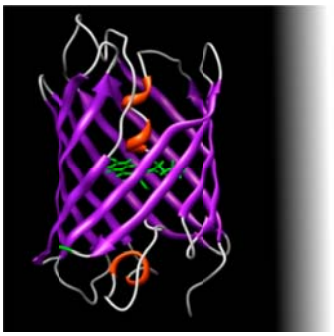


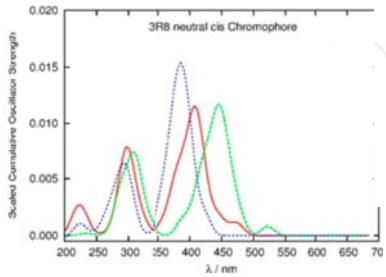
From Gómez *et al.*, J Am Chem Soc , 2013

- **Serine-threonine kinases**: The cAMP-dependent protein kinase A (PKA) is a prototypical kinase that plays pivotal roles in numerous signaling pathways. During this period, important progress has been done on the study of the reaction mechanisms (dissociative and associative) of the phosphoryl transfer catalyzed by PKA and the Asp166Ala mutant. As Asp166 has a fundamental role in the dissociative mechanism, the only way to explain the experimental activity observed for the mutant enzyme is via an associative process never taken into account by other modeling studies of this important catalytic process. The energetic and structural analysis of the catalytic reaction pathway performed in our laboratory is shedding some light on the origin of transition state stabilization within the kinase family.



- **Fluorescent Proteins**: Part of our group has a strong background in the study of chemical reactivity in excited states. In the last years, this experience is also being





applyied to investigate several aspects related to the fluorescence phenomena in fluorescent proteins, which have many applications in biomedicine as *in vivo* biomarkers. The Green Fluorescence Protein (GFP) and many members of the Red Fluorescence Protein (RFP) family are being the focus of our research. Especially we are working on the design of RFP variants that excite and emit in the optical window in which mammalian tissues are relatively transparent to light. This new fluorescent proteins for imaging in mammals should be useful for following biological processes "in vivo".

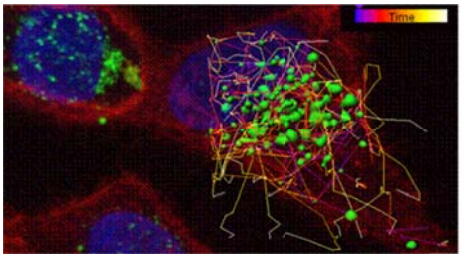
Projects

Adscribed at the Department of Chemistry of the UAB.

Nanobiotechnology

Group Leader	Antonio P. Villaverde
Senior Members	Neus Ferrer
	Esther Vazquez
	José Luis Corchero
	Elena Garcia Fruitós
	Joaquin Seras
PhD Students	Olivia Cano
	Mireia Pesarrodona
	Paolo Saccardo
	Ugutz Unzueta
	Xu Zhikun
	Naroa Serna
	Laura Sanchez
	Fabián L. Rueda
	Esther Martínez
	José Vicente Carratalá
	Cristina Membrado
	Anna Pascual
	Eudald Pérez
Lab Technician	Rosa Mendoza

Overview



- Development of self-assembling protein nanoparticles for non-viral gene therapy.
- Development of new bacterial nanomaterials for tissue engineering.
- Design and production of enzymes and antibodies for cell therapy.
- Design of processes for production of recombinant proteins of therapeutic interest in bacteria, insect cells and mammal cells.
- Study of cell stress responses to the production of proteins of pharmacological interest.
- Study of the physiology and genetics of protein aggregation in recombinant bacteria.
- Generation and engineering of virus-like-particles of biomedical interest.
- Design of functionalized proteins for targeted drug delivery, endosomal escape and blood-brain barrier crossing.

Projects

Provision of operational and technical expertise in relation to chemical and biochemical processes and advanced product development. INNOTUNE BVBA. IP Antoni Villaverde

Genotoxic nanoparticles targeting colorectal cancer stem cells. TV32013-132031. IP Antoni Villaverde

Ingenieria de nanoparticulas proteicas para la entrega dirigida de proteinas terapeuticas y de acidos nucleicos. BIO2013-41019-P. IP Antoni Villaverde.

2014 SGR 132 Microbiologia bàsica i aplicada. . IP Antoni Villaverde

Ingeniería del vehículo y el cargo en la terapia génica no vírica del cáncer colorrectal metastásico. PI12/00327. IP Esther Vazquez Gomez.

Personalized nanomedicine for triple negative breast cancer stem cells. TV32013-133930. IP Esther Vazquez Gomez.

Others

PhD thesis

Eudald Pérez Pérez. Optimización de la producción de nanopartículas de interferón gamma bovino en Escherichia coli KPM335. Màster: Biotecnologia Avançada. 2015. Elena Garcia Fruitós i Neus Ferrer Miralles.

Cristina Membrado Corma. Nanopartículas recombinantes de poliéster producidas en Lactococcus lactis. Màster Microbiologia Aplicada. 2015. Elena Garcia Fruitós

Laura Sánchez García. Recombinant therapeutic proteins for clinical use. Màster Microbiologia Aplicada. 2015. Antonio Villaverde Corrales, Esther Vázquez Gómez, Neus Ferrer Miralles, Ugutz Unzueta.

MSc Thesis

Esther Ramirez. Analysis of the bacteriophage P22 viral spread within bacterial populations and its characterization as immunobiosensor. 2015 . A.Villaverde

Paolo Saccardo. Desenvolupament de virus artificials per nanomedicina i teràpia gènica.2015. A.Villaverde, N.Ferrer, E.Rodríguez.

Xu Zhikun. Desigtn of protein nanoparticles for cell targeting and blood brain barrier crossing. 2015. E.Vazquez, A.Villaverde, N.Ferrer.

Patent

Olivier LACZKA, Francisco Javier DEL CAMPO, Francisco Xavier MUÑOZ PASCUAL, Antonio P. VILLAVERDE CORRALES, Neus FERRER MIRALLES, Rosa María FERRAZ COLOMINA. Biosensor for detecting anti-hiv antibodies. WO2010026275A1. US20110233073 A1

Marco Colás, María Pilar; Pascual Durán, Nuria; Pastells Díez, Carme; Sanchez Baeza, Francisco; Villaverde Corrales, Antonio Pedro; Rodríguez Carmona, Escarlata. Haptenos y conjugados derivados de piocianina, anticuerpos de los mismos, y método inmunoquímico para la detección de infecciones provocadas por pseudomonas aeruginosa. WO2014135730 A. US20160033489.

Miro Jaume Veciana, Bastardas Inmaculada Ratera, GIL César DÍEZ, Corrales Antonio Pedro Villaverde, Gómez Esther Vázquez, Fruitós Elena García. Inclusion bodies, bacterial cells and compositions containing them and uses thereof. WO2010026275A1. US20110233073 A1.

Miro Jaume Veciana, Bastardas Inmaculada Ratera, GIL César DÍEZ, Corrales Antonio Pedro Villaverde, Gómez Esther Vázquez, Fruitós Elena García. Inclusion bodies, bacterial cells and compositions containing them and uses thereof. WO2010076361 A1. US20110268773.

Rigat Isolda Casanova, Navarro María Virtudes Céspedes, Miralles Neus Ferrer, Bafalluy Ramon Mangues, Elorza Ugutz Unzueta, Gómez Esther Vázquez, Corrales Antonio Villaverde. Methods and reagents for efficient and targeted delivery of therapeutic molecules to cxcr4 cells. WO2012095527 A1. WO2012095527 A1.

Members of:

Member of CIBER en Biomateriales, Bioingeniería y Nanomedicina (ISCIII) since 2006.

Member of the Spanish Platform on Nanomedicine since 2007.

Member of the European technological Platform in Nanomedicine since 2008 and UAB representative.

Chairman B-DEBATE on "Nanotechnology in human and animal health". Barcelona, Spain, 2013.

Chairman 2st Workshop on Nanomedicine UAB-CEI. Barcelona, Spain, 2013.

Asian Congress on Biotechnology (Acb2013). India. 2013.

Scientific advisor of the la TWAS, The academy of sciences for the developing world, since 2013

Editorial work:

BMC Genomics Associate Editor.

Editor-in-Chief de Microbial Cell Factories (ISSN: 1475-2859).

Editor de Microorganisms (ISSN 2076-2607) desde 2012.

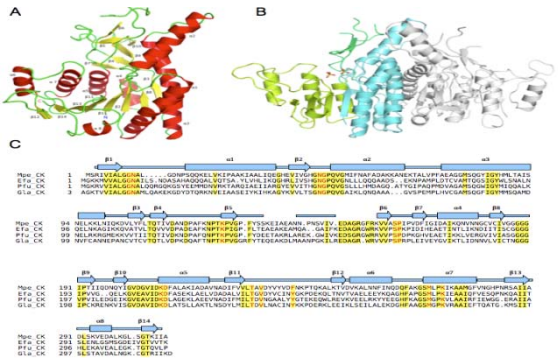
Editor de Medical Sciences (ISSN 2076-3271) desde 2012.

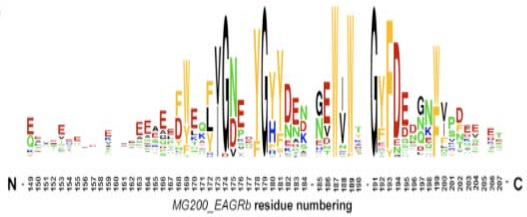
Molecular Biology

Group Leader	Enrique Querol Murillo
Senior Members	Jaume Piñol Ribas
	Josep A. Perez Pons
Postdoctoral Fellow	Ángel Mozo
	Xavier Serra Hartmann
	Oscar Quijada
	Merçe Ratera
PhD Students	Isaac Amela Abellán
	Luis González González
	Luis Franco Serrano
	Ana María, Martínez
	Luis García Morales
	Mario Huerta Casado
	Marta Hernández Solans
	Cristian Ponce Basco
	Sergi Torres Puis
	Juan Aibar

Overview

- Mycoplasma genitalium as a model of minimal cell and genome. Functional proteomics, adhesion and gliding mechanism, pathogenicity.
- Bioinformatics: Analysis of protein structure and function. Gene expression algorithms. Vaccine and drug target identification.
- Biotechnology: vaccine and diagnostic kits design.





Projects

¿Son la mayoria de las proteinas multifunionales (MOONLIGHTING)?. BFU2013-50176-EXP. IP Enrique Querol.

Coordinació i dinamització Grups Tecnio UAB-CSIC a l'entorn del PRUAB. TECCIT12-1-0007-08. IP Enrique Querol.

Analisis de los mecanismos de virulencia y patogenicidad en micoplasmas: diseño de vacunas contra algunas especies de interes clinico. BIO2013-48704-R. IP Jaume Piñol.

Others

PhD thesis

Luis Gonzalez. Functional and structural analyses of the terminal organelle of Mycoplasma genitalium.2015. Directors: E.Querol, J.Piñol.

Luis Garcia. Role of MG491 protein in the motile machinery of Mycoplasma genitalium.2015. Directors: E.Querol, J.Piñol.

Sergio Hernández. Análisis bioinformático de las proteinas multifuncionales (moonlighting). 2015. Directors: E.Querol.

Patent

Inventores:, L. González, J. Piñol, J. Montane, M. Camats, E. Querol, M. Sitja. “Cepas mutantes de *Mycoplasma hyopneumoniae*” WO2014/009586 A2. “Vectors for transforming *Mycoplasma hyopneumoniae*, transformed *M. hyopneumoniae* straints, and use thereof ”EP 2 684959 A1”.

Inventors Gonzalez Luis Gonzalez, RIBAS Jaume PIÑOL, Giralt Jordi Montane, Malet Maria Camats, Murillo Enrique Querol, ARNAU Marta SITJA. WO2014135730 A1. Haptenos y conjugados derivados de piocianina, anticuerpos de los mismos, y método inmunoquímico para la detección de infecciones provocadas por pseudomonas aeruginosa. US20160033489

RIBAS Jaume PIÑOL, Virgili Sergi Bru, SOLER Laura FERRER, ARNAU Marta SITJA, Murillo Enrique Querol. WO2014009586 A3. Cepa viva atenuada de actinobacillus pleuropneumoniae. US20150306200

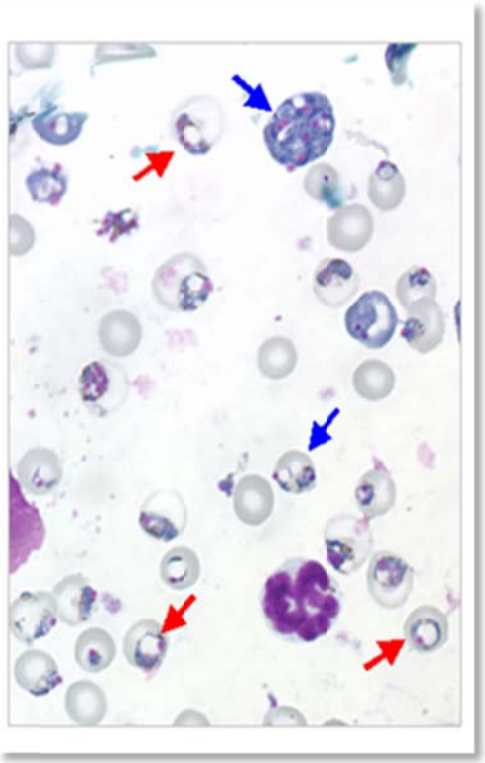
Protein Engineering and Proteomics

Group Leader	Francesc X. Avilés Puigvert
Senior Members	Josep Vendrell Roca
	Julia Lorenzo Rivera
PhD Students	Giovanny Covaleda
	Olivia Tort Regas
	Javier Garcia Pardo
	Esther Berenguer de la Cuesta
	Roberto Fernández Álvarez
	María del Carmen García Guerrero
	Carla Granados Colomina
	Sergi Montané Bel
	David Montpeyó García-Moreno
	Irantzu Pallarés Goitiz
	Emi Evangelio
	Albert Fina
	David Martínez
	Threpthimol Ponnoth
	Sergi Rodríguez
	Salvio Suárez

Overview

Our group's interests lie in protein engineering, focusing on the study of protease precursors and inhibitors in general, and on metallocarboxipeptidases in particular. Among this lines we work in redesigning proteins or organoproteic molecules capable of keeping these enzymes inactive, and in such way finding out determinant factors for their activation and inactivation.

We also develop methodologies for high-throughput proteomics as well as for the classification, structural prediction / simulation and modeling of proteins, ligand design, drug design and protein engineering in general.



Projects

Grup consolidat de la Generalitat de Cataluña 2014SGR1658. 2014. IP: F. X. Avilés.

Interactomica diseño de sondas e imagen de carboxipeptidasas. en transito de la funcion a la aplicabilidad. BIO2013-44973-R.2014. IP: F. X. Avilés

Others

PhD thesis

Javier Garcia. Structural and functional characterization of regulatory metallocarboxypeptidases: Studies on human carboxypeptidases D and Z, and the transthyretin-like domain. 2015. Directors: J.Lorenzo, F.X.Avilés.

Members of:

Evaluator/referee of different scientific journals and, particularly, of Eur. J. Biochem./ FEBS J./ Proteomics / J Biol Chem...etc... etc (1985-2015), and member of the Editorial Board of J. Protein Chem & The Protein Journal (2001- to now), Microbial Cell Factories (2004-2014) and J Biol Chem (1990-1995 & 2009-2014).

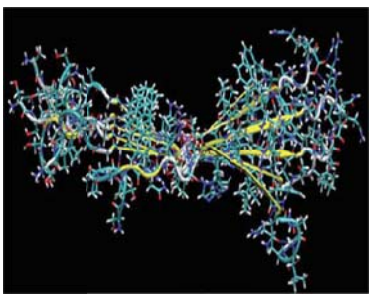
Protein Folding and Conformational Diseases

Group Leader	Salvador Ventura Zamora
Postdoctoral Fellow	Susana Navarro Cantero
Lab Technician	Natalia Sanchez de Groot
PhD Students	Ricardo Graña-Montes
	Patrizia Marinelli
	Anita Carija
	Marta Díaz Caballero
	Sebastián Andrés Esperante Bedani
	Francisca Pinheiro
	Ricardo Sant'Anna Oliveira
	Alex Mur
	Bruno Macedo
	Carlota Gómez
	Joan Serrano
	Jordi Pujols
	Marcos Gil
	Sergio Espinosa

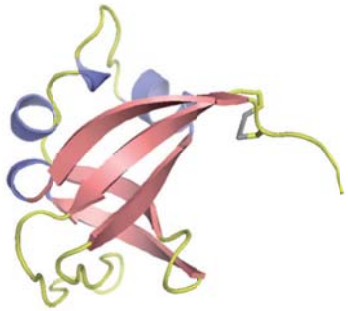
Overview

We aim to understand the chemistry and biology of protein folding and how this reaction is competed in the cell by misfolding and aggregation processes, leading to the onset of a variety of human conformational diseases.

Among other achievements, in the present year:

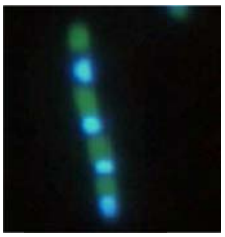


1.- Using atomic force microscopy, single molecule force spectroscopy and molecular dynamics we have addressed the inner forces that stabilize amyloid fibrillar structures (Valle-Delgado JJ. et al. 2012)

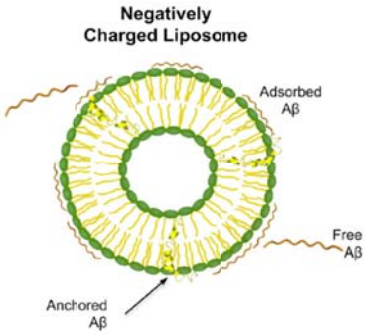


2.- We have deciphered the role played by disulfide bonds on the thermodynamic stability of proteins, folding kinetics and specially on the their aggregation into amyloid fibrils. They act as key molecular elements promoting the formation of stable functional forms and precluding the population of aggregating species that might trigger pathological processes. (Grana-Montes R, et al. 2012)

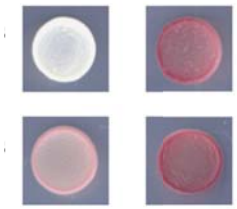
3.- The formation of aggregates by misfolding toxic for the cell, decreasing cellular fitness. organism we have developed a robust system to impact of protein aggregation in cell al., 2012a)



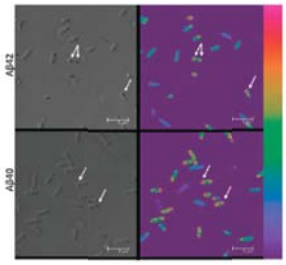
polypeptides is inherently Using bacteria as a model model and quantify the homeostasis. (Villar-Pique et



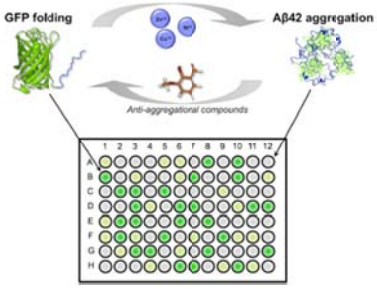
4- The neurotoxicity of the amyloid peptide Abeta is exerted through interactions with neuronal membranes. Using liposomes as model membranes, we have shown that it is the balance between peptide insertion and adsortion in the membrane that modulates its aggregation and toxicity (Sabate et al 2012a).



5- We have shown that bacterial cells might form infective amyloid structures and therefore that they can be used to generate and study prion proteins (Espargaro et al 2012a).



6- We have developed a method that exploits flow-cytometry to screen the impact of genetic mutations or chemical compounds in the aggregation of proteins involved in different pathologies (Espargaro et al 2012b).



7- We have developed a method based on GFP refolding to identify chemical compounds that promote or avoid the aggregation of biotechnological/biomedical relevant proteins (Villar-Pique et al., 2012a).

Projects

Grup d'estudis de proteïnes autoagregatives (**2014SGR 938**) 2014. Generalitat de Catalunya.

ICREA-ACADEMIA Award 2009 in Life and Medical Sciences. 2010-2015. Generalitat de Catalunya. IP: Salvador Ventura

Descubrimiento, caracterizacion y diseño de nuevos amiloides funcionales auto-replicativos. BFU2013-44763-P. IP: Salvador Ventura.

Desarrollo de un medicamento para el tratamiento de la amiloidosis por transtiretina. Empresa: SOM INNOVATION BIOTECH SLU. RTC-2014-1931-1. IP: Salvador Ventura.

Diagnóstico y combate molecular de tres enfermedades neurodegenerativas (Parkinson, fenilcetonuria y amiloidosis TTR) NEUROMED. SOE4/P1/E831. IP: Salvador Ventura.

Others

PhD thesis

Patrizia Marinelli. From sequence to structure: Determinants of Functional and Non-functional protein aggregation. 2015. Director: S.Ventura, S.Navarro

Protein Structure

Group Leader	David Reverter Cendrós
Postdoctoral Fellow	Nathalia Varejáo Nogueira da Paz
PhD Students	Bing Liu
	Gerard Casacuberta
	Hèctor López
	Jara Lascorz
	Jéssica Angulo
	Roger Canton

Overview

- Structural characterization of the activation cascade by the mitotic kinases NEK6, NEK7 and NEK9.
- Structural and functional studies of the de-ubiquitin proteases USP25 and USP28 regulated by SUMO modification.
- Structural characterization of the complex SMC5/SMC6 and its roles as a SUMO E3 ligase.

Projects

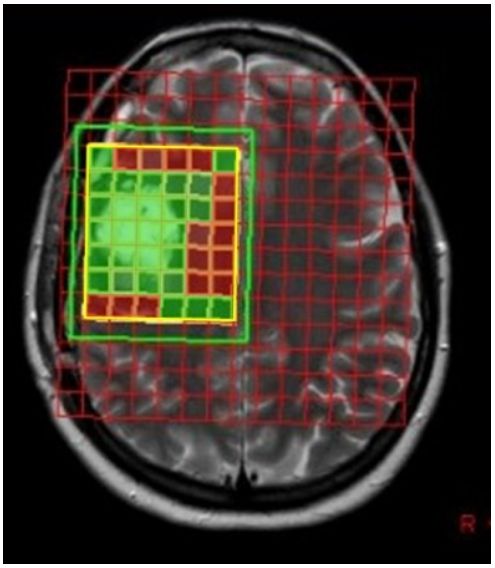
Estudio funcional y estructural de las modificaciones post-traduccionales por la familia ubiquitin/ubiquitinlike (Ref. BFU2012-37116). MEC 2013-2015.

NMR Applications in Biomedicine (GABRMN)

Group Leader	Carles Arús Caraltó
Senior Members	Margarida Julià Sapé
	Ana Paula Candiota
PhD Students	Magdalena Ciezka
	Victor Mocioiu
	Laura Ferrer Font
	Xavier Serra Mocioiu
	Yanisleydis Hernández

Overview

GABRMN stands for "Grup d'Aplicacions Biomèdiques de la Ressonància Magnètica Nuclear".



Our research group is located jointly at the IBB and at the Unitat de Biociències of the Departament de Bioquímica i Biologia Molecular, located at the Faculty of Biosciences of the Universitat Autònoma de Barcelona, UAB.

The GABRMN@IBB hosts all infrastructure and personnel related to bioinformatics developments needed to fulfil our research lines. The GABRMN@IBB hosts, jointly with the Servei de Ressonància Magnètica (Nuclear Magnetic Resonance Facility) (SeRMN) (http://sermn.uab.cat/) of the UAB, one of the CIBER-BBN platform units, the Platform of Biomedical Applications of Nuclear Magnetic Resonance at the Universitat Autònoma de Barcelona.

The bioinformatics platform @IBB, with a total storage capacity of 12TB, is accessible through the UAB network (agarcia@gabrmn.uab.es for access). It hosts two multicentre databases (INTERPRET and eTUMOUR), with NMR and clinical data for more than 1000 human brain tumour patients.and provides consultancy in processing and mathematical analysis of MRSI data, preclinical and clinical.

The platform also distributes GABRMN software packages such as the INTERPRET decision-support system for human brain tumour diagnosis based on MRS and SpectraClassifier, for pattern recognition of in vivo MRS data.

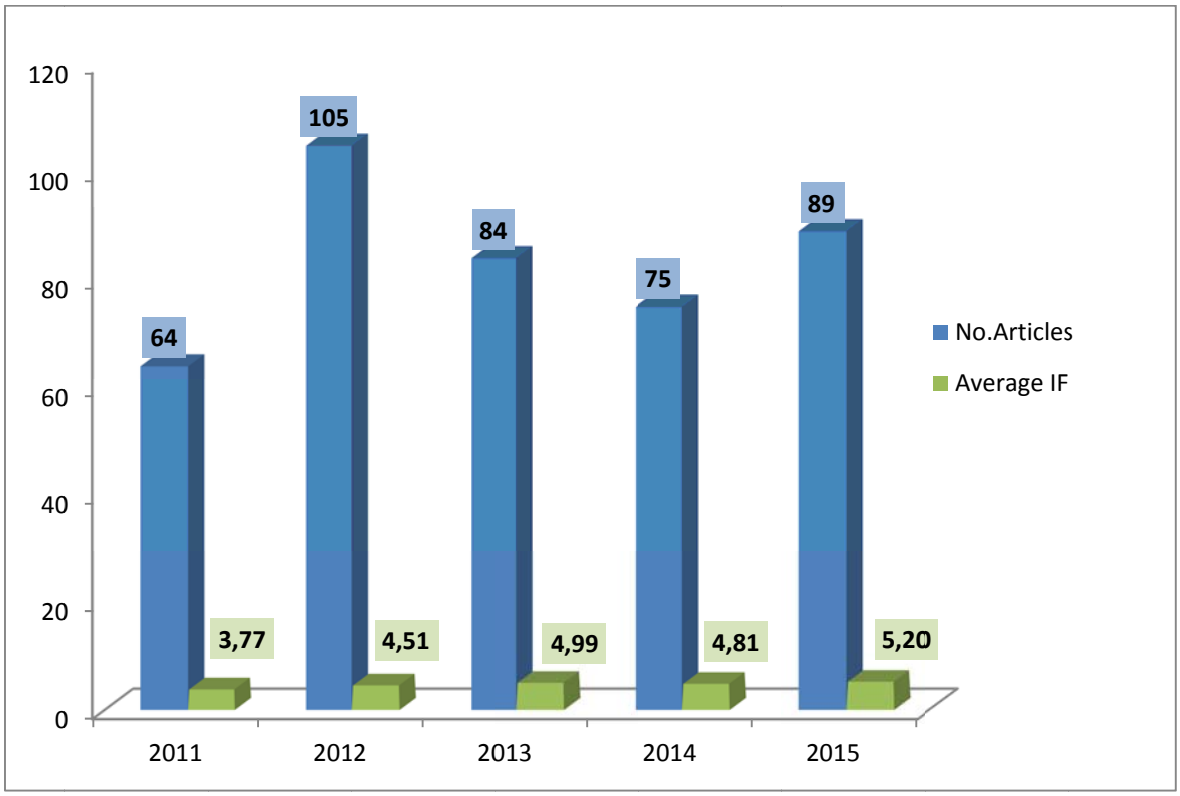
Others

Editorial work

Carles Arús is member of the editorial board of “MAGMA Magnetic Resonance Materials in Physics, Biology and Medicine”.

Publications

Year	No.Articles	Total IF	Average IF
2011	64	241,49	3,77
2012	105	473,86	4,51
2013	84	418,86	4,99
2014	75	360,66	4,81
2015	89	462,45	5,20



Abrie, J. A., C. Molero, J. Arino, and E. Strauss. 2015. "Complex stability and dynamic subunit interchange modulates the disparate activities of the yeast moonlighting proteins Hal3 and Vhs3." Scientific Reports 5.

Alamo, P., A. Gallardo, F. Di Nicolantonio, M. A. Pavon, I. Casanova, M. Trias, M. A. Mangues, A. Lopez-Pousa, A. Villaverde, E. Vazquez, A. Bardelli, M. V. Cespedes, and R. Mangues. 2015. "Higher metastatic efficiency of KRas G12V than KRas G13D in a colorectal cancer model." Faseb Journal 29 (2): 464-476.

Albesa-Jove, David, Fernanda Mendoza, Ane Rodrigo-Unzueta, Fernando Gomollon-Bel, Javier O. Cifuente, Saioa Urresti, Natalia Comino, Hansel Gomez, Javier Romero-Garcia, Jose M. Lluch, Enea Sancho-Vaello, Xevi Biarnes, Antoni Planas, Pedro Merino, Laura Masgrau, and Marcelo E. Guerin. 2015. "A Native Ternary Complex Trapped in a Crystal Reveals the Catalytic Mechanism of a Retaining Glycosyltransferase." Angewandte Chemie-International Edition 54 (34): 9898-9902

Alvarez, I., J. A. Collado, R. Colobran, M. Carrascal, M. T. Ciudad, F. Canals, E. A. James, W. W. Kwok, M. Gartner, B. Kyewski, R. Pujol-Borrell, and D. Jaraquemada. 2015. "Central T cell tolerance: Identification of tissue-restricted autoantigens in the thymus HLA-DR peptidome." Journal of Autoimmunity 60: 12-19.

Argyris, J. M., A. Ruiz-Herrera, P. Madriz-Masis, W. Sanseverino, J. Morata, M. Pujol, S. E. Ramos-Onsins, and J. Garcia-Mas. 2015. "Use of targeted SNP selection for an improved anchoring of the melon (Cucumis melo L.) scaffold genome assembly." Bmc Genomics 16.

Armengol, P., R. Gelabert, M. Moreno, and J. M. Lluch. 2015. "Unveiling How an Archetypal Fluorescent Protein Operates: Theoretical Perspective on the Ultrafast Excited State Dynamics of GFP Variant 565T/H148D." Journal of Physical Chemistry B 119 (6): 2274-2291.

Armengol, Pau, Ricard Gelabert, Miquel Moreno, and Jose M. Lluch. 2015. "Theoretical Computer-Aided Mutagenic Study on the Triple Green Fluorescent Protein Mutant S65T/H148D/Y145F." Chemphyschem 16 (10): 2134-2139.

Ata-Ali, J., A. J. Flichy-Fernandez, T. Alegre-Domingo, F. Ata-Ali, J. Palacio, and M. Penarrocha-Diago. 2015. "Clinical, microbiological, and immunological aspects of healthy versus peri-implantitis tissue in full arch reconstruction patients: a prospective cross-sectional study." Bmc Oral Health 15.

Bermudez-Lopez, M., I. Pocino-Merino, H. Sanchez, A. Bueno, C. Guasch, S. Almedawar, S. Bru-Virgili, E. Gari, C. Wyman, D. Reverter, N. Colomina, and J. Torres-Rosell. 2015. "ATPase-Dependent Control of the Mms21 SUMO Ligase during DNA Repair." Plos Biology 13 (3): e1002089

Caceres, M. 2015. "Structural variants, much ado about nothing?" Briefings in Functional Genomics 14 (5): 303-304.

Callol, A., D. Pajuelo, L. Ebbesson, M. Teles, S. MacKenzie, and C. Amaro. 2015a. "Early steps in the European eel (Anguilla anguilla)-Vibrio vulnificus interaction in the gills: Role of the RtxA1(3) toxin." Fish & Shellfish Immunology 43 (2): 502-509.

Callol, A., F. E. Reyes-Lopez, F. J. Roig, G. Goetz, F. W. Goetz, C. Amaro, and S. A. MacKenzie. 2015b. "An Enriched European Eel Transcriptome Sheds Light upon Host-Pathogen Interactions with Vibrio vulnificus." Plos One 10 (7).

Canadell, D., A. Gonzalez, C. Casado, and J. Arino. 2015. "Functional interactions between potassium and phosphate homeostasis in Saccharomyces cerevisiae." Molecular Microbiology 95 (3): 555-572.

Canadell, D., J. Garcia-Martinez, P. Alepuz, J. E. Perez-Ortin, and J. Arino. 2015. "Impact of high pH stress on yeast gene expression: A comprehensive analysis of mRNA turnover during stress responses." Yeast 32: S69-S69.

Canadell, David, Jose Garcia-Martinez, Paula Alepuz, Jose E. Perez-Ortin, and Joaquin Arino. 2015. "Impact of high pH stress on yeast gene expression: A comprehensive analysis of mRNA turnover during stress responses." Biochimica Et Biophysica Acta-Gene Regulatory Mechanisms 1849 (6): 653-664.

Cano-Garrido, O., J. Seras-Franzoso, and E. Garcia-Fruitos. 2015. "Lactic acid bacteria: reviewing the potential of a promising delivery live vector for biomedical purposes." Microbial Cell Factories 14.

Carinelli, S., C. X. Ballesteros, M. Marti, S. Alegret, and M. I. Pividori. 2015. "Electrochemical magneto-actuated biosensor for CD4 count in AIDS diagnosis and monitoring." Biosensors & Bioelectronics 74: 974-980.

Carinelli, S., M. Marti, S. Alegret, and M. I. Pividori. 2015. "Biomarker detection of global infectious diseases based on magnetic particles." New Biotechnology 32 (5): 521-532.

Castells, X., J. J. Acebes, C. Majos, S. Boluda, M. Julia-Sape, A. P. Candiota, J. Arino, A. Barcelo, and C. Arus. 2015. "Robustness of Equations that Define Molecular Subtypes of Glioblastoma Tumors Based on Five Transcripts Measured by RT-PCR." Omics-a Journal of Integrative Biology 19 (1): 41-51.

Ciudad, M. T., A. Kim, J. A. Collado, E. A. James, W. W. Kwok, S. Sadegh-Nasseri, and D. Jaraquemada. 2015. "In vitro study of thyroglobulin peptides associated to HLA-DR3 under thyroid antigen presentation conditions." Molecular Immunology 68 (2): 162-162.

Correia, I., S. Roy, C. P. Matos, S. Borovic, N. Butenko, I. Cavaco, F. Marques, J. Lorenzo, A. Rodriguez, V. Moreno, and J. C. Pessoa. 2015. "Vanadium(IV) and copper(II) complexes of salicylaldimines and aromatic heterocycles: Cytotoxicity: DNA binding and DNA cleavage properties." Journal of Inorganic Biochemistry 147: 134-146.

de Groot, N. S., R. A. Gomes, A. Villar-Pique, M. M. Babu, A. V. Coelho, and S. Ventura. 2015. "Proteome response at the edge of protein aggregation." Open Biology 5 (2).

Fait, M. E., G. L. Garrote, P. Clapes, S. Tanco, J. Lorenzo, and S. R. Morcelle. 2015. "Biocatalytic synthesis, antimicrobial properties and toxicity studies of arginine derivative surfactants." Amino Acids 47 (7): 1465-1477.

Fernandez-Nino, M., M. Marquina, S. Swinnen, B. Rodriguez-Porrata, E. Nevoigt, and J. Arino. 2015. "The Cytosolic pH of Individual Saccharomyces cerevisiae Cells Is a Key Factor in Acetic Acid Tolerance." Applied and Environmental Microbiology 81 (22): 7813-7821.

Ferrer-Dalmau, J., F. Randez-Gil, M. Marquina, J. A. Prieto, and A. Casamayor. 2015. "Protein kinase Snf1 is involved in the proper regulation of the unfolded protein response in Saccharomyces cerevisiae." Biochemical Journal 468: 33-47.

Ferrer-Miralles, N., E. Rodriguez-Carmona, J. L. Corchero, E. Garcia-Fruitos, E. Vazquez, and A. Villaverde. 2015. "Engineering protein self-assembling in protein-based nanomedicines for drug delivery and gene therapy." Critical Reviews in Biotechnology 35 (2): 209-221.

Flichy-Fernandez, A. J., J. Ata-Ali, T. Alegre-Domingo, E. Candel-Marti, F. Ata-Ali, J. R. Palacio, and M. Penarrocha-Diago. 2015b. "The effect of orally administered probiotic Lactobacillus reuteri-containing tablets in peri-implant mucositis: a double-blind randomized controlled trial." Journal of Periodontal Research 50 (6): 775-785.

Fraga, H., and S. Ventura. 2015. "Influence of Cytoplasmatic Folding on Mitochondrial Import." Current Medicinal Chemistry 22 (19): 2349-2359.

Gaudesi, D., C. Peri, G. Quilici, A. Gori, M. Ferrer-Navarro, O. Conchillo-Sole, R. Thomas, A. Nithichanon, G. Lertmemongkolchai, R. Titball, X. Daura, G. Colombo, and G. Musco. 2015. "Structure-Based Design of a B Cell Antigen from B. pseudomallei." Acs Chemical Biology 10 (3): 803-812.

Gomez, Hansel, Fernanda Mendoza, Jose M. Lluch, and Laura Masgrau. 2015. "QM/MM Studies Reveal How Substrate-Substrate and Enzyme-Substrate Interactions Modulate Retaining Glycosyltransferases Catalysis and Mechanism." Advances in protein chemistry and structural biology 100: 225-254.

Gourlay, L. J., R. J. Thomas, C. Peri, O. Conchillo-Sole, M. Ferrer-Navarro, A. Nithichanon, J. Vila, X. Daura, G. Lertmemongkolchai, R. Titball, G. Colombo, and M. Bolognesi. 2015. "From crystal structure to in silico epitope discovery in the Burkholderia pseudomallei flagellar hook-associated protein FlgK." Febs Journal 282 (7): 1319-1333.

Guillen, Y., N. Rius, A. Delprat, A. Williford, F. Muyas, M. Puig, S. Casillas, M. Ramia, R. Egea, B. Negre, G. Mir, J. Camps, V. Moncunill, F. J. Ruiz-Ruano, J. Cabrero, L. G. de Lima, G. B. Dias, J. C. Ruiz, A. Kapusta, J. Garcia-Mas, M. Gut, I. G. Gut, D. Torrents, J. P. Camacho, G. C. S. Kuhn, C. Feschotte, A. G. Clark, E. Betran, A. Barbadilla, and A. Ruiz. 2015. "Genomics of Ecological Adaptation in Cactophilic Drosophila." Genome Biology and Evolution 7 (1): 349-366.

Haq, T., M. W. Richards, S. G. Burgess, P. Gallego, S. Yeoh, L. O'Regan, D. Reverter, J. Roig, A. M. Fry, and R. Bayliss. 2015. "Mechanistic basis of Nek7 activation through Nek9 binding and induced dimerization." Nature Communications 6: 8771

Hernandez, Y. L., D. Yero, J. M. Pinos-Rodriguez, and I. Gibert. 2015. "Animals devoid of pulmonary system as infection models in the study of lung bacterial pathogens." Frontiers in Microbiology 6.

Huedo, P., D. Yero, S. Martinez-Servat, A. Ruyra, N. Roher, X. Daura, and I. Gibert. 2015. "Decoding the genetic and functional diversity of the DSF quorum-sensing system in Stenotrophomonas maltophilia." Frontiers in Microbiology 6.

Iglesias, V., N. S. de Groot, and S. Ventura. 2015. "Computational analysis of candidate prion-like proteins in bacteria and their role." Frontiers in Microbiology 6.

Jimenez-Xarrie, E., M. Davila, S. Gil-Perotin, A. Jurado-Rodriguez, A. P. Candiota, R. Delgado-Mederos, S. Lope-Piedrafita, J. M. Garcia-Verdugo, C. Arus, and J. Marti-Fabregas. 2015. "In vivo and ex vivo magnetic resonance spectroscopy of the infarct and the subventricular zone in experimental stroke." Journal of Cerebral Blood Flow and Metabolism 35 (5): 828-834.

Julia-Sape, M., J. R. Griffiths, A. R. Tate, F. A. Howe, D. Acosta, G. Postma, J. Underwood, C. Majos, and C. Arus. 2015. "Classification of brain tumours from MR spectra: the INTERPRET collaboration and its outcomes." Nmr in Biomedicine 28 (12): 1772-1787.

Kim, A., I. Z. Hartman, T. Boronina, N. B. Song, M. T. Ciudad, D. Jaraquemada, and S. Sadegh-Nasseri. 2015. "Multiple paths to immunodominance: Dominant epitopes are captured by MHC II prior, or post antigen proteolysis, and are enriched by HLA-DM." Molecular Immunology 68 (2): 137-137.

Lufrano, D., J. Cotabarren, J. Garcia-Pardo, R. Fernandez-Alvarez, O. Tort, S. Tanco, F. X. Aviles, J. Lorenzo, and W. D. Obregon. 2015. "Biochemical characterization of a novel carboxypeptidase inhibitor from a variety of Andean potatoes."Phytochemistry 120: 36-45.

Macedo, B., R. Sant'Anna, S. Navarro, Y. Cordeiro, and S. Ventura. 2015. "Mammalian prion protein (PrP) forms conformationally different amyloid intracellular aggregates in bacteria." Microbial Cell Factories 14.

Mamat, U., K. Wilke, D. Bramhill, A. B. Schromm, B. Lindner, T. A. Kohl, J. L. Corchero, A. Villaverde, L. Schaffer, S. R. Head, C. Souvignier, T. C. Meredith, and R. W. Woodard. 2015. "Detoxifying Escherichia coli for endotoxin-free production of recombinant proteins." Microbial Cell Factories 14:57.

Marjanovic, M., C. Sanchez-Huertas, B. Terre, R. Gomez, J. F. Scheel, S. Pacheco, P. A. Knobel, A. Martinez-Marchal, S. Aivio, L. Palenzuela, U. Wolfrum, P. J. McKinnon, J. A. Suja, I. Roig, V. Costanzo, J. Luders, and T. H. Stracker. 2015. "CEP63 deficiency promotes p53-dependent microcephaly and reveals a role for the centrosome in meiotic recombination."Nature Communications 6.

Martinelli, L., D. Lalli, L. Garcia-Morales, M. Ratera, E. Querol, J. Pinol, I. Fita, and B. M. Calisto. 2015. "A Major Determinant for Gliding Motility in Mycoplasma genitalium THE INTERACTION BETWEEN THE TERMINAL ORGANELLE PROTEINS MG200 AND MG491." Journal of Biological Chemistry 290 (3): 1699-1711.

Martinez, P., P. Huedo, S. Martinez-Servat, R. Plane, M. Ferrer-Navarrol, X. Daura, D. Vero, and I. Gibert. 2015. "Stenotrophomonas maltophilia responds to exogenous AHL signals through the LuxR solo SmoR (Smlt1839)." Frontiers in Cellular and Infection Microbiology 5.

Martinez-Gonzalez, J. A., M. Gonzalez, L. Masgrau, and R. Martinez. 2015. "Theoretical Study of the Free Energy Surface and Kinetics of the Hepatitis C Virus NS3/NS4A Serine Protease Reaction with the NS5A/5B Substrate. Does the Generally Accepted Tetrahedral Intermediate Really Exist?" Acs Catalysis 5 (1): 246-255.

Martinez-Olivan, J., H. Fraga, X. Arias-Moreno, S. Ventura, and J. Sancho. 2015. "Intradomain Confinement of Disulfides in the Folding of Two Consecutive Modules of the LDL Receptor." Plos One 10 (7).

Masgrau, L., and D. G. Truhlar. 2015. "The Importance of Ensemble Averaging in Enzyme Kinetics." Accounts of Chemical Research 48 (2): 431-438.

Miserachs, H. G., M. Cipriani, J. Grau, M. Vilaseca, J. Lorenzo, A. Medeiros, M. A. Comini, D. Gambino, L. Otero, and V. Moreno. 2015. "Antitumor and antiparasitic activity of novel ruthenium compounds with polycyclic aromatic ligands."Journal of Inorganic Biochemistry 150: 38-47.

Mocioiu, V., S. Ortega-Martorell, I. Olier, M. Jablonski, J. Starcukova, P. Lisboa, C. Arus, and M. Julia-Sape. 2015. "From raw data to data-analysis for magnetic resonance spectroscopy - the missing link: jMRUI2XML." Bmc Bioinformatics 16.

Munoz-Fuentes, V., M. Marcet-Ortega, G. Alkorta-Aranburu, C. L. Forsberg, J. M. Morrell, E. Manzano-Piedras, A. Soderberg, K. Daniel, A. Villalba, A. Toth, A. Di Rienzo, I. Roig, and C. Vila. 2015. "Strong Artificial Selection in Domestic Mammals Did Not Result in an Increased Recombination Rate." Molecular Biology and Evolution 32 (2): 510-523.

Nadal-Ferret, M., R. Gelabert, M. Moreno, and J. M. Lluch. 2015. "Transient low-barrier hydrogen bond in the photoactive state of green fluorescent protein." Physical Chemistry Chemical Physics 17 (46): 30876-30888.

Navarro, S., M. Diaz, P. Gallego, D. Reverter, and S. Ventura. 2015. "Surface aggregation-propensity as a constraint on globular proteins evolution." Protein Science 24: 292-293.

Navarro, S., P. Marinelli, M. Diaz-Caballero, and S. Ventura. 2015. "The prion-like RNA-processing protein HNRPDL forms inherently toxic amyloid-like inclusion bodies in bacteria." Microbial Cell Factories 14.

Nithichanon, A., D. Rinchai, A. Gori, P. Lassaux, C. Peri, O. Conchillio-Sole, M. Ferrer-Navarro, L. J. Gourlay, M. Nardini, J. Vila, X. Daura, G. Colombo, M. Bolognesi, and G. Lertmemonkolchai. 2015. "Sequence- and Structure-Based Immunoreactive Epitope Discovery for Burkholderia pseudomallei Flagellin." Plos Neglected Tropical Diseases 9 (7).

Pacheco, S., M. Marcet-Ortega, J. Lange, M. Jasin, S. Keeney, and I. Roig. 2015. "The ATM Signaling Cascade Promotes Recombination-Dependent Pachytene Arrest in Mouse Spermatocytes." Plos Genetics 11 (3): e1005017.

Pastor-Flores, D., J. Ferrer-Dalmau, A. Bahi, M. Boleda, R. M. Biondi, and A. Casamayor. 2015. "Depletion of yeast PDK1 orthologs triggers a stress-like transcriptional response." Bmc Genomics 16.

Peluffo, H., U. Unzueta, M. L. Negro-Demontel, Z. K. Xu, E. Vaquez, N. Ferrer-Miralles, and A. Villaverde. 2015. "BBB-targeting, protein-based nanomedicines for drug and nucleic acid delivery to the CNS." Biotechnology Advances 33 (2): 277-287.

Perez-Gallegos, A., M. Garcia-Viloca, A. Gonzalez-Lafont, and J. M. Lluch. 2015b. "SP20 Phosphorylation Reaction Catalyzed by Protein Kinase A: QM/MM Calculations Based on Recently Determined Crystallographic Structures." Acs Catalysis 5 (8): 4897-4912.

Perez-Gallegos, A., M. Garcia-Viloca, A. Gonzalez-Lafont, and J. M. Lluch. 2015a. "A QM/MM study of Kemptide phosphorylation catalyzed by protein kinase A. The role of Asp166 as a general acid/base catalyst." Physical Chemistry Chemical Physics 17 (5): 3497-3511.

Perez-Gallegos, Ayax, Mireia Garcia-Viloca, Angels Gonzalez-Lafont, and Jose M. Lluch. 2015. "A QM/MM study of Kemptide phosphorylation catalyzed by protein kinase A. The role of Asp166 as a general acid/base catalyst." Physical Chemistry Chemical Physics 17 (5): 3497-3511.

Puig, M., D. Castellano, L. Pantano, C. Giner-Delgado, D. Izquierdo, M. Gaya-Vidal, J. I. Lucas-Lledo, T. Esko, C. Terao, F. Matsuda, and M. Caceres. 2015. "Functional Impact and Evolution of a Novel Human Polymorphic Inversion That Disrupts a Gene and Creates a Fusion Transcript." Plos Genetics 11 (10): e1005495.

Puig, M., S. Casillas, S. Villatoro, and M. Caceres. 2015. "Human inversions and their functional consequences." Briefings in Functional Genomics 14 (5): 369-379.

Randino, C., R. Gelabert, M. Moreno, J. M. Lluch, and K. D. Piatkevich. 2015. "Molecular modelling of the pH influence in the geometry and the absorbance spectrum of near-infrared TagRFP675 fluorescent protein." Physical Chemistry Chemical Physics 17 (43): 29363-29373.

Rey, S., F. A. Huntingford, S. Boltana, R. Vargas, T. G. Knowles, and S. Mackenzie. 2015. "Fish can show emotional fever: stress-induced hyperthermia in zebrafish." Proceedings of the Royal Society B-Biological Sciences 282 (1819).

Reyes-Lopez, F. E., J. S. Romeo, E. Vallejos-Vidal, S. Reyes-Cerpa, A. M. Sandino, L. Tort, S. Mackenzie, and M. Imarai. 2015. "Differential immune gene expression profiles in susceptible and resistant full-sibling families of Atlantic salmon (Salmo salar) challenged with infectious pancreatic necrosis virus (IPNV)." Developmental and Comparative Immunology53 (1): 210-221.

Reytor, M. L., D. Reverter, S. Trejo, M. D. Chavez, F. X. Aviles, and M. A. del Rivero. 2015. "The crystal structure of a tri domain BPTI Kunitz inhibitor in complex with human carboxypeptidase A4 revealed a novel and non canonical inhibition mechanism." Journal of Biomolecular Structure & Dynamics 33: 136-137.

Rodriguez-Carmona, E., R. Mendoza, E. Ruiz-Canovas, N. Ferrer-Miralles, I. Abasolo, S. Schwartz, A. Villaverde, and J. L. Corchero. 2015. "A novel bio-functional material based on mammalian cell aggresomes." Applied Microbiology and Biotechnology 99 (17): 7079-7088.

Roque, A., R. Sortino, S. Ventura, I. Ponte, and P. Suau. 2015. "Histone H1 Favors Folding and Parallel Fibrillar Aggregation of the 1-42 Amyloid-beta Peptide." Langmuir 31 (24): 6782-6790.

Rueda, F., M. V. Cespedes, O. Conchillo-Sole, A. Sanchez-Chardi, J. Seras-Franzoso, R. Cubarsi, A. Gallardo, M. Pesarrodona, N. Ferrer-Miralles, X. Daura, E. Vazquez, E. Garcia-Fruitos, R. Mangues, U. Unzueta, and A. Villaverde. 2015. "Bottom-Up Instructive Quality Control in the Biofabrication of Smart Protein Materials." Advanced Materials 27 (47): 7816-7822.

Ruyra, A., A. Yazdi, J. Espin, A. Carne-Sanchez, N. Roher, J. Lorenzo, I. Imaz, and D. Maspoch. 2015b. "Synthesis, Culture Medium Stability, and In Vitro and In Vivo Zebrafish Embryo Toxicity of Metal-Organic Framework Nanoparticles."Chemistry-a European Journal 21 (6): 2508-2518.

Ruyra, A., D. Torrealba, D. Morera, L. Tort, S. MacKenzie, and N. Roher. 2015a. "Zebrafish liver (ZFL) cells are able to mount an anti-viral response after stimulation with Poly (I:C)." Comparative Biochemistry and Physiology B-Biochemistry & Molecular Biology 182: 55-63.

Sabate, R., F. Rousseau, J. Schymkowitz, and S. Ventura. 2015. "What Makes a Protein Sequence a Prion?" Plos Computational Biology 11 (1).

Sabate, R., F. Rousseau, J. Schymkowitz, C. Batlle, and S. Ventura. 2015. "Amyloids or prions? That is the question."Prion 9 (3): 200-206.

Sanjurjo, L., G. Aran, N. Roher, A. F. Valledor, and M. R. Sarrias. 2015. "AIM/CD5L: a key protein in the control of immune homeostasis and inflammatory disease." Journal of Leukocyte Biology 98 (2): 173-184.

Seras-Franzoso, J., W. I. Tatkiewicz, E. Vazquez, E. Garcia-Fruitos, I. Ratera, J. Veciana, and A. Villaverde. 2015. "Integrating mechanical and biological control of cell proliferation through bioinspired multieffector materials."Nanomedicine 10 (5): 873-891.

Serra-Cardona, A., S. Petrezselyova, D. Canadell, J. Ramos, and J. Arino. 2015. "A shared regulatory network allows functional coupling of Pho89 and Ena1 in response to environmental alkalinization." Yeast 32: S111-S111.

Serrano, L. F., S. Hernandez, A. Calvo, G. Ferragut, I. Amela, J. Cedano, and E. Querol. 2015. "Moonlighting proteins: relevance for biotechnology and biomedicine." Protein Science 24: 304-305.

Simoes, R. V., J. E. Ortuno, L. Bokacheva, A. P. Candiota, M. J. Ledesma-Carbayo, T. Delgado-Goni, M. L. Garcia-Martin, A. Santos, and C. Arus. 2015. "Effect of acute hyperglycemia on moderately hypothermic GL261 mouse glioma monitored by T1-weighted DCE MRI." Magnetic Resonance Materials in Physics Biology and Medicine 28 (2): 119-126.

Tanco, S., O. Tort, H. Demol, F. X. Aviles, K. Gevaert, P. Van Damme, and J. Lorenzo. 2015. "C-terminomics Screen for Natural Substrates of Cytosolic Carboxypeptidase 1 Reveals Processing of Acidic Protein C termini." Molecular & Cellular Proteomics 14 (1): 177-190.

Torabi, K., R. Miro, N. Fernandez-Jimenez, I. Quintanilla, L. Ramos, E. Prat, J. del Rey, N. Pujol, J. K. Killian, P. S. Meltzer, P. L. Fernandez, T. Ried, J. J. Lozano, J. Camps, and I. Ponsa. 2015. "Patterns of somatic uniparental disomy identify novel tumor suppressor genes in colorectal cancer." Carcinogenesis 36 (10): 1103-1110.

Torres-Puig, S., A. Broto, E. Queroi, J. Pinoi, and O. Q. Pich. 2015. "A novel sigma factor reveals a unique regulon controlling cell-specific recombination in Mycoplasma genitalium." Nucleic Acids Research 43 (10): 4923-4936.

Unzueta, U., F. Vazquez, G. Accardi, R. Mendoza, V. Toledo-Rubio, M. Giuliani, F. Sannino, E. Parrilli, I. Abasolo, S. Schwartz, M. L. Tutino, A. Villaverde, J. L. Corchero, and N. Ferrer-Miralles. 2015b. "Strategies for the production of difficult-to-express full-length eukaryotic proteins using microbial cell factories: production of human alpha-galactosidase A." Applied Microbiology and Biotechnology 99 (14): 5863-5874.

Unzueta, U., M. V. Cespedes, E. Vazquez, N. Ferrer-Miralles, R. Mangues, and A. Villaverde. 2015a. "Towards protein-based viral mimetics for cancer therapies." Trends in Biotechnology 33 (5): 253-258.

Villaverde, A., J. L. Corchero, J. Seras-Franzoso, and E. Garcia-Fruitos. 2015. "Functional protein aggregates: just the tip of the iceberg." Nanomedicine 10 (18): 2881-2891.

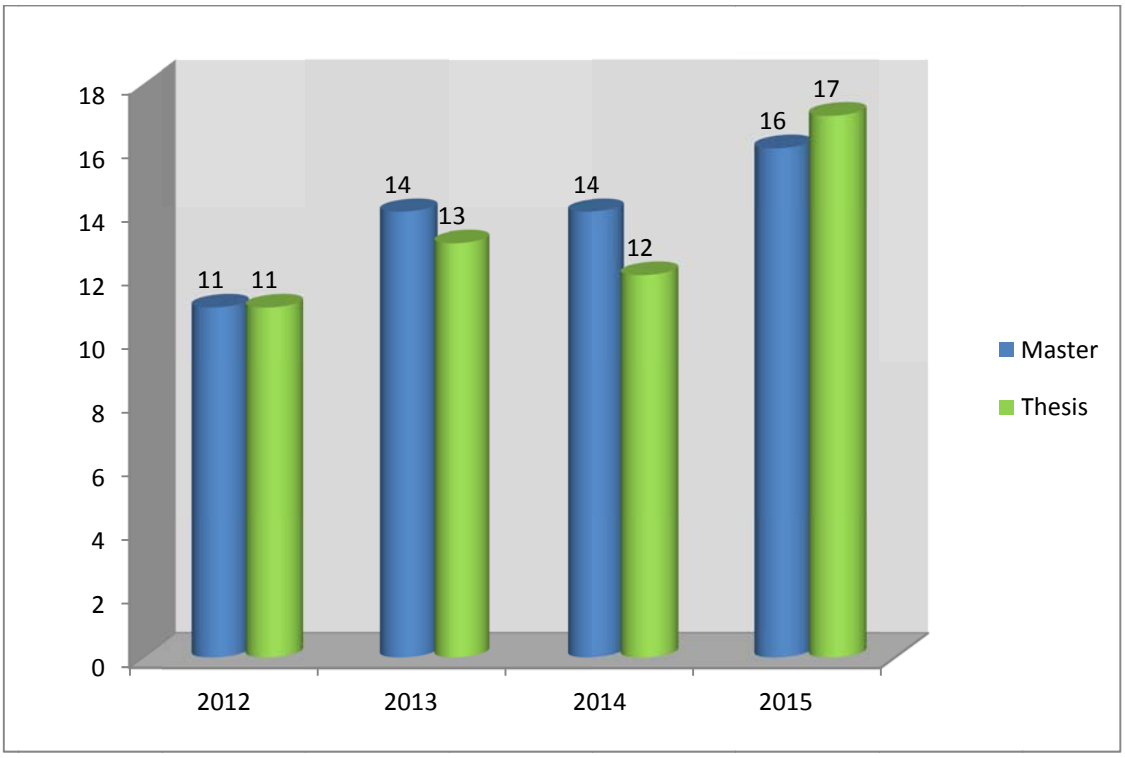
Xu, Z. K., M. V. Cespedes, U. Unzueta, P. Alamo, M. Pesarrodona, R. Mangues, E. Vazquez, A. Villaverde, and N. Ferrer-Miralles. 2015a. "Targeting low-density lipoprotein receptors with protein-only nanoparticles." Journal of Nanoparticle Research 17 (3).

Xu, Z. K., U. Unzueta, M. Roldan, R. Mangues, A. Sanchez-Chardi, N. Ferrer-Miralles, A. Villaverde, and E. Vazquez. 2015b. "Formulating tumor-homing peptides as regular nanoparticles enhances receptor-mediated cell penetrability."Materials Letters 154: 140-143.

Zambrano, R., M. Jamroz, A. Szczasiuk, J. Pujols, S. Kmiecik, and S. Ventura. 2015b. "AGGRESCAN3D (A3D): server for prediction of aggregation properties of protein structures." Nucleic Acids Research 43 (W1): W306-W313.

Zambrano, R., O. Conchillo-Sole, V. Iglesias, R. Illa, F. Rousseau, J. Schymkowitz, R. Sabate, X. Daura, and S. Ventura. 2015a. "PrionW: a server to identify proteins containing glutamine/asparagine rich prion-like domains and their amyloid cores." Nucleic Acids Research 43 (W1): W331-W337.

Thesis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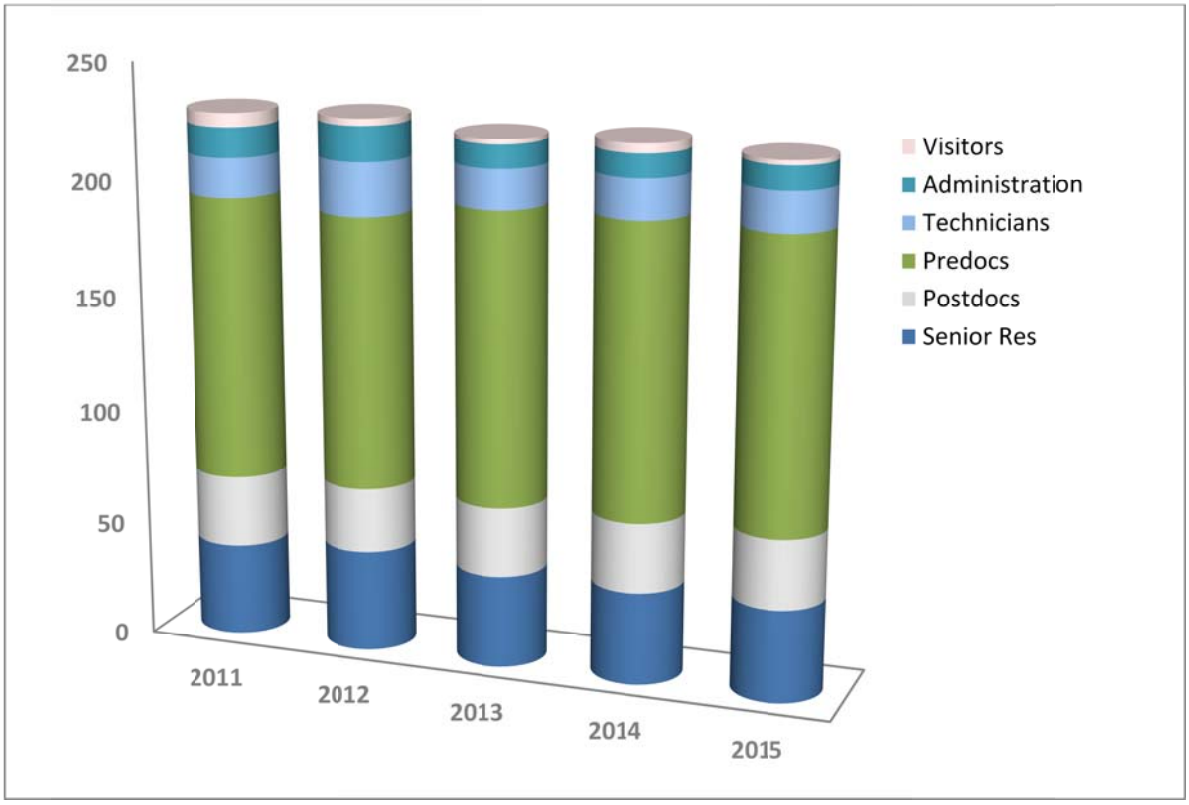
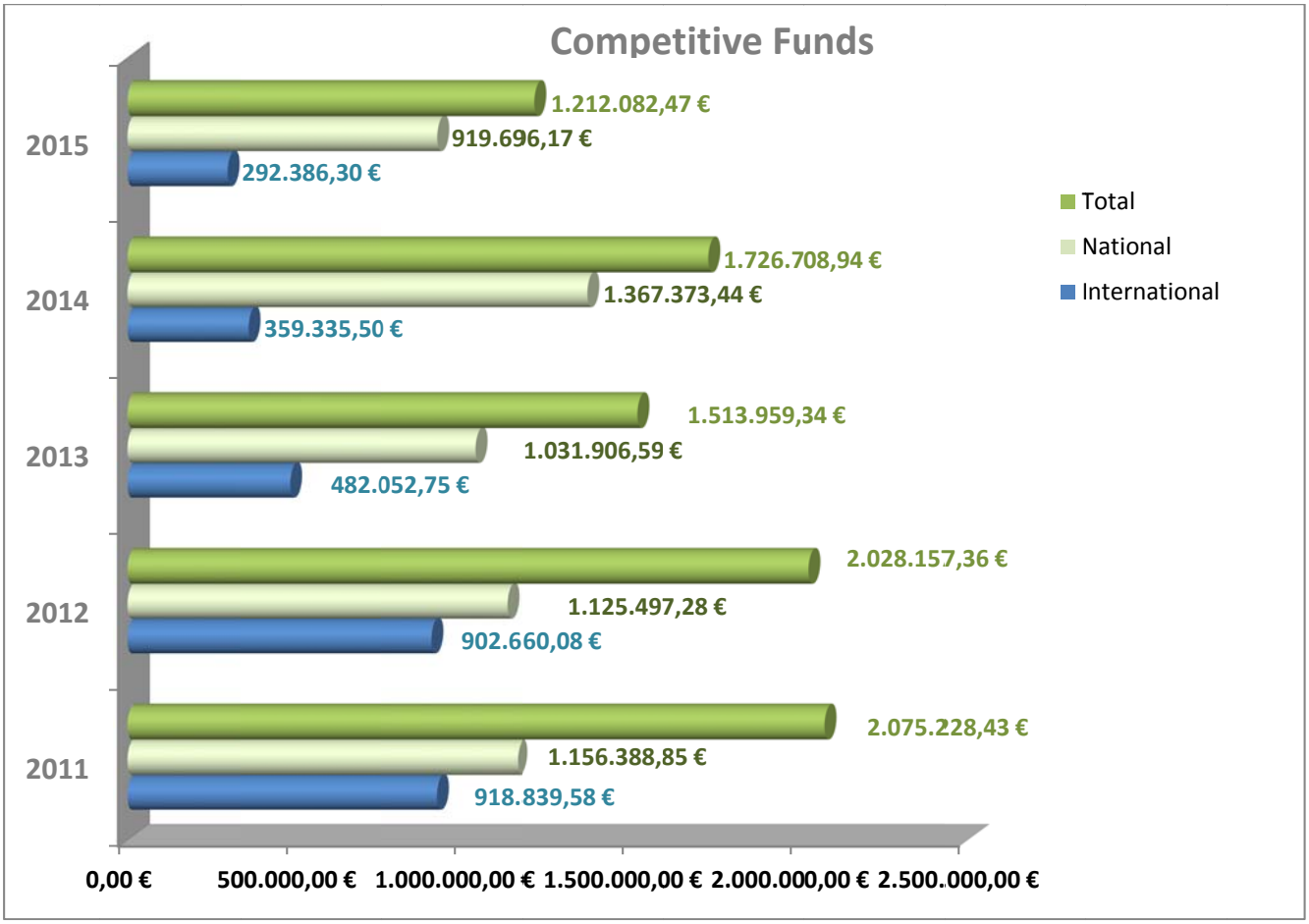
Human Resources

	Senior Res	Postdocs	Predocs	Technicians	Administratior	Visitors	Total
2011	40	31	122	17	13	6	229
2012	44	28	117	23	15	3	230
2013	40	30	126	17	10	2	225
2014	40	30	126	17	10	4	227
2015	40	30	125	17	10	2	224



Funding


Competitive Funds
2015
1.212.082,47 €
919.696,17 €
292.386,30 €
2014
1.726.708,94 €
1.367.373,44 €
359.335,50 €
2013
1.513.959,34 €
1.031.906,59 €
482.052,75 €
2012
2.028.157,36 €
1.125.497,28 €
902.660,08 €
2011
2.075.228,43 €
1.156.388,85 €
918.839,58 €
Total
National
International
0,00 €
500.000,00 €
1.000.000,00 €
1.500.000,00 €
2.000.000,00 €
2.500.000,00 €