The Institute of Research, Development, and Innovation in Healthcare Biotechnology in Elche (IDiBE) is one of the University Research Institutes at the University Miguel Hernandez de Elche. The IDiBE is located in the University Campus in Elche, occupying a 4,000 sq. m. of laboratory in the Torregaitán Building. The Institute emerged in 2018 from a transformation of the Institute of Molecular and Cell Biology (IBMC), as a strategy to focus our research in Healthcare Biotechnology. IDiBE aims to become a market-oriented Research Institute that excels in translational science. In the past 19 years, the IBMC (now IDiBE) has excelled in both its scientific production, and in the exploitation of the generated results and technologies. This translational excellence has thrust the creation of spin-off companies and Joint ventures with private enterprises and local Hospitals. This seminal vision has been kept invariable and can be fully appreciated in the Annual Report 2018 that describes all our achievements in research, exploitation, training and dissemination activities. All these accomplishments are in line with the objectives set in our Plan of Action 2013-2018.

As in previous years, our groups have been active in securing funding from both governmental and private sources, publishing papers (70% in Q1) that are widely cited, training young scientists with the highest scientific standards as recognized by recent audit of our Doctorate program by the AVAP, and to disseminate our activities and achievements to society through our out-reach programs (science with tapas; And you, what do you research on? In addition, we consolidated the Master Degree in Biotechnology and Bioengineering with the Institute of Bioengineering that is becoming a national reference in the field. A major success of the Institute has been the commercialization of innovative products generated from the research projects in the fields of nutraceuticals, cosmeceuticals and biotechnology; and having 4 lead compounds in clinical development. To reinforce our translational activities, four technological platforms have been established. This success has been possible thanks to our philosophy of potentiating communication and collaborations, and sharing all the infrastructures, as well as to the commitment of our administrative and technical personnel to the IDiBE project.

A major milestone for 2018 has been the incorporation of new research teams to the Institute, thus reinforcing our human resources, and incorporating additional skill and competences to the existing ones. This is going to potentiate the multidisciplinary and allow us to increase our national and international competitiveness, which is essential to secure a more ambitious research program.

Although we have achieved many milestones, there is still plenty to attain for increasing the IDiBE international exposure and scientific translational excellence. In this regard, our next Plan of Action (2019-2022) approved on December 21st 2018 by the General Council, strengthens the original vision, and establishes the central mission to consolidate a multidisciplinary research program in the area of Healthcare Biotechnology.

Prof. Antonio Ferrer-Montiel
IDiBE Director
STRUCTURE AND GENERAL DESCRIPTION

The IDiBE has established a unique research and training program, which exploits multidisciplinarity, making the most of the complementarities of the groups and using synergies as a strategy for attaining excellence and increasing competitiveness and productivity. To accomplish this aim, in the last two years, research has been organized into two complementary areas of research, namely, (i) molecular and cell design and (ii) molecular diagnosis and therapy. These research lines, in turn, are organized into sub-areas, which rationally combine the groups’ abilities and skills in the supplementary fields that contribute to the development of bioactive molecules, reducing scientific dispersion by grouping activities in order to carry out unique and ambitious research projects. Consequently, in the next five-year period, the IDiBE aspires to become a center of reference in the discovery of pharmacological and biotechnological tools, with a clear translational and transfer potential. The intense and sustain work in this line is the central objective for the next five-year period, and to so agreements with PROs will be pursued which will permit reinforcing deficient areas or those that require an impetus for their consolidation, and thereby generating a unique and unprecedented project on a national and international level.

In scientific terms, the targets of these research areas of the IDiBE are developed as follows:

A. Molecular and Cellular Design

Research within the line of Molecular and Cellular Design aims at advancing knowledge of relationships between structure and function in proteins, in order to be able to modify them rationally and specifically. The underlying goal is the transformation of the activity of these proteins with bio and chemo-technological purposes, or the use of the information to design targeted ligands to modulate the receptor activity acting as sensors.

The different scientific backgrounds of the researchers who develop this research line allows a reasonably and pluridisciplinary (though improved) approach to analyze problems, offering an opportunity for the development of common interests and benefiting from synergies that naturally appear in this context. This multidisciplinary approach of issues enables a broad focusing on scientific topics, ranging from a perspective of basic science to investigations with clear translational vocation.

Both the composition of the different research groups that make up this line of research as its multidisciplinarity and flexibility to raise specific scientific goals fosters a high competitiveness, both in the uptake of competitive sources and scientific production, in
the training of research personnel and in the technological transfer of research results. In this sense, strong links with research groups both national and international have been notably established, which have materialized, for example, in leadership or participation in projects coordinated with other institutions both within the different National Plans of Research and funded by the European Union and recently granted.

Molecular and Cellular Design line is organized into two sub-lines, each comprising several research groups with common research interests. The first is centered around Molecular Recognition and Protein Biophysics and Engineering, while the second focuses his research on Structure-Function Relationships in Membrane Proteins.

B. Diagnosis and Molecular Therapy.

The Diagnosis and Molecular Therapy line seeks the identification and validation of molecular markers in human and animal pathologies of high prevalence, as well as the development of diagnostic methods and therapeutic or preventive strategies. This line consists of a multidisciplinary team of researchers covering from molecular aspects to the semi-industrial production of biological actives.

Milestones achieved in this line of research have had and have a high scientific impact, as shown by scientific publications in magazines of recognized international prestige, as well as the generation of unique technologies that are protected by patents extended worldwide and have been licensed to interested companies. Also, it should be noted as a strong point of this line the high level of national and international collaborations with public bodies and private research, contributing to increase the impact of activities and its internationalization. In addition, the interrelationship of the sub-lines that make up this line of research has fostered identifying synergies and common interests between groups that have driven collaborations that accelerate the achievement of results and technologies.

Clearly, the activities of this line have a high potential for clinical translation materialized in close collaboration with the General Hospital and the University of Elche, as well as biotechnology transfer and exploitation resulting in continuous and consolidated collaborations with biotech, food, cosmetics and pharmaceutical companies.
MOLECULAR AND CELLULAR DESIGN LINE.
MOLECULAR AND CELLULAR DESIGN.

Molecular Recognition and Protein Biophysics and Engineering.

Group name: **PROTEIN STRUCTURE AND THERMODYNAMICS OF MOLECULAR RECOGNITION.**

Our group is involved in the study, by using calorimetric and spectroscopic techniques, of macromolecular interactions. To that end, the group has the expertise in DSC, ITC, fluorescence and circular dichroism. Furthermore, the group has the knowledge to solve structures by using state-of-the-art techniques. Some, but note exclusively, of the biomolecules currently under study in the group are: (i) those involved in the phosphorylation transfer in microorganisms; and (ii) those implicated in the assembly of the capsid of HIV.

**Staff.**

Javier Gómez Pérez  
José Luis Neira Faleiro  
Rocío Esquembre Tomé

**Ph. D Students.**

Felipe Hornos Adán

**Technicians.**

Elisa Pérez García

**Publications.**


**Patents.**


**Governmental Projects and Funding.**


**Scientific and Educational Committees.**

CONYCET, Argentina (2008-...). José L Neira.
Our group is interested in the development of new fluorescent materials with applications in biological systems. On one hand, we design and develop fluorescent biosensors with high sensitivity, based on the entrapment of organic molecules and biomolecules in inorganic matrices, and characterize these hybrid materials at a molecular level in order to improve their applications. On the other hand, we work on the design, synthesis and characterization of novel fluorescent conjugated polyfluorenes, to be used as nanoparticles and nanofibers in applications such as bioimaging, drug delivery, clinical diagnosis and sensing devices for biomolecules. Other group activities include the characterization of macromolecular interactions, especially in non-conventional systems, such as ionic liquids as well as the synthesis of conjugated polymers to be applied in photonics and optoelectronics devices.

**Group name:** **FLUORESCENT NANOMATERIALS APPLIED TO BIOLOGICAL SYSTEMS.**

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<tr>
<th><strong>Staff.</strong></th>
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<td>Carmen Reyes Mateo Martínez</td>
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<td>Ricardo Mallavia Marin</td>
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<td>Mª José Martínez Tomé</td>
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<th><strong>Postdoctoral Researchers.</strong></th>
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<td>Juan Alberto Falcó Graciá</td>
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<th><strong>Ph. D Students.</strong></th>
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<tr>
<td>Marta Rubio Camacho</td>
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<td>Yolanda Inmaculada Alacid Martínez</td>
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**Technicians.**

Elisa Pérez García

**Publications.**


**Patents.**


**Invited Talks and Courses.**
Science dissemination: outreach activities.

Jornadas de divulgación científica “Ciencia con tapas”.
- Anorexia y bulimia: El papel de los medios de comunicación, 16-10-2018.
- Adicciones: Una perspectiva neurobiológica, psicológica y social, 12-12-2018.
- Resistencia a los antibióticos: ¿Le ganaremos la partida a las superbacterias?, 04-05-2018.

MÓDULO “CIENCIA, SALUD Y TECNOLOGÍA” DESARROLLADO EN LA III FERIA DE LA CIENCIA Y LA TECNOLOGÍA DE ELCHE (FeCiElx).

Mª José Martínez Tomé. Comité organizador.

Number of Congress Communications.

Poster presentations: 6.
International contributions: 1.
Poster presentations: 1.

Governmental Projects and Funding.


Private funding. Technical Services and Assistance.


Scientific and Educational Committees.

Polymers. C. R. Mateo.

Editorial Boards.

Board member Nanomaterials, special issue in MDPI (Oct. 2018-...). R. Mallavia (Editor invitado).

Group name: PROTEIN ARCHITECTURE.

This newly created group is led by Ph.D. Ana María Fernández Escamilla who has joined IDIIBE recently. The group’s expertise lies in the field of protein engineering by combining theoretical (computational) and experimental approaches, for biochemical, biophysics and structural characterization of macromolecules aimed at engineering of polypeptides and peptides with new or desirable functions and properties for technological applications in
biomedicine, bioengineering and in the most recent areas of nanoscience.

Proteins are dynamic nanomolecular machines ubiquitous in all living systems that adopt distinct three-dimensional (3D) structures to perform multitude of biological functions. Advance in modern molecular biology and biotechnology have improved our understanding of basic functional and architectural principles of proteins, making them attractive candidates as concept generators for technological development in biomedicine, bioengineering and in the most recent areas of nanoscience. Applying “rational design”, protein engineering is the most powerful approach to obtain proteins with new or desirable functions and properties. In biomolecular engineering is of particular interest, the protein biochemical and biophysical characterization by thermodynamic, kinetic, spectroscopic and structural methods allowing us to better understanding the rules that govern the processes of interest, and the degree of involvement of proteins in these processes.

The efforts of the group are leading to get insights into the relationship between protein structure and function (or dysfunction), as well as to the creation of novel biomolecules with desirable properties to study. We approach this from a variety of angles and employ state-of-the-art in silico (protein rational design, protein modeling and molecular docking for identification of novel active compounds) and in vitro molecular methods for biophysical, biochemical and structural characterization of diverse recombinant proteins by using spectroscopic techniques (Circular Dichroism, Fluorescence, Dynamic Light Scattering) and thermodynamic techniques (DSC and ITC Calorimetry).

Our studies are focused on three main lines of research:
- Protein structure regularization and effect on function.
- Protein stability, folding and oligomerization with the final aim of understanding the molecular basis of the aggregation contribution to allergenic properties of food allergens.
- Zika and dengue viruses. New direct-acting antivirals through computational and experimental tools.

Our Molecular Recognition and Protein Biophysics and Engineering division possess a protein-protein interaction facility equipped, among others, with a recently acquired TA DSC (Differential scanning nanocalorimeter), VP ITC (Isothermal Titration Calorimeter), two Circular Dichroism Spectrophotometers (J-810 and J815) and also a recently acquired Malvern nano-ZS DLS (Dynamic Light Scattering).

**Staff.**

Ana María Fernández Escamilla

**Number of Congress Communications.**

National contributions: 2.
Oral presentations: 1.
Poster presentations: 1.

**Scientific and Educational Committees.**


**Structure-Function Relationships in Membrane Proteins.**

**Group name:** STRUCTURE-FUNCTION RELATIONSHIP OF ION CHANNELS.

Structure/Function relationships in membrane proteins: Neuroreceptors and ion channels. Lipid-Protein and Protein-protein interactions in biological membranes. Modulation of ion channels. Potential applications to drug discovery.
**Staff.**
José Manuel González-Ros
José Antonio Poveda Larrosa

**Postdoctoral Researchers.**
Mª Lourdes Renart Pérez
Ana Marcela Giudici Besseghini

**Ph. D Students.**
Clara Díaz García

**Technicians.**
Eva Martínez

**Publications.**

**Number of Congress Communications.**
National contributions: 2.
Oral presentations: 1.
Poster presentations: 1.
International contributions: 3.
Oral presentations: 2
Poster presentations: 1.

**Governmental Projects and Funding.**


**Scientific and Educational Committies.**
Archives of Biochemistry and Biophysics. J. A. Poveda.
International Journal of Molecular Sciences J. A. Poveda.
Protein Expression and Purification. J. A. Poveda.
Biopolymers. J. A. Poveda.
AIMS Biophysics J. A. Poveda.
FWF Austrian Science Fund. J. M. González-Ros.
Agència de Gestió d’Ajuts Universitaris i de Recerca. J. M. González-Ros.
MINECO. J. M. González-Ros.
Oncotarget. J. M. González-Ros.
MOLECULAR DIAGNOSIS AND THERAPY LINE.
MOLECULAR DIAGNOSIS AND THERAPY.

Bioactive Molecules.

Group name: NATURAL BIOACTIVE COMPOUNDS.

The relationship between the biological activity of natural dietary compounds and its effects on chronic human diseases is under intense debate. The research target of our group is to characterize the wide biological activity of natural bioactive compounds using cellular and animal models and to understand the mechanism underlying their health effects. The characterization and identification of natural compounds in complex matrices, especially polyphenols, is also our target. Our group is focused on:

The capacity of polyphenols to ameliorate metabolic disturbances associated to obesity (oxidative stress and insulin resistance) in cellular models and hyperlipidemic mice.

Bioguided screening of antimicrobial herbal extracts and compounds for applications in cosmetics, hygiene or medical devices. Searching for natural compounds for democosmetic applications.

The antiproliferative and apoptotic effects of polyphenols in cancer cellular models using global OMICs. Nano-encapsulation of potential anticarcinogenic compounds.

Characterization of food and herbal materials by chromatography coupled to mass spectrometry. Semi-industrial scale production of herbal extracts deriving from plants or vegetal by-products.

Optimization of juice extraction processes and integral exploitation of by-products.

Staff.

Vicente Micol Molina, IP
José Antonio Encinar Hidalgo
Enrique Barrajón Catalán
María Herranz López

Postdoctoral Researchers.

Almudena Pérez Sánchez
Verónica Ruiz Torres

Ph. D Students.

María Losada Echeberría
María Dolores Olivares Vicente
Luz María Aguilló Chazara
Javier Álvarez Martínez
Noelia Sánchez Marzo

Technicians.

Mª Teresa Garzón Cabrero

Publications.


Creation of Spin-Off Firms.


Organization of Meetings.

Barajón-Catalán, E. Member of the scientific committee of 21st International Drying Symposium, Valencia (2018).

Invited talks and courses.


Number of Congress Communications.

National congress: 1.
International congress: 12.

**Governmental Projects and Funding.**


**Private funding: Contracts.**


**Private funding: Technical Services and Assistance.**


14 provisions of services with different companies in 2018.

**R&D and Educational Committees.**

Enrique Barrajón Catalán. Vocal científico en Órgano Evaluador de Proyectos (órgano habilitado) de la Universidad Miguel Hernández de Elche.

Vicente Micol. Evaluador de la Agencia Nacional de Evaluación y Prospectiva (ANEP).

**R&D Management.**


**Editorial Boards.**


**Group name:** **INDUSTRIAL DEVELOPMENTS FOR HEALTH INGREDIENTS.**

In order to cover the basic activities in the field of biotechnology, it is possible to define a biotechnology product as a good or service, the development of which requires the use of one or more biotechnology techniques. On the other hand, into the specific area of “industrial biotechnology” it is convenient to
highlight that scientific and technological complexity are also inherent to biotechnology and consequently, it should be understood that interfaces and overlaps among other techniques.

The main lines in that area are:

a. Optimization of industrial processes for:
   • functional beverages production and
   • waste management for nutraceutical ingredients with a bio economy perspective (Profs. Domingo Saura López and Nuria Martí Bruña).

b. Semi-industrial scale production of nutraceuticals from plants, herbs or by-products.

c. Identification & Purification of bioactive molecules from waste management, and small-scale production herein for agricultural biological pest control.

d. Identification, isolation, culture development and pilot plant scale production of microorganism for agriculture and feedstock.

e. Development of new nutritional products from fermentation processes.


g. Formulation, development and pilot plant scale production of cosmetic and food functional products.

The IDiBE Pilot Extraction Biotech Platform’s is created for research, development and technology transfer to companies focused in Food, Pharmacy and Biotech business. The PEB plant is able to offer knowledge of high technological value and to give support to the industries in the life, health and agro food science areas. The know-how is directly transformed into a pipeline of products, processes, services and technological strategies that provide to the industries competitive and highly specialized products.

The PEB plant has complementary services for the companies, customer and the general market, such as; formulation of new food, beverage and nutraceutical ingredient development, technological analysis of bioactive compounds, technical consultancy and specialised training for employers.

The mission of PEB is generating technological strategies and solutions with high industrial value according with Bioeconomy Strategy of EU 2018. The objective is modernisation and strengthening of the industrial biotech base through the creation of new value chains and more cost-effective industrial processes.

The main activities of PEB platform in collaboration with consolidated companies in this business model are:

h. Quality control or development of new biotech products and process

i. Design, optimisation and industrial scale up of biotechnology process

j. Extraction, Purification and characterization of bioactive compounds produced through green technologies

Staff.
Nuria Martí Bruña
Domingo Saura López
Manuel Valero Roche

Ph. D Students.
Sara Gea Botella

External collaborators integrated in the group.
Concepción Martínez Madrid (UMH)

Publications.

Patents.
Inventores: Martí, N., Barrajón-Catalán, E., Berenguer-Martínez, M.D.R., Martínez, R.,


**Governmental Projects and Funding.**

Símbiosis Industrial en el aprovechamiento integral del caqui (Diospyros kaki); ejemplo de bioeconomía. Proyectos competitivos de subvención pública. MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD Subvención concedida: 64.553,50 €. Duración: 01/01/2018 – 31/12/2020. IPs: Domingo Saura y Manuel Valero.


**Private funding: Contracts.**


**Private funding: Technical Services and Assistance.**

Domingo Saura, Nuria Martí y Manuel Valero. Technical Assistance to Cool Vega Company S.L.

Chronic inflammation & pain.
**Group name: DRUG DESIGN ON THERMO TRPs AND PAIN SIGNALING.**

Our group is interested in understanding the cellular and molecular basis underlying pain transduction in the peripheral nervous system, and to use this knowledge to design and validate novel therapeutic strategies for pain control. Our research is hypothesis-based and combines cellular and molecular approaches, using from animal models to purified proteins. Identification of the signalplexes involved in sensory and pain transduction allows us to identify new druggable targets that enter our drug discovery program for hit identification.

To refine lead development, we are also interested in unveiling the protein structure of the selected targets, mostly thermoreceptor channels (thermoTRPs). This information is essential for accelerating the identification and development of lead compounds. Complementarily, we also characterize the biophysics of channel activity to further understand how ion channels work in terms of their underlying protein structure and the antagonists modulate their activity.

**Staff.**

Antonio Ferrer-Montiel.
Gregorio Fernández-Ballester
Asia Fernández Carvajal

**Postdoctoral Researchers.**

Maite Artero Morales
Sara González Rodríguez

**Ph. D Students.**

Magdalena Nikolaeva Koleva
Smona Giorgi
David Alarcón Alarcón
Alicia Medina Peris
Gloria Briceño Vega
Eva Villalba Riquelme
Mariana Dionissi

**Collaborators integrated in the group.**

Laura Butró Garcia

**Technicians.**

Irene Mudarra Fraguas
Antonio Manuel Zafra Pinto

**Publications.**


Balsera B, Mulet J, Sala S, Sala F, de la Torre-Martínez R, González-Rodríguez S, Plata A, Naesens L, Fernández-Carvajal


Creation of Spin-Off Firms.
Antonio Ferrer. Administrador de PROSPERA BIOTECH y FASTBASE SOLUTIONS.


Inventores: Antonio Ferrer Montiel, van den Nest, Wim, DOMENECH, Nuria Alminana, Consuelo Garcia. Título: Compounds useful for the treatment and/or care of the skin, hair, nails and/or mucous membranes. Titular: LUBRIZOL ADVANCED MATERIALS, INC. Registros: WO2018071640.

Inventores: Antonio Ferrer Montiel. Título: Compounds useful for the treatment and/or care of the skin, hair, nails and/or mucous membranes. Ampliación: US2018369115.


PhD Theses.


Invited Talks and Courses.


Science Dissemination: Outreach Activities.

Ciencia con Tapas. Monthly outreach activity of IDiBE.


Jornadas de Puertas Abiertas del IBMC. 13 julio 2018.


Number of Congress Communications.

National contributions: 2.
Poster presentations: 2.
International contributions: 8.
Oral presentations: 4.
Poster presentations: 4.
**Governmental Projects and Funding.**


**Private funding: Contracts.**


Contrato de licencia para explotación de la patente "Nuevas dianas terapéuticas y su uso para el tratamiento del dolor". AntalGenics, SL 2018. IP: Antonio Ferrer Montiel. Instituto De Biología Molecular Y Celular. UMH.

Contrato de licencia de patente "Compuestos antagonistas del receptor TRPM8 y sus aplicaciones". AntalGenics, SL.

**Private funding: Technical Services and Assistance.**

Antonio Ferrer Montiel. Technical Assistance to AntalGenics SL.

**R&D and Educational Committees.**


Asia Fernández Carvajal. Evaluación convocatoria de proyectos sinérgicos de la Comunidad de Madrid. BBRR Sinérgicos.


**R&D Management.**


**Scientific Society Councils.**


**Editorial Boards.**


**Antiviral Strategies.**

**Group name:** ANTIVIRAL STRATEGIES.
The group of Virology at the IBMC was established fourteen years ago. The group members have proven expertise over 20 years in the field of viral diseases of fish in aquaculture. The group's interest is focused on the study of viruses, fish immune response related to virus infections and antiviral strategies for disease prevention and treatment:

- Study of the early steps of rhabdovirus infections.
- Design of new antivirals using combinatorial chemistry or molecules related to the innate immune response such as AMPs (antimicrobial peptides).
- Development of environmentally friendly DNA vaccines. Characterization of the immune response induced by DNA vaccines using genomic and proteomic approaches (microarrays) to determine the molecular bases of protection conferred by these vaccines.

**Staff.**
Luis Pérez García-Estañ

**Postdoctoral Researchers.**
Regla María Medina Gali

**Ph. D Students.**
Melissa Belló Pérez

**Technicians.**
Ángeles Gómez Martínez

**Publications.**


**Science dissemination: outreach activities.**


**Group name: VIRAL MEMBRANE PROTEINS.**

Among the pathogens which cause the higher rates of mortality and morbidity on humans and animals we can name the viruses. However, in the vast majority of cases, there are no vaccines or effective therapeutic treatments. Flaviviridae constitute a large family of viruses to which medically highly relevant human pathogens belong. Viruses such as the hepatitis C virus, the Yellow Fever Virus, West Nile virus, Tick-Borne Encephalitis Viruses, Zika and Dengue belong to this family. Dengue (DENV), as well as Zika (ZIKV), cause the most prevalent arthropod-borne viral disease among humans affecting millions of people per year. These diseases have evolved from a sporadic occurrence to a global public health problem. The number of reported cases is increasing geometrically due to environmental and geographical changes and many countries, including ours, have a direct risk to them. Significantly, all processes inherent to the
viral replication cycle are directly or indirectly related to membrane systems or membranes derived from them. Anything that might interfere with any one of these processes would be potentially useful in ensuring that the virus cannot get in or out of the cell. Our group aims to study the structure and interaction with different types of model biomembrane systems of several peptide domains derived from the structural and non-structural proteins of DENV and ZIKV viruses. Our goal will be to distinguish and correlate the effects on both the peptides and the membrane components, with the specific aims of obtaining, on the one hand, the knowledge of the molecular mechanism of the biological function of the original proteins and on the other, effective antiviral and bioactive molecules against them. Relaying on the knowledge we have about the structural and non-structural proteins of DENV, our experimental approach and objectives will consist of using in silico molecular dynamics to find the specific interacting three dimensional structure of selected peptides of DENV and ZIKV with biomembrane model systems, in vitro obtain exhaustive information about its structure and specific lipid interaction, in silico screening and peptide docking methodologies to obtain antiviral peptides and bioactive molecules against those obtained structure, and test them to check their effectivity using different model biomembrane compositions. These data will permit us the development of new leading compounds useful for improved combined therapies in order to achieve the ultimate goal, eradicate the DENV and ZIKV viral infections.

**Staff.**

José Villalaín Boullón

**Ph. D Students.**

Laureano Emilio Carpio Mulas

**Publications.**


**Scientific and Educational Comitties.**

CONICET, Argentina (2005-…). J. Villalain.

Israeli Science Foundation, Israel (2012-…). J. Villalain.

**Group name:** RED BLOOD CELLS IN ANTIVIRAL IMMUNOLOGY.

Fish are the phylogenetically oldest vertebrate group with an immune system with clear similarities to the immune system of mammals. However, it is an actual matter of fact that the current knowledge of the fish immune system seems to lack the key piece to complete the puzzle.

In 1953 Nelson described a new role of human red blood cells (RBCs) which would go beyond the simple transport of O2 to the tissues. This new role, involved in the defence against microbes, described the antibody and complement-dependent binding of microbial immune complexes to RBCs. Regardless of the importance of this finding in the field of microbial infection, this phenomenon has been poorly evaluated. Just recently, a set of biological processes relevant to immunity have been described in the RBCs of a diverse group of organisms, which include: pathogen recognition, pathogen binding and clearance and cytokines production.

Furthermore, it has been demonstrated that nucleated erythrocytes from fish and avian species develop specific responses to different pathogen associated molecular patterns and produce soluble factors that modulate leukocyte activity.

In the light of these pieces of evidences, and in an attempt to improve the knowledge of the immune mechanism(s) responsible for fish protection against viral infections, we raised the question: could
nucleated fish erythrocytes be the key mediators of the antiviral responses? To answer this question, we decided to focus our work on the evaluation of the crosstalk between red and white blood cells in the scenario of fish viral infections and prophylaxis. For that we chose a working model composed of the rainbow trout, the viral haemorrhagic septicemia virus (VHSV) and the glycoprotein G of VHSV (GVHSV), the antigen encoded by this DNA vaccine.

**Staff.**

María del Mar Ortega-Villaizán Romo

**Postdoctoral Researchers.**

Verónica Chico Gras

**Ph. D students.**

Iván Nombela Díaz

Sara Puente Marín

**Technicians.**

Efren Lucas Mañogil

Remedios Torres Montero

**Publications.**


**Governmental Projects and Funding.**


**Editorial Boards.**


**Molecular and Cellular Oncology.**

**Group name:** MOLECULAR AND CELLULAR ONCOLOGY.

The main objectives of our research group are, first, the study of the molecular mechanisms associated to chemo and radio resistance in cancer, and second, the search of new therapeutical strategies for the treatment of chemo
and radioresistant tumours. We propose different experimental approaches to raise these objectives:

1. Development of cellular models closer to the patient, allowing ex vivo tests of the treatments.
2. Development of the several models in order to determine the presence of tumour stem cells in primary cultures.
3. Use of novel therapies such as epigenetic and enzymatic therapies, in cellular models from glioblastoma and pancreatic carcinoma.
4. Study of signal transduction pathways involved in resistance acquisition in glioblastoma and pancreatic carcinoma. This experimental approach allows the identification of genes involved in this process that can be considered as putative therapeutical targets.

During the last years, nanotechnology development has gained an important boom as a putative therapeutical approach for the treatment of several tumours. The use of immunodirected nanoparticles, will allow:

- To increase of the local doses and to decrease of the secondary effects.
- To direct the treatments to cellular subpopulations of interest on the tumour, such as tumour stem cells or stroma cells.
- To combine and direct different and novel therapeutical strategies against the tumours of interest, such as epigenetic and enzymatic therapies.
- To explore the possibilities of these nanoparticles to potentiate the immunogenic effects observed with classical chemotherapeutical treatments as well as with radiotherapeutical treatments.

**Staff.**
Miguel Saceda Sánchez
Mª Pilar García Morales

**Ph. D Students.**
María Fuentes Baile (predoctoral-ISABIAL)
María Paz Ventero Martin (predoctoral-ISABIAL)
Elizabeth Perez Valenciano

**Genetic board from the General University Hospital of Elche.**
Victor Manuel Barbera Juan

**Publications.**

**Number of Congress Communications.**
International contributions: 4.
Poster presentations: 4.

**Diabetes & metabolic disorders.**

**Group name: DIABETES RESEARCH UNIT.**

Diabetes mellitus is characterized by hyperglycaemia caused by an insulin deficiency. Its prevalence is rising, reaching 425 million people worldwide (www.idf.org). In Spain a 13.8% of adult population is diabetic and 3 of 10 people have problems with glucose metabolism (Soriguer et al, Diabetologia 2012). There are two main types of diabetes mellitus. Type 1 diabetes is caused by an autoimmune attack against β-cells, which is the cell type responsible for producing and releasing insulin, the only hormone in our organism able to decrease glucose. When the β-cell is destroyed, no more insulin is produced...
and, therefore, the patient depends on insulin injection. Between a 10 and 15% of diabetic persons are diagnosed as Type 1. About 80-85% of diabetics are diagnosed as Type 2, which occurs when peripheral tissues experience a decrease in insulin sensitivity or insulin resistance together with an incapacity of the β-cell to produce and secrete enough insulin to counteract such resistance. Then, hyperglycemia progresses because insulin secretion and β-cell mass are below a critical threshold.

The etiology of both diabetes types is different, but both forms are the result of genetic background and environmental factors interaction. Our research unit works to understand how different environmental factors such as high fat diet, aging and endocrine disrupting chemicals work to increase diabetes susceptibility.

We work on four different research lines:

1. The role that endocrine disrupting chemicals (EDCs) in the etiology of Diabetes. We study how exposure to EDCs at different times during life, from pregnancy to adulthood, affects insulin sensitivity as well as the function of the endocrine pancreas. We address this problem by investigating in mice how these chemicals change the expression of genes related to β-cell function, death and division, during fetal development as well as during adulthood. We combine in vivo research with ex vivo and in vitro approaches to molecularly understand how EDCs alter β-cell function, division and death.

This should give light to the hormone receptors involved as well as the molecular pathways used and endpoints affected by EDCs exposure, which will help to establish harmonizing testing protocols to identify EDCs with diabetogenic effects.

The results of this research line in the last two decades have been seminal to establish the link between EDC exposure and diabetes mellitus.

2. The physiological role of estrogen receptors ERα, ERβ and GPER1 in the islet of Langerhans. Using molecular biology and electrophysiology, we study how estrogens influence the plasticity of the endocrine pancreas during the adaptation to pregnancy and obesity. This will help us to better understand sex differences in glucose regulation and the development of new chemicals that should help to establish gender-based therapeutic for diabetes.

3. The effect of aging on pancreatic islet function and glucose homeostasis. The prevalence of diabetes and other alterations in glucose homeostasis increases with age. It is believed that this situation is mainly due to a loss of peripheral insulin sensitivity. This condition gives rise to functional and morphological adaptations to couple the plasma levels of insulin and glucagon to the new requirements imposed by insulin resistance. If these adaptations do not occur properly, glucose homeostasis is altered and this situation can progress to diabetes. In this line of research, we want to know what functional and morphological adaptations take place in the islet cells during aging and what molecular mechanisms underlie these adaptations. Likewise, we want to know the impact of these alterations on glucose homeostasis. We also aim to find possible therapeutic targets to favor these pancreatic adaptations or to prevent and treat possible harmful alterations during aging.

4. Discovery of new targets for the treatment of type 1 and type 2 diabetes based on pancreatic alpha-cell strategies to survive proinflammatory and metabolic stresses. Using a combination of bioinformatics and molecular biology approaches, our aim is to identify genes and signalling pathways that allow pancreatic alpha-cells to survive under different stresses related to the onset and progression of T1D (e.g. proinflammatory cytokines) and T2D (e.g. palmitate). The results of this project will provide a better understanding of the mechanisms underlying the survival of endocrine pancreatic cells upon proinflammatory and metabolic stresses. This may open the door to the development of new therapeutic strategies aimed to preventing the loss of beta cell mass
observed in the early stages of these diseases.

Staff.
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Iván Quesada Moll
Esther Fuentes Marhuenda
Cristina Ripoll Orts
Paloma Alonso-Magdalena

Postdoctoral Researchers.
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Eva Tudurí López
Hilda Ferrero Hidalgo
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Ph. D Students.
Cristina Quesada Candela
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Talía Boronat Belda
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External collaborators (Universidad de Alicante)
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Sergi Soriano Úbeda

Technicians.
Mª Luisa Navarro García
Salomé Ramón Penalva

Publications.


Alonso-Magdalena P, Tudurí E, Marroqui L, Quesada I, Sargis R, Nadal A. Toxic


**Organization of meetings.**

Symposium: Jornadas Prometeo-Generalitat Valenciana 2018 of the Diabetes Research Unit-UMH.


**Invited Talks and Courses.**

Discussion Leader EED Toxicology and Modes of Action: Mechanisms of Inheritance and Novel Paradigms. Ángel Nadal. 11th GORDON RESEARCH CONFERENCE. ENVIRONMENTAL ENDOCRINE DISRUPTORS, Les Diablerets, Suiza 03/06/2018.


Exposure to endocrine disrupting chemicals during pregnancy and risk of obesity in the offspring. Ángel Nadal. FESBE 2018 XXXIII REUNIAO ANNUAL, Campos do Jordao, Brasil 03/09/2018.


**Awards.**

Paloma Alonso Magdalena. Premio José Antonio Hedo de investigación básica junior-Sociedad Española de Diabetes.

**Govermental Projects and Funding.**


**R&D and Educational Committees.**

Ángel Nadal. Member of the Direction Committee of CIBERDEM.

Ángel Nadal. Scientific Advisory Board-Food Packaging Forum Foundation, Zürich, Suiza.

**R&D Management.**


Iván Quesada. Reviewer of Agencia Estatal de Investigación-MINECO.


**Clinical pharmacology.**

**Group name: IMMUNOPHARMACOLOGY.**

We develop translational research on immunopharmacology. Our research projects are mostly devoted to study the mechanism of action and the
pharmacokinetic-pharmacodynamic relationship of drugs widely used in clinical practice in inflammatory diseases and cancer, especially in digestive diseases. In 2018, our studies were centered basically in:

1. Immunoregulatory effects of beta-blockers drugs in patients with cirrhosis in risk of development of hepatocellular carcinoma.

2. Role of inflamasome in the development of hepatocellular carcinoma.

3. Mechanism of action of antibiotics used to reduce bacterial translocation in patients with cirrhosis.

4. Pharmacokinetic-pharmacodynamic relationship of biological drugs used in inflammatory bowel diseases

**Staff.**

Pedro Zapater Hernández  
**Postdoctoral Researchers.**  
José Manuel González-Navajas  
**Ph. D Students.**  
Susana Almenara de Riquer  
Beatriz Lozano Ruiz  

**Publications.**


Technical Services and Assistance.


Asesoramiento y asistencia técnica sobre el ensayo clínico titulado “Multicenter, Open-Label, Single Arm, Phase II Exploratory Study to Evaluate the Effect of a One-Year Consolidation Treatment with Ponatinib 15 mg on Treatment Free-Remission Rate in Patients with Philadelphia-Positive Chronic Myeloid Leukemia, who had previously Achieved a Deep Molecular Response with Imatinib”. Contrato para actividades de asesoramiento y asistencia técnica entre la Universidad Miguel Hemández de Elche y la Fundación Teófilo Hernando. 2018-2019. IP: Pedro Zapater.

Number of Congress Communications.

National contributions: 2
Oral presentations: 1.
Poster presentations: 1.
Oral presentations: 3,
Poster presentations: 3.

Group name: RECEPTORS AND MECHANISMS INVOLVED IN ANALGESIA.

Our group is formed by professors of the University Miguel Hemández and physicians of the Department of Anaesthesia, Resuscitation and Pain Relief Therapy of the General University Hospital of Alicante. We develop translational and clinical research on pain therapy and anaesthesia. Present lines of research are:
1. Regarding translational research we are interested in the neurobiological basis of the variability in opiate actions in normal and pathological conditions, at molecular level.

2. The analgesic efficacy of radiofrequency for the relief of the Greater Trochanteric Pain Syndrome

3. Ambispective comparative study of post operative cognitive dysfunction after anaesthesia using inhalatory anaesthetics in bariatric surgery

Staff.

Juan José Ballesta Payá

Ph. D Students.

Luis Gómez Salinas

Physicians from the General University Hospital of Alicante.

Yolanda Sastre Peris

Invited Talks and Courses.


Number of Congress Communications.

National contributions: 4.

Poster presentations: 4.
PhD THESIS (2018).
Título: Herramientas para el estudio del dolor.
Autor: Maite Artero Morales.
Fecha de Lectura: 23/11/2018
Dirección: Antonio Ferrer Montiel.
https://www.educacion.gob.es/teseo/mostrarRef.do?ref=1720005#

Título: Citoarquitectura y dinámica del citoesqueleto de F-actina en el proceso de secreción en el modelo neuroendocrino.
Autor: Yolanda Giménez Molina
Fecha de Lectura: 23/11/2018
Dirección: José Heliodoro Villanueva Roig
https://www.educacion.gob.es/teseo/mostrarRef.do?ref=1715796
Título: **Investigación en farmacocinética en preclínica, ensayos clínicos, y rutina clínica.**
Ponente / Institución: Dr. Ricardo Nalda. Universidad Miguel Hernández.
Viernes, 19 enero 2018.

Título: **¿Nosotros podemos hacer experimentos de biomedicina en el sincrotrón Alba?**
Lunes, 12 febrero 2018.

Título: **Nanoparticle-neuron interactions: molecular basis of neuronal activity modulation.**
Ponente / Institución: Carla Distasi. Department of Pharmacological Science, UPO, Italy.
Viernes, 16 de febrero 2018.

Título: **Trends and Opportunities in Food Fermentation.**
Adulteration of Olives and olive oil.
Ponente / Institución: Dra. Farah Hosseinian. Associate Professor, Institute of Biochemistry. Carleton University (Canadá).
Miércoles, 21 de febrero 2018.

Título: **My Journey from Medical Sciences to Business: A Marketing Primer for Biotec.**
Ponente / Institución: Dr. Michel Rod. Associate Dean, Research and International. Sprott School of Business, Carleton University (Canadá).
Miércoles, 21 de febrero 2018.

Título: **Presentación de las líneas de investigación del IBMC.**
Ponente / Institución: Profesores del Instituto de Biología Molecular y Celular.
Viernes, 23 de febrero 2018.

Título: **Molecular mechanism of angiogenesis adaptations to exercise in adipose tissue: basis of physical activity as efficient as anti-obesity therapy?**
Ponente / Institución: Dr. Catherine Riva. Laboratoire de Pharm-ecologie Cardiovasculaire. Université d’Avignon (France).
Martes, 27 de febrero 2018.

Título: **Cardiac ectopic fat depots and myocardial function: translational approach and effect of exercise training**
Ponente / Institución: Dr. Philippe Obert. Laboratoire de Pharm-ecologie Cardiovasculaire. Université d’Avignon (France).
Miércoles, 28 de febrero 2018.
Título: “¿Son las plantas y los productos naturales recursos interesantes para la investigación farmacéutica?"
Viernes, 2 de marzo 2018.

Título: Aproximaciones bioinformáticas en la identificación de marcadores de utilidad clínica en gliomas.
Ponente / Institución: Dr. Víctor Manuel Barberá Juan Dr. Eduardo Lamba Tomel. Unidad de Genética Molecular, Hospital General Universitario de Elche.
Viernes, 13 de abril 2018.

Título: ¿Qué podemos hacer con NANOmateriales en un mundo MACROscópico?
Ponente / Institución: Dra. María Antonia Herrero Chamorro.
Viernes, 18 de mayo 2018.

Título: Respuesta inmunitaria de peces frente a Nodavirus.
Ponente / Institución: Dr. Alberto Cuesta.

Título: Jerusalem artichoke: an ancient plant for future clean sugar.
Ponente / Institución: Dra. Farah Hosseinian. Associate Professor, Institute of Biochemistry. Carleton University (Canadá).
Martes, 29 de mayo 2018.

Título: Respuesta inmune en campo contra Piscirickettsia salmonis: Un desafío del PGSA en Chile.
Ponente / Institución: Luis Alberto Mercado Vianco.
Miércoles, 3 de octubre 2018.

Título: Fármacos metabolo-epigenéticos: Un nuevo paradigma en el abordaje del envejecimiento y el cáncer.
Ponente / Institución: Prof. Javier Menéndez del Instituto de Oncología de Girona.
Miércoles, 5 de diciembre 2018.

Título: Claves en la redacción de patentes para el sector biotecnológico y químico-farmacéutico.