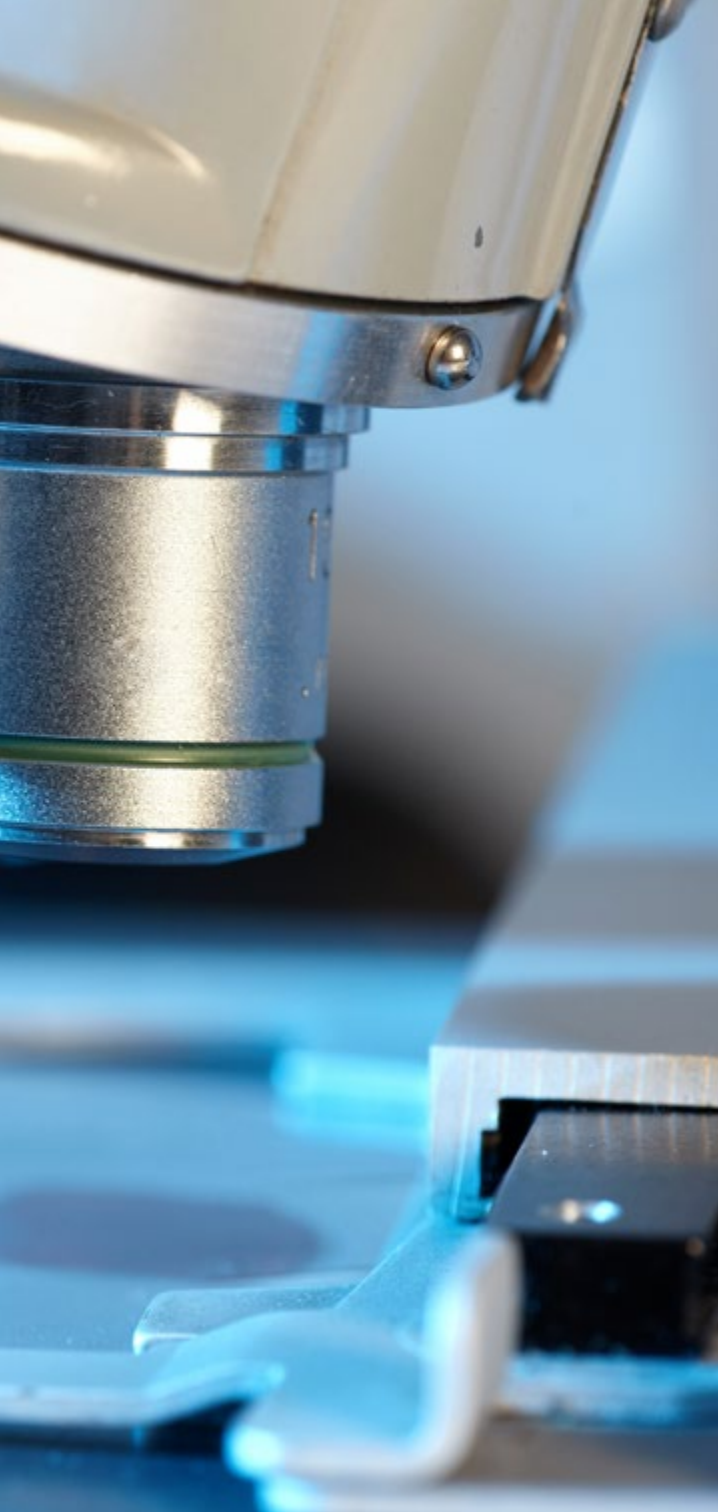


# BIO TECH NO LOGY





Deseño e maquetación: Área de Imaxe  
Vicerreitoría de Comunicación e Relacións Institucionais  
Fotografías: Adobe Stock



## ***Biotechnology***

This area of research includes the use of biological processes, living cells, or products derived from organisms or systems intended to obtain and improve useful products for several applications. It develops from a multidisciplinary approach involving Biology, Medicine, Chemistry, Engineering, Immunology, Physics, Ecology, Agronomy, Biochemistry, Genetics, Virology and others. The wide range of expected applications extends from Medicine, Pharmacy and Food, to sewage treatment or Agriculture, among other uses.

A number of biotechnological processes have been discovered and applied throughout history, for example, the use of microorganisms helping the fermentation process in alcoholic beverages and bread, or those that help in the development and selection of a variety of plants and animals of agricultural or livestock interest.

At present, according to their common characteristics or utilities, there is a classification system of biotechnological uses into five basic groups identified by a distinctive color code.

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## ***Red Biotechnology***

Red Biotechnology refers to that applied in medicine: generation of vaccines and antibiotics, development of new drugs, new methods of diagnosis, regenerative therapies and cure of illnesses by genetic manipulation. Some remarkable examples are: cellular and gene therapy and drugs based on biological molecules like therapeutic monoclonal antibodies.

Research lines at the UVigo:

- Vaccines.
- Development of therapeutic monoclonal antibodies.
- New orthopaedical implants improved with bioactive particles processed by laser.
- New metallic compounds with biological activity.
- Antimicrobial / antitumoral compounds.



## ***White Biotechnology***

White Biotechnology, also called industrial biotechnology, focuses on efficiently improve the design of processes and products in a way that they either consume less energy or are less polluting, reducing the waste during their production. Some examples are the utilization of microorganisms for chemical products in manufacturing, the design and production of new materials for daily use (like textile or biodegradable plastics), or the development of new sustainable sources of energy like biofuel.

Research lines at the UVigo:

- Lipase, amylase and protease production. Production of biodiesel using thermophilic lipases.
- New biotechnological processes for food industry.
- Biosensors.
- Bioactive compounds.
- Biofuel.





## *Gray Biotechnology*

Gray Biotechnology covers the direct applications on the environment. They can be divided in two groups of uses:

- Biodiversity maintenance by genetic analysis of populations or species part of ecosystems, as well as their comparison and cataloguing. It also includes cloning techniques for species preservation and the utilization of genome storage technologies.
- Contaminants disposal or bioremediation using microorganisms and vegetable species to clean polluted places by the isolation and the elimination of different substances like hydrocarbon or heavy metals.

Research lines at the UVigo:

- Vermicomposting of organic wastes.
- Bioconversion of lignocellulosic materials.
- Phylogenomic and phylogenetic analysis.
- Green chemistry for biotechnological processes.

## Green Biotechnology

Green Biotechnology covers the application in agriculture: creation of new vegetable varieties with agricultural and farming interest, production of biopesticides and biofertilizers, *in vitro* crops and plants cloning. It looks for solutions more respectful with the environment than traditional methods of industrial agriculture.

The most famous example is the obtaining of transgenic plants, which has started with an international social controversy. This kind of technology consists in inserting into the selected plant original genes from another variety or another organism with three objectives:

- The development of resilient vegetable varieties, either able to grow in adverse environmental conditions or resistant to illness or plagues.
- The development of varieties with better nutritional properties (rich in vitamins, for example).
- The use of plants as biofactories to produce substances with biosanitary or medical interest which can be easily purified and isolated for their industrial production.

It is expected that Green Biotechnology will produce more environment-friendly solutions than traditional methods of industrial agriculture, as it avoids external applications of pesticides, and it also can be used as an ecological tool to increase or maintain natural resources like forests. Research lines at the UVigo:

- Allelopathy: interaction among plant species. Bioherbicide and plant protection search.
- Agri-food biotechnology.
- Plant biotechnology.



## ***Blue Biotechnology***

Blue Biotechnology, also called marine biotechnology, includes uses related to marine resources. Its development is in an early phase of research however, the expected applications are multiple. Just to mention some of the sectors that will benefit from it: aquaculture, health, cosmetics, agriculture and food. Nowadays the commodities market with marine origin is the most popular, like hydrocolloids and gelling agents applied in food, health or purification. Several molecular markers or particles from marine organism origins and with enzymatic activity are frequently applied in research or diagnostics. Besides, biomaterials and agents with regenerative or pharmacological activity with very interesting potential uses are now coming up.

Research lines at the UVigo:

- Analytical proteomics.
- Aquaculture and fishery genetics.

## ***Other Transversal Research Lines at the UVigo:***

- Bioinformatic tools: genomics and proteomics.
- Biostatistics.
- Computational genomics.
- Bioengineering.
- Bioeconomy.







## ***Index***

### ***Red biotechnology***

- Bioengineering & Chronobiology Lab
- Immunology Research Group
- Organic Chemistry Team
- New Materials
- Next Generation Computer Systems Group

### ***White biotechnology***

- Chemical Engineering Team
- Electroanalysis and Biosensors
- Functional Nanobiomaterials Group
- Group of Bioengineering and Sustainable Processes
- Genomic and Biomedicine Group

### ***Gray biotechnology***

- Applied Physics Team
- Biocost
- Biomass and Sustainable Development
- Synthesis, Spectroscopy and Simulation in Organic Chemistry

### ***Green biotechnology***

- AgroBioTech for Health
- Agro-environmental and Food Research
- Industrial Biotechnology and Environmental Engineering Group
- Industrial Microbiology and Microbial Biotechnology Team
- CITI, Research, Transfer and Innovation Centre

### ***Blue biotechnology***

- Biotechnology and Quality in Agro-food Industries and Environment
- Marine Genetic Resources Laboratory
- Research Group of Coastal Ecology

## ***BIOENGINEERING & CHRONOBIOLOGY LABS (SC4)***

### ***Researchers***

- Ramón Carmelo Hermida Domínguez
- José Ramón Fernández Bernárdez
- Artemio Mojón Ojea
- Ignacio Alonso Alonso
- María J. Fontao Fernández
- Juan José Crespo Sabarís
- María Teresa Ríos Rey

### ***Offer***

Bioengineering:

- Biological signal processing.
- Biomedical engineering.
- Applications for diagnosis and treatment of hypertension.

Chronobiology and chronotherapy:

- Methodology for biological signal analysis.
- Epidemiology and public health (Epidemiology of transmitted diseases, microbiology and bacteriology, breast cancer, uterine cervix cancer, etc.).
- Endocrinology, obstetrics and gynecology, pharmacology.

Signal processing:

- Methodology for time series analysis.
- Methods for prediction, classification and discrimination.
- Quality control, statistical inference, modelling and simulation.

Biomedical instrumentation: blood pressure monitoring, physical activity, neonatal blood pressure.

### ***Keywords***

Parasitology, epidemiology, biomedical engineering, chronobiology, clinical engineering, hypertension, blood pressure, gynecology, environmental impact studies, monitoring, prediction, signals, health, cancer, endocrinology, microbiology, pharmacology, inference, quality control, bacteriology.

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## ***IMMUNOLOGY RESEARCH GROUP (IN1)***

### ***Researchers***

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- Encarnación de Miguel Villegas
- José Manuel Faro Rivas
- Andrés Sanjuan López
- Susana Magadán Mompó
- Rosana Simón Vázquez
- Andrea Fernández Carrera
- Amparo Martínez Pérez
- Lara Diego González
- Javier Freire González
- Immacolata Maietta
- Araceli Piñeiro Abuín

### ***Offer***

Vaccines against infectious and chronic diseases:

- Characterization of polymeric nanocapsules (NCs) that were able to induce protective antibodies levels against a Hepatitis B antigen by intranasal administration.
- Identification of immunological, proteomic and transcriptomic biomarkers of protective immune responses to Tuberculosis from human subjects exposed to *Mycobacterium tuberculosis* (MTB).
- Identification of immunological, proteomic and transcriptomic predictors of TB vaccine efficacy in mice using mucosal and systemic tissues.
- Development of polymeric nanocapsules for intranasal vaccination against TB and characterization of the influence of the nanocapsule's physicochemical properties in the immune response.
- Design of new vaccines for pancreatic cancer. This research line tries to develop new therapies against pancreatic cancer using three different approaches: induction of a specific immune response against the mutated tumour cells, new chemotherapeutic drugs and gene inhibition.

Nanotoxicity:

- Development of protocols for studying the interaction of nanomaterials with biological systems.
- Characterization of the conformational changes induced by metal oxide NPs in some relevant human plasma proteins and implications in the coagulation process.

- Characterization of signalling pathways activated by different metal oxide NPs and the synergistic or antagonistic effect between them.
- Biocompatibility and therapeutic characterization of diverse drugs and nanomaterials for biomedical applications

Comparative immunology:

- Development of deep sequencing protocols of the Adaptive Immune Receptor Repertoire (AIRRseq) to track B/T responding lymphocytes in fish.
- Establishment of consistent nomenclature for Salmonid IGH genes that allows an accurate annotation of AIRRseq data and comparative studies between Salmonid species.

Theoretical immunology:

- Mathematical modelling of the dynamics of the Germinal Center Reaction.
- Conceptual and mathematical modelling of the antibody affinity maturation during the Germinal Center Reaction.
- Conceptual and mathematical studies of the homeostasis of lymphocytic populations.
- Conceptual and computational modelling of thymic selection.
- Analysis of 2-dimensions *vs* 3-dimensions ligand-receptor kinetic constants.

### ***Keywords***

Nanotechnology, vaccines, tuberculosis, bioinformatics, autoimmunity, fibrosis, immunotherapy, monoclonal antibodies, cancer, cell culture, ELISA, Western blot, dot blot, phagocytosis, immunodetection, chromatography, immunohistochemistry, molecular biology, flow cytometry, experimental animals.

### ***Contact***

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## ***ORGANIC CHEMISTRY TEAM - ORCHID (QO1)***

### ***Researchers***

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- Rosana Álvarez Rodríguez
- Luis Muñoz López
- Beatriz Iglesias Antelo
- Marta Domínguez Seoane
- Belén Vaz Araújo
- Jose Antonio Souto Salgado
- Pedro Villar Cruces
- Patricia García Domínguez
- Paula Lorenzo Fernández
- Paula Mora Ayuso
- Oscar Iglesias Menduñía
- Daniel Otero Calleiras
- Víctor Pérez Revenga
- Alberto Pernas Álvarez
- Javier González Ricarte

### ***Offer***

Design and synthesis of innovative medicines:

- Design, based on the structure of the receptors, and synthesis of agonists and antagonists of nuclear receptors for its use on the treatment of cancer and obesity.
- Novel epigenetic drugs inspired in the structure of natural products for the treatment of cancer and snc diseases, such alzheimer and parkinson.
- Diversity-oriented synthesis of natural product libraries with antitumor action.
- Development of new biosensors based on nanoparticles as high-sensitivity tools for molecular recognition with applications in detection and diagnostics.
- Structural determination of natural pigments.
- Synthetic processes in tandem and sequences catalyzed by transition metals.
- Computational analysis of catalytic processes and concerted reactions.

Services:

- Structural determination (Nuclear Magnetic Resonance, NMR; Mass Spectrometry, MS)
- Custom synthesis

### ***Keywords***

Bioactive compounds, NMR, organic synthesis, medicinal chemistry, synthetic methods, structural determinations, mass spectrometry, epigenetics, retinoids, carotenoids, biosensors nanoparticles, catalysis.

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## ***NEW MATERIALS (FA3)***

### ***Researchers***

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- Stefano Chiussi
- Julia Serra Rodríguez
- María Graciela Paz Bermúdez
- Sandra Bolaño García
- María Eugenia López de Silanes Vázquez
- Paulino Pérez Feijoo
- José Lorenzo Alonso Gómez

### ***Offer***

Biomaterials and biomedicine:

- Obtaining of bioceramics (hydroxyapatite (HA), Fluor-HA and calcium phosphates) from by-products of marine origin with applications as bone filler in various biomedical fields.
- 3D porous scaffolds fabrication by combining bioceramics and biopolymers for tissue engineering applications.
- Production of bio-inspired ceramics (bioSiC and bioC) from natural resources with application in implants, tissue engineering and drug delivery.
- Design and production of biocompatible coatings with bioactive properties and semiconductor coatings for applications in biomedical devices.
- Study of pathologies in mineralized tissues (such as bone and dental tissues) and non-mineralized tissues (such as oral mucosa and skin), for the prevention and treatment of clinical pathologies such as osteoporosis, demineralization of tooth enamel and carcinogenesis.

Courses

- Physical basis of lasers. Types. Complementary instruments.
- Basis of laser processing.
- Techniques for surface analysis.
- Biomaterials: basis and applications.
- Laser techniques in science and technology.
- Vacuum technology.

### ***Keywords***

Biomaterials, biomedicine, biocompatibles, chiral optical materials, laser processing, bioinspired ceramics bioengineering, nanotechnology, photonics, chiral molecules.

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## ***NEXT GENERATION COMPUTER SYSTEMS GROUP - SING (SI4)***

### ***Researchers***

- Florentino Fernández Riverola
- Eva M<sup>a</sup> Lorenzo Iglesias
- Lourdes Borrajo Diz
- Rosalía Laza Fidalgo
- Reyes Pavón Rial
- Daniel González Peña
- José Ramón Méndez Reboredo
- Miguel Reboiro Jato
- Analía García Lourenço

### ***Offer***

Design and implementation of novel algorithms, systems and tools in the field of biomedicine and medicine.

#### Bioinformatics:

- Searching for biomarkers and/or implementation of predictive models for genomics (microarray and ultra-sequencing), metagenomics, proteomics (mass spectrometry) and metabolomics.
- Biological network mining.

#### Informatic systems for hospital environments:

- Analysis of electronic clinical records (through big data, machine learning, data and text mining) for pattern recognition (e.g., nosocomial infections, etc.).
- Medical decision support systems (automatic diagnosis with case based reasoning systems, rule based systems, machine learning, etc.).
- Information fusion and integration from spare sources (e.g., nursing, pharmacy, microbiology, clinical records, etc.).

### ***Keywords***

Bioinformatics, genomics, proteomics, metabolomics, medical decision support systems, case-based reasoning, machine learning, data and biomedical text mining.

### ***Contact***

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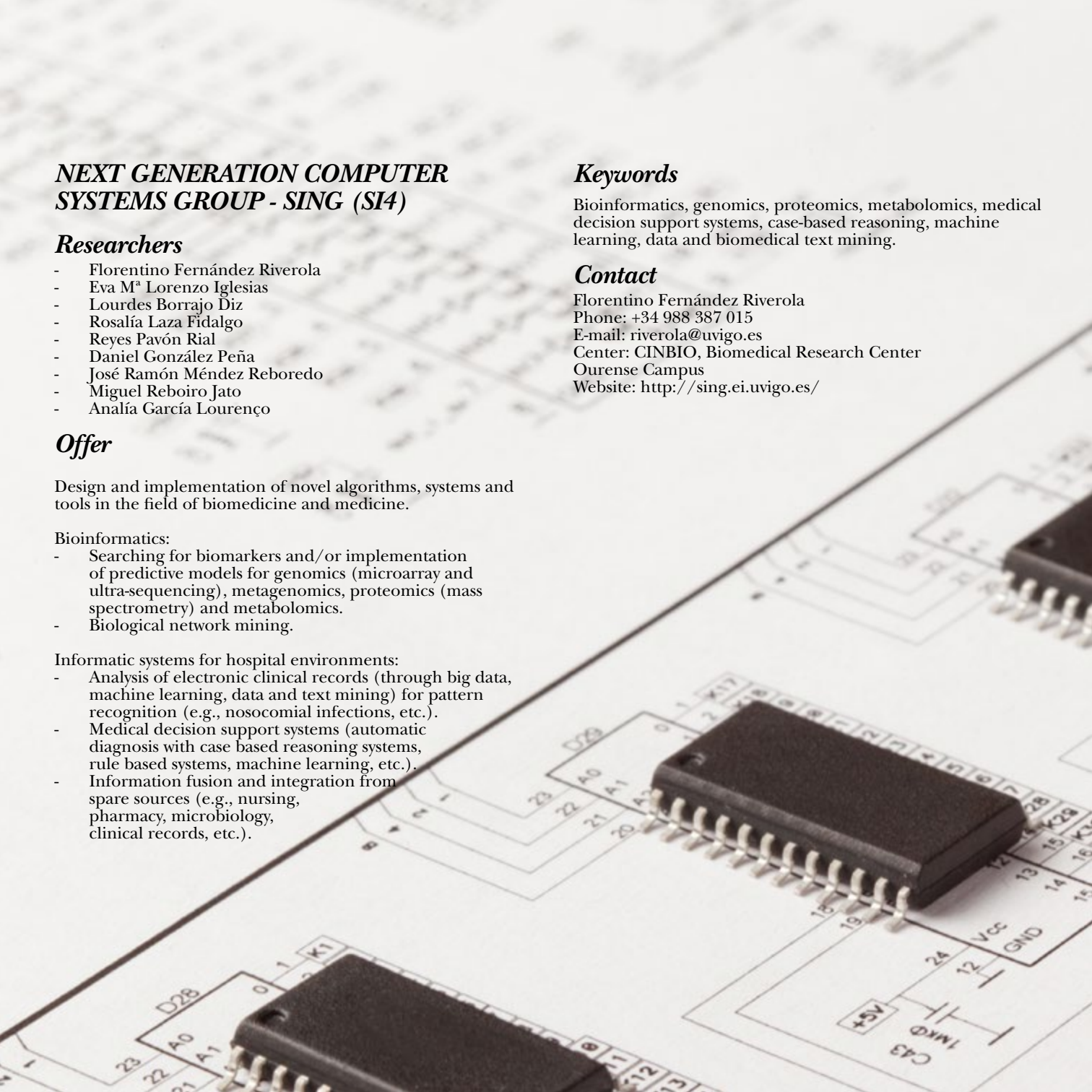
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## ***CHEMICAL ENGINEERING TEAM (EQ10)***

### ***Researchers***

- José Manuel Cruz Freire
- Ana Belén Moldes Menduïña
- Xanel Vecino Bello
- Benita Pérez Cid

### ***Offer***

- Extraction, purification, characterization and application of bio-surfactants, obtained from lactic acid bacteria or from natural sources, in the food, cosmetic and environmental industries.
- Utilization of organic industrial wastes for the recovery and/or extraction of natural molecules with potential uses in the food, cosmetic and environmental industries.
- Development of new biotechnological processes, using renewable substrates, and recovery/purification of the fermentative metabolites.
- Treatment of wastewater using eco-friendly adsorbents.
- Formulation of eco-friendly adsorbents based on alginate beads. Optimization of the formulation conditions.
- Emerging technologies in the food industry: active and intelligent packaging by the inclusion of natural metabolites.

### ***Keywords***

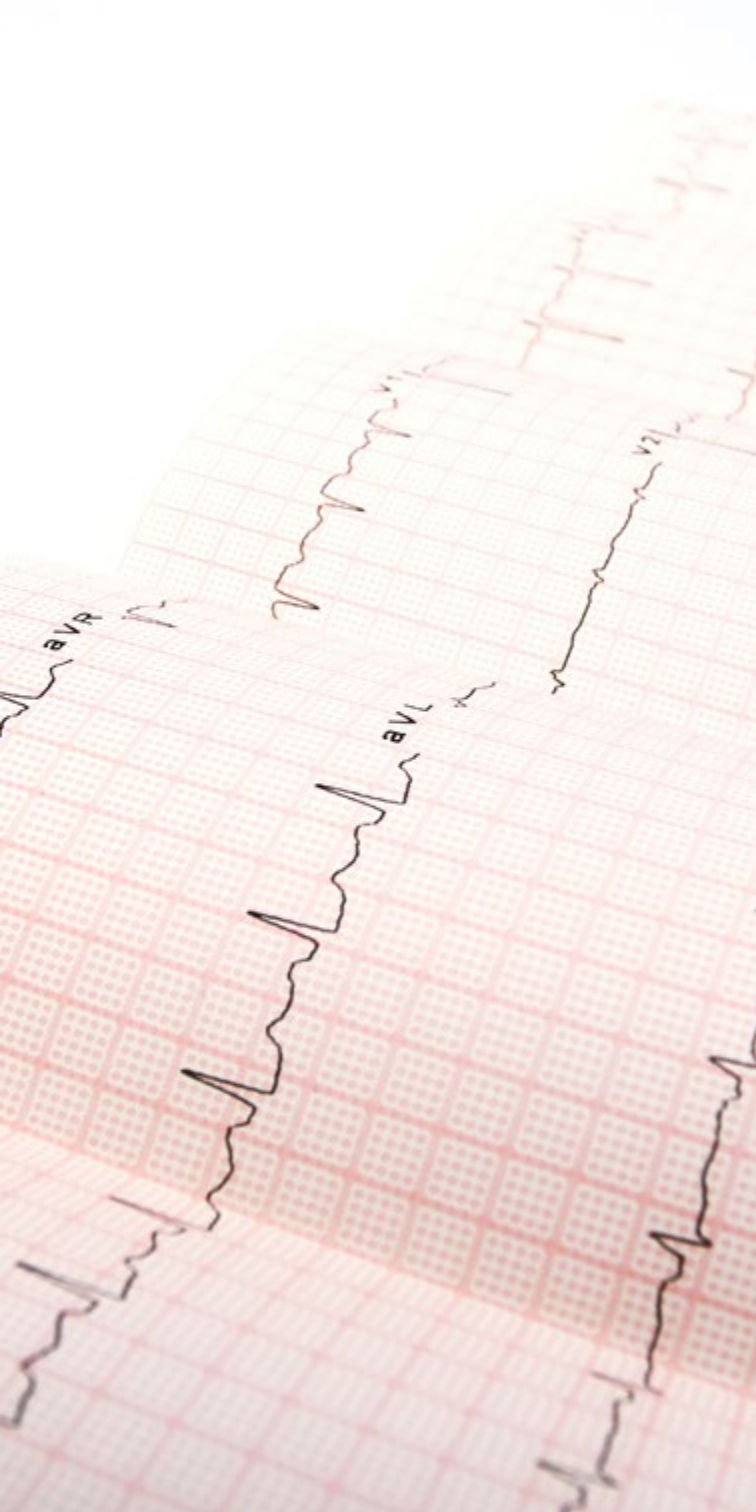
Biosurfactants, sustainable technologies, wastewater, lactic acid bacteria, agro food waste recovery, derivative products, fermentation technologies, natural cosmetic metabolites, food additives, active packaging.

### ***Contact***

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## ***ELECTROANALYSIS AND BIOSENSORS***

### ***Researchers***

- Elisa González Romero
- Javier Marcos González Costas

### ***Offer***

- Biosensors (enzyme electrodes, immunosensors and genosensors).
- Nanostructures and nanobiotechnology.
- Electroanalysis: redox and chemical probes (arendiazonium ions).
- Electroanalysis: distribution of antioxidants in emulsions.
- Electroanalysis: monitorization of emerging pollutants during its degradation process.
- Electrochemistry at tailored interfaces.
- Nanomaterial-based biosensors.
- New electroanalytical methodology applied to environmental, food and health fields.

#### Courses:

- Biosensors. Electroanalysis.
- Chemical probes, mediators and catalysis. Environmental chemistry.

### ***Keywords***

Electroanalysis, biosensors, functionalized and modified electrodes (nanotechnology), electrodes, enzymes, antioxidants, arendiazonium ions (chemical reactivity and electrochemistry), interfaces, catalysis, colloidal systems, bionanotechnology, chromatography, food, environment, health.

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## ***FUNCTIONAL NANOBIMATERIALS GROUP (QF1)***

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- Jorge Pérez Juste
- Pablo Hervés Beloso
- Gustavo Bodelón González
- Sarah de Marchi
- Sergio Gómez Graña
- Krishna Kant
- Sara Núñez Sánchez
- Sergio Rodal Cedeira
- Lorena Vázquez Iglesias

### ***Offer***

- Design and development of codified nanoparticles for imaging and detection.
- Design and development of new sensors based on plasmonic nanoparticles for biosensing and environmental analysis.
- Design and development of catalyst based on supported nanoparticles for synthetic chemistry and energy.
- Expression and purification of recombinant proteins for nanomaterial functionalization.

### Services:

- Synthesis and surface modification of nanoparticles.
- Bioconjugation.
- Analysis of physical-chemical properties of nanostructured materials.
- Expression and purification of recombinant proteins.
- Validation of immunoassays techniques for the detection of biomarkers and antigens.

### Organization of training courses:

- Synthesis and surface modification of nanoparticles.
- Characterization techniques of physical-chemical properties of nanostructured materials.
- Expression and purification of recombinant proteins for nanomaterial functionalization.

### ***Keywords***

Nanotechnology, nanostructured materials, nanocatalyst, biosensing, energy, environmental analysis, recombinant proteins.

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## ***GROUP OF BIOENGINEERING AND SUSTAINABLE PROCESSES - BIOSUV (EQ3)***

### ***Researchers***

- María Ángeles Sanromán Braga
- Diego Moldes Moreira
- Marta Pazos Currás
- María Asunción Longo González
- Francisco Javier Deive Herva
- Emilio Rosales Villanueva

### ***Offer***

Bioprocesses applications in industry:

- Production and application of microbial enzymes (i.e. Lipases, proteases, peroxidases, amylases) in different sectors: food, detergent, fine chemistry or pharmaceutical industries.
- Enzyme immobilization techniques.
- Production of bioactive products (e.g. polyunsaturated fatty acids) from microalgae and other microorganisms.
- Scale-up of probiotic production.
- Use of wastes from food industry as raw materials in biotechnological processes.

Environmental technologies:

- Development of emerging technologies for treatment and valorisation of solid and liquid agroforestry and industrial wastes.
- Treatment of polluted soils by electrochemical techniques for remediation of contaminants (i.e. dyes, heavy metals and organic compounds).
- Design of permeable reactive biobarriers for the removal of pollutants from soils and groundwater.
- On-demand biosorbent synthesis from industrial wastes.
- Development of eco-friendly systems for the disinfection of pathogens in water and surfaces.

Green chemistry for biotechnological processes:

- Design of new separation strategies based on aqueous biphasic systems.

- Production and recovery of industrially interesting metabolites by using neoteric solvents.
- Enzymatic grafting for improvement of wood properties.
- Lignin valorisation as “green” binder and coating.
- Wastewater characterization (COD, pH, conductivity, solids concentration...).

### ***Keywords***

Immobilization, timber industry, revalorisation, biodegradation, biofuels, biocatalysis, bioprocesses, bioreactors, soil decontamination, environmental impact, proteins, enzymes, ionic liquids, aqueous biphasic systems, extremophiles, fermentation, industrial wastes, remediation, microalgae, polyunsaturated fatty acid production, disinfection, biosorbent, synthesis, biochar, hydrochar, probiotic.

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## ***GENOMIC AND BIOMEDICINE GROUP (XB5)***

### ***Researchers***

- Diana Valverde Pérez
- Miguel Arenas Busto
- María del Carmen Rodríguez Argüelles

### ***Offer***

- Extraction of bioactive compounds from marine resource.
- Extraction of bioactive compounds from plants biomass.
- Design and development of metallic nanoparticles using green methods with medical applications.
- Characterization of physicochemical properties of nanomaterials.
- Molecular evolution. Development and application of methodologies for the evolutionary analysis of biological macromolecules.
- Virus evolution. Population genetics and evolution of viruses.
- Proteomic, transcriptomic.

### ***Keywords***

Nanotechnology, nanomaterials, green synthesis, antitumoral, antimicrobial, antioxidant, molecular evolution, virus evolution, phylogenetics, population genetics.

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## ***APPLIED PHYSICS TEAM (FA2)***

### ***Researchers***

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- Javier Vijande López
- Marta María Mato Corzón
- Jesús Torres Palenzuela
- Veronica Salgueiriño Maceira
- Luis Lugo Latas
- David Cabaleiro Álvarez
- Pablo Breogán Sánchez Vázquez
- Carmen Paula Gómez Pérez
- Carolina Hermida Merino
- Lourdes Mourelle Mosqueira
- Marco Antonio Marcos Millán
- Martín Pérez Rodríguez
- Julia Natalia Majcherkiewicz
- Luis González Vilas

### ***Offer***

Characterization of complex materials and liquid state models:

- Experimental: thermal, electromagnetic, and transportation properties (materials: ionic liquids, thermal peloids, nanomaterials and complex fluid mixtures). Complex materials.
- Theoretical: study of prediction models, equations of state and molecular simulation.

Physics applied to the environment:

- Remote sensing applied to the marine environment.
- Water quality monitoring systems.
- Renewable energy.
- Sustainability in the recovery of textile fabrics.

Physics applied to biomedicine and cosmetic:

- Applications of microcalorimetry to the diagnosis and treatment of bacterial infections.
- Thermo-therapeutic and cosmetic applications of new products.

Courses:

- Thermalism.

### ***Keywords***

Thermodynamic, nanomaterials, peloids, physical properties, molecular simulation, thermo-therapeutics, thermalism, cosmetics, renewable energy, recovery of textile fabrics, remote sensing, water quality, complex materials, expert systems.

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## ***BIOCOST***

### ***Researchers***

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- Ernesto López-Valeiras Sampedro

### ***Offer***

- Cost calculation of biotechnological production process.
- Management models of biotechnology.

### ***Keywords***

Costs, management control, economic valuation, bioindustry, biobanks.

### ***Contact***

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## ***BIOMASS AND SUSTAINABLE DEVELOPMENT (EQ2)***

### ***Researchers***

- Herminia Domínguez González
- Juan Carlos Parajó Liñares
- José Luis Alonso González
- Valentín Santos Reyes
- Remedios Yáñez Díaz María
- Andrés Moure Varela
- Dolores Torres Pérez
- Sandra Rivas Siota
- Carlos Vila Babarro
- Noelia Flórez Fernández
- Lucía López Hortas
- Lucía Penín Sánchez
- Mar López Rodríguez
- Beatriz Míguez Alonso
- Paula Rodríguez Seoane
- Vanesa Sanz Lloréns
- Xiana Rico Castro
- Laura López Caamaño

### ***Offer***

- Novel biotechnological processes for the production of organic acids of commercial interest.
- Production, characterization and evaluation of novel pectin and hemicellulose derived prebiotics.
- Extraction and characterization of marine hydrocolloids and gelling agents.
- Extraction and purification of bioactives.
- Design, production and evaluation of novel composites and biodegradable materials from biomass.
- Development of novel processes for the production of building blocks and derivatives from biomass.

### ***Keywords***

Biomass, agroindustrial and forestal wastes, invasive species, biorefinery, prebiotics, marine hydrocolloids, bioactives, biodegradable composites.

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## ***SYNTHESIS, SPECTROSCOPY AND SIMULATION IN ORGANIC CHEMISTRY (S3)***

### ***Researchers***

- Magdalena Cid Fernández
- Olalla Nieto Faza
- Carlos Silva López
- Yagamare Fall Diop
- María Generosa Gómez Pacios
- Marta Marín Luna

### ***Offer***

Organic synthesis:

- Synthesis of allenophanes and macrocycles.
- Design and synthesis of new bioactive compounds.
- Custom design and synthesis of new compounds and materials with chiroptical properties.
- Design and synthesis of chemical sensors based in host-guest systems.

Computational Chemistry:

- Study of reaction mechanisms in organic, inorganic or diologic processes.
- Structure and property prediction and spectral properties.
- Molecular modelling in homogeneous, heterogeneous and bio-catalysis.

Services:

- Structural elucidation: MNR, circular dichroism, chiroptics.
- Custom development of scientific software (processing, analysis and visualization).
- Structure prediction and molecular modelling

### ***Keywords***

NMR, bioactive compounds, isotope labeling, host-guest, structural elucidation, circular dichroism, chiroptics, computational chemistry, molecular modeling, catalysis, chemical sensors.

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## ***AGROBIOTECH FOR HEALTH***

### ***Researchers***

- Pedro Pablo Gallego Veigas
- María Elena Benito Rueda
- María Esther Barreal Modroño
- Emilio Gil Martín
- Eva Lozano Milo

### ***Offer***

Research topics:

- Plant biotechnology, plant production, sustainable agriculture, culture modelling and optimization, soil properties and uses, soil fertility.

Services:

- *In vitro* tissue culture media optimization, quality clonal plant production, plant tissue culture, woody plant micro propagation (kiwi, vitis, pistachio, prunes, eucalyptus, ...), plant genetic transformation, soil physico-chemical properties.

Training and courses:

- Artificial intelligence modelling, plant tissue culture, micro propagation and genetic transformation, soil ecology, soil properties.

### ***Keywords***

- Protocol optimization of *in vitro* cultivation plants, micro propagation fruit, cloning plants, molecular biology plants, genetic transformation of plants, Artificial Intelligence, soil properties.

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# ***AGRO-ENVIRONMENTAL AND FOOD RESEARCH (AA1)***

## ***Researchers***

- Jesús Simal Gándara
- Juan Carlos Mejuto Fernández
- Jianbo Xiao
- F.J. Barba
- S.M. Jafari
- María Concepción Pérez Lamela
- Nelson Pérez Guerra
- Ana María Torrado Agrasar
- María Luisa Rúa Rodríguez
- Benedicto Soto González
- Gonzalo Astray Dopazo
- Elisa Alonso González
- Antonio Cid Samamed
- María Fraga Corral
- Clara Fuciños González
- Patricia Gullón Estevez
- Patricia Otero Penedo
- Miguel Ángel Prieto Lage
- Elena Roselló Soto

## ***Offer***

Research in food safety and quality (or quality-axis):

- Development and improvement of techniques for determining the origin, authenticity and traceability of raw materials, food ingredients, microorganisms with industrial interest and products.
- Production systems, feeding and management to improve quality, productivity, stability and nutritional and functional characteristics of production and agricultural products, aquaculture and livestock.
- Fast methods of analysis of chemical, physical, physicochemical or biological for food and food products.
- Effects of human activity on the food production.
- Epidemiological studies and intervention in Galicia about the effect of diet on health.
- Functional foods rich in antioxidants, and desirable aromatic quality.
- Impact assessment of communication and training

- programs on nutritional eating habits.
- Development of smart nanodevices for the controlled release of food preservatives and bioactives with application in the food and pharmaceutical industry.
- Application of emerging technologies to agrifood processes.
- Modelling, design, optimization, validation and application of innovative processes of transformation, conservation and packaging systems.
- Application of biotechnology for the selection, characterization, collection and processing of food.
- Exploitation and valorisation of residual materials and byproducts from the food industry for the production of highvalue compounds (bioactive peptides, enzymes, polymers, bacteriocins, food hydrocolloids, biopolymers).
- New functional and healthy products.
- Production, purification, biochemical and functional characterization and application of microbial enzymes (wild type and recombinant enzymes).
- Analysis and screening of microbial biodiversity in hot springs and thermal muds using molecular methods.

Research into sustainable production (or output axis):

- Valorisation of agrifood waste and by-products for agricultural purposes.
- Transport of contaminants in soil-water-crop agrosystem.

## ***Keywords***

Food safety and quality, new food ingredients and products, soil-water management and sustainable food production.

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# ***INDUSTRIAL BIOTECHNOLOGY AND ENVIRONMENTAL ENGINEERING GROUP - BIOTECNIA***

## ***Researchers***

- José Manuel Domínguez González
- Claudio Cameselle Fernández
- Esther de Blas Varela
- José Manuel Salgado Seara
- Francisco Tugores Martorell
- Susana Margarida Alves Ferreira de Gouveia
- Sandra María Cortés Diéguez
- Alicia Pérez Paz
- David Outeiriño Rodríguez
- Iván Costa Trigo

## ***Offer***

Valorization of waste from the agricultural and food industry and marine resources.

ANEP area: chemical engineering and technology.

- Characterization of wastes and by-products derived from the agricultural food industry and marine resources.
- Wastes biorefinery to recover bioactive, sustainable and ecological metabolites such as lipids, polyphenols and proteins.
- Development of ionic liquids and deep eutectic solvents to improve the extraction of carbohydrates.

Development of biotechnological processes for the elaboration of compounds of industrial interest.

ANEP area: chemical engineering and technology.

- Isolation, selection and identification of microorganisms.
- Use of sugars-rich liquors as culture media to produce bioactive molecules: biosurfactants, bacteriocins and natural additives.
- Design and scaling of novel bioreactors.
- Enzyme engineering: design, production and purification of enzymes and functional ingredients of industrial and commercial relevance.
- Use of enzymes in the synthesis and/or hydrolysis of industrial products.
- Bioprocessing of macroalgae through solid state fermentation.
- Production of foods of high nutritive value with application in feed for aquaculture.

- Biological treatment of effluents from industrial activities in the textile and food sector.

Analytical and sensory characterization of food and beverages and biotechnology applied to traditional beverages

ANEP area: food technology.

- Application of instrumental analytical techniques and sensory analysis, according to ISO standards and consumer test, for the characterization and differentiation of food and drinks.
- Monitoring of the production processes, from the raw materials to the final product for its optimization.
- Biotechnology applied to the elaboration of natural beverages.
- Design of new products with competitive analytical and sensory profile.

Environmental remediation and water/wastewater treatment.

ANEP area: chemical engineering and technology.

- Advanced processes for removal of contaminants in water and industrial effluents.
- Treatment and removal of contaminants in soils and groundwater.

## ***Keywords***

Biotechnology, biorefinery, bioeconomy, bioconversion, bioprocesses in the agrifood industry, marine resources, additives, natural additives, bioreactors, biorremediation, traditional beverages, soil remediation, advanced water treatment.

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# ***INDUSTRIAL MICROBIOLOGY AND MICROBIAL BIOTECHNOLOGY TEAM (MB3)***

## ***Researchers***

- Carmen Sieiro Vázquez
- Ángeles Pichardo Gallardo
- Lara Areal Hermida
- Vanesa Redondo Fernández

## ***Offer***

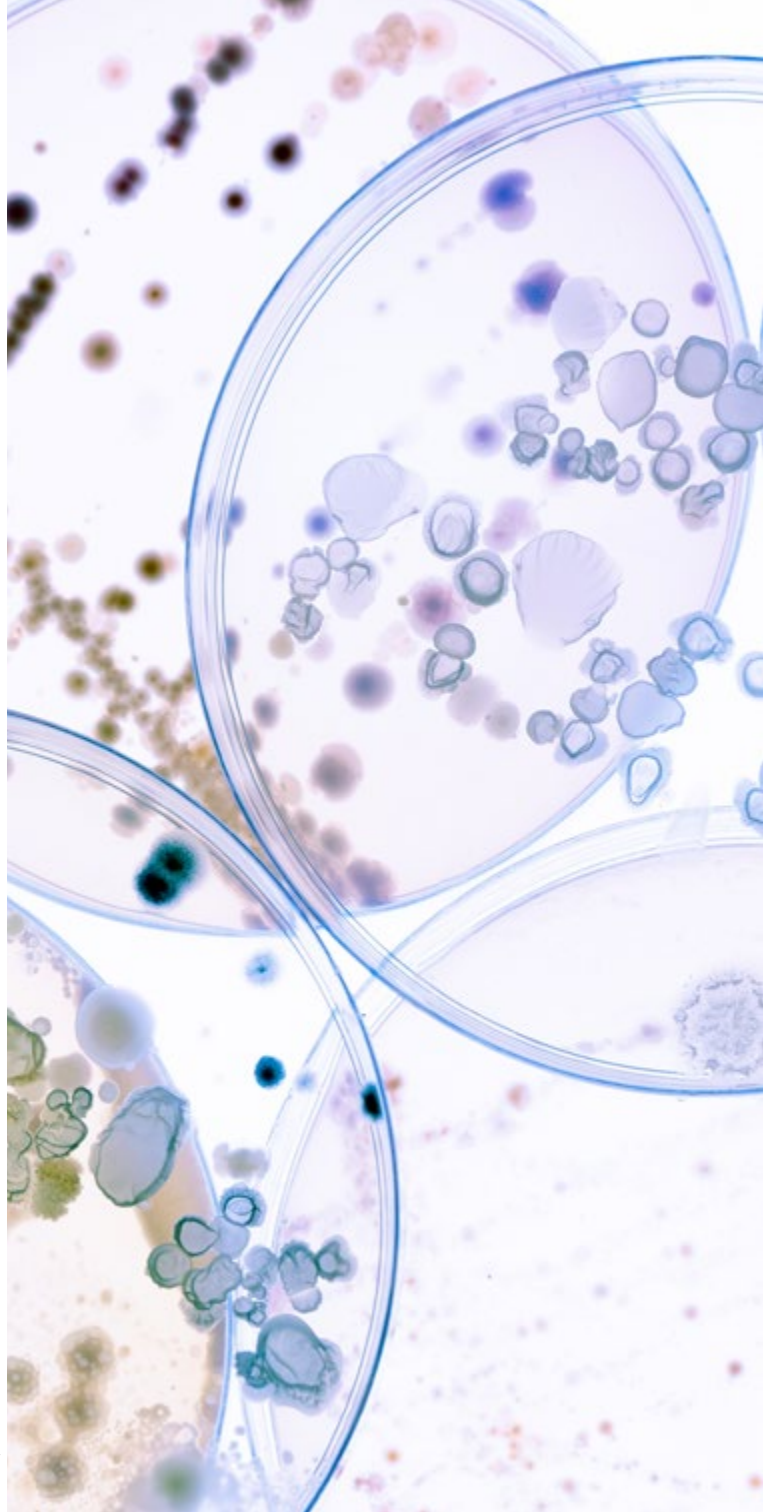
- Isolation, identification and typing (biochemical and molecular methods) of new microorganisms of biotechnological interest.
- Selection and improvement of new microorganisms (bacteria and yeasts) of interest for industrial processes (starters).
- Search, characterization and improvement of new microorganisms for the production of enzymes (chitinases, pectinases, proteases), of interest for the food industry (oenological and dairy industries), for recycling and/or bioconversion of residues (chitin, pectin) and with environmental applications.
- Optimization of processes for the food industry. Improvement of the quality and organoleptic properties (aroma, flavour, colour, taste) of food (particularly wine and dairy products) by means of new microbial enzymes.
- Search, development and production of new bioactive substances, produced by microorganisms, with antimicrobial activity.

## ***Keywords***

Microbial biodiversity, molecular microbiology, microbial biotechnology, yeasts, lactic acid bacteria, wine, dairy products, aroma, enzymes, chitinases, pectinases, proteases, antimicrobials, strains selection, strains improvement, heterologous expression, oenological industry, dairy industry.

## ***Contact***

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## ***RESEARCH, TRANSFER AND INNOVATION CENTRE (CITI)***

### ***Offer***

Main lines of work:

- Processes that seek to improve food quality.
- Obtaining bioactive molecules.
- Obtaining bio-fuels.
- Developing, assessing and scaling fermentation processes.
- Valorising residual liquid effluents.
- Production of biodegradable composites.
- Production of filaments for 3D printing.

CITI's pilot plant services:

The pilot plant's versatility enables the execution of both scaling tests of the processes carried out in research laboratories and proofs of concept as well as pilot productions. The equipment is intended for agri-food, environmental and biotechnological fields.

- Chemical and biological transformation lines.

These include different types of fermentation as well as a pressurised reactor with various working volumes which allow to execute the study of optimum conditions at a laboratory scale or scaling and production tests.

- 50 L fermentor
- Multi-vessel fermentor
- 2 L airlift fermentor
- 5 gallon pressurised reactor. Maximum operating pressure of 130 bar and 350 °C.

- Separation, extraction and purification of compounds line.

Count with a centrifugal clarifier, membrane filtration equipment, a supercritical extraction plant, a cell disruptor and a pilot scale FPLC equipment. These are employed to obtain high purity compounds following environmentally-friendly processes, thus improving the final product quality and adapting it to consumer demands.

- Food sanitation and preservation line.

Includes the high hydrostatic pressure equipment that allows food sanitation by applying pressure, thus eliminating pathogenic microorganisms without altering its organoleptic characteristics. This treatment consumes less energy than heat treatment.

- New Materials development line.

It has equipment aimed at the obtaining of composite materials, the mechanical analysis of parts and the measurement of oxygen and water vapour permeability with foils and plastic packages.

It has also extruder for the production of filaments for 3D printing.

- Technical support equipment

Computing center with CPUs and GPUs infrastructure for computational processes.

### ***Contact***

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# **BIOTECHNOLOGY AND QUALITY IN AGRO-FOOD INDUSTRIES AND ENVIRONMENT (ByCIAMA)**

## **Researchers**

- José Manuel García Estévez
- Luis Alfonso Rodríguez López
- Raúl Iglesias Blanco
- Juan José Rodríguez Quiroga
- María José Pérez Álvarez
- Julia Carballo Rodríguez
- Alvaro Rodríguez Alonso
- Carmen María Sieiro Gallardo
- Ariana Pombar Gómez

## **Offer**

### Main R&D Activities:

- Identification and diagnosis parasite pathogens.
- Emerging parasitic diseases in aquaculture.
- Epidemiology and pathology.
- Host-parasite relationships: immune response.
- Immunoprophylaxis.
- Vaccines.
- Marine parasites as biological tags.
- Ecotoxicology.

### Services to the aquaculture sector:

- Development of biotechnological tools for the diagnosis of fish diseases.
- Separation and purification of parasite antigens.
- Production of monoclonal antibodies.
- Cell cultures and cryopreservation.
- Immunological techniques.
- Histology and histopathology.
- *In vitro* and *in vivo* assays.
- Diagnosis and control of parasitic diseases in fish and shellfish farming.
- Parasitological analysis of fish from fisheries: identification of zoonotic parasites.
- Monitoring the health status of fish and shellfish populations.
- Consulting in management of marine resources.

### Microbiology Laboratory:

- Optimization of fermentation processes.
- Elaboration of new fermented foods and beverages.
- Isolation and identification of microorganism of biotechnology interest.
- Development of starters (bacteria and yeasts) of interest for industrial processes.
- Probiotics.
- Quality control of processes.
- Biofilms.
- Advice and monitoring of the production of fermented food and beverages.

## **Keywords**

Aquaculture, parasites, fish and shellfish health, biotechnological tools, vaccines, microbial biodiversity, microbial biotechnology, yeasts, lactic acid bacteria, wine, beer, strains selection, dairy industry, fermented food, fermented beverages, biofilms.

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## ***MARINE GENETIC RESOURCES LABORATORY***

### ***Researchers***

- Pablo Presa Martínez
- Alfonso Pita Bugallo
- Manuel Nande Domínguez
- Borja Puente Díaz
- María Fernández Míguez
- Paola Valentina Gabasa Ulfe

### ***Offer***

Genetic assessment in fisheries:

- Genetic assessment of fish stocks and strategies for fishing sustainability.
- Fishery forensics: origin and authentication of fish products.
- Genetic testing in fishery conflicts.

Genetic assessment of aquaculture stocks:

- Genetic assessment of cultures stocks of *mytilus*, hake and wreckfish: genetic selection of broodstocks.
- Identification of candidate genes for artificial selection
- chiral optical materials.

### ***Keywords***

Marine genetic resources, fishery genetics, molecular markers, genetic management of stocks, aquaculture genetics, genetic traceability, hake, wreckfish, mussel, limpets.

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## ***RESEARCH GROUP OF COASTAL ECOLOGY(EZ1)***

### ***Researchers***

- Celia Olabarria Uzquiano
- Mariano Lastra Valdor
- Jesús Souza Troncoso
- Estefanía Paredes Rosendo
- Andreu Blanco Cartagena
- Elsa Vázquez Otero
- Ricardo Beiras García-Sabell
- Oscar Nieto Palmeiro
- Bernardino González Castro
- Jesús López Pérez

### ***Offer***

Marine resources:

- Assessment of marine resources: rocky and sedimentary substrates.
- Assessment and study of the reproductive state of marine resources.
- Analysis of the growth of cultured marine species: assessment of the cultured conditions effects.
- Assessment of climate change effects on marine resources including macroalgae, shellfisheries and stalked barnacle fisheries.
- Larval and marine invertebrate culture.
- Cryopreservation of marine genetic resources.

Assessment of marine pollution:

- Analysis of metals Zn, Cd, Pb, Cu in water: presence and concentration.
- Analysis of polycyclic aromatic hydrocarbons (PAHs) and organochlorine.
- Compounds (pesticides and PCBs) in sediments and marine organisms.

- Chemical, toxicological and biological analysis of water.
- Integrated assessment of coastal marine pollution.

Environmental assessment:

- Biomass and production evaluation of marine ecosystems.
- Integrated marine ecosystems evaluation for its application to preservation and impact studies.
- Evaluation of trophic networks and marine protected areas by stable isotopes.
- Study and analysis of invasive species impacts and of the climate change on marine ecosystems.

Dissemination and courses:

- Impact evaluation and environmental quality.
- Marine pollution, invasive species and climate change.
- Sustainable exploitation of marine resources.
- Experimental design and data analysis.

### ***Keywords***

Invasive species, marine pollution, zoology, marine ecosystems, PAHs, toxicology, environmental impact, ecology, climate change, heavy metals, marine resources, environmental quality, cryopreservation, marine protected areas.

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