BIOTECH NOLOGY

Universidade Vigo

Vice-Rectorate for Research, Transfer and Innovation

Knowledge Transfer Office

HR EXCELLENCE IN RESEARCH

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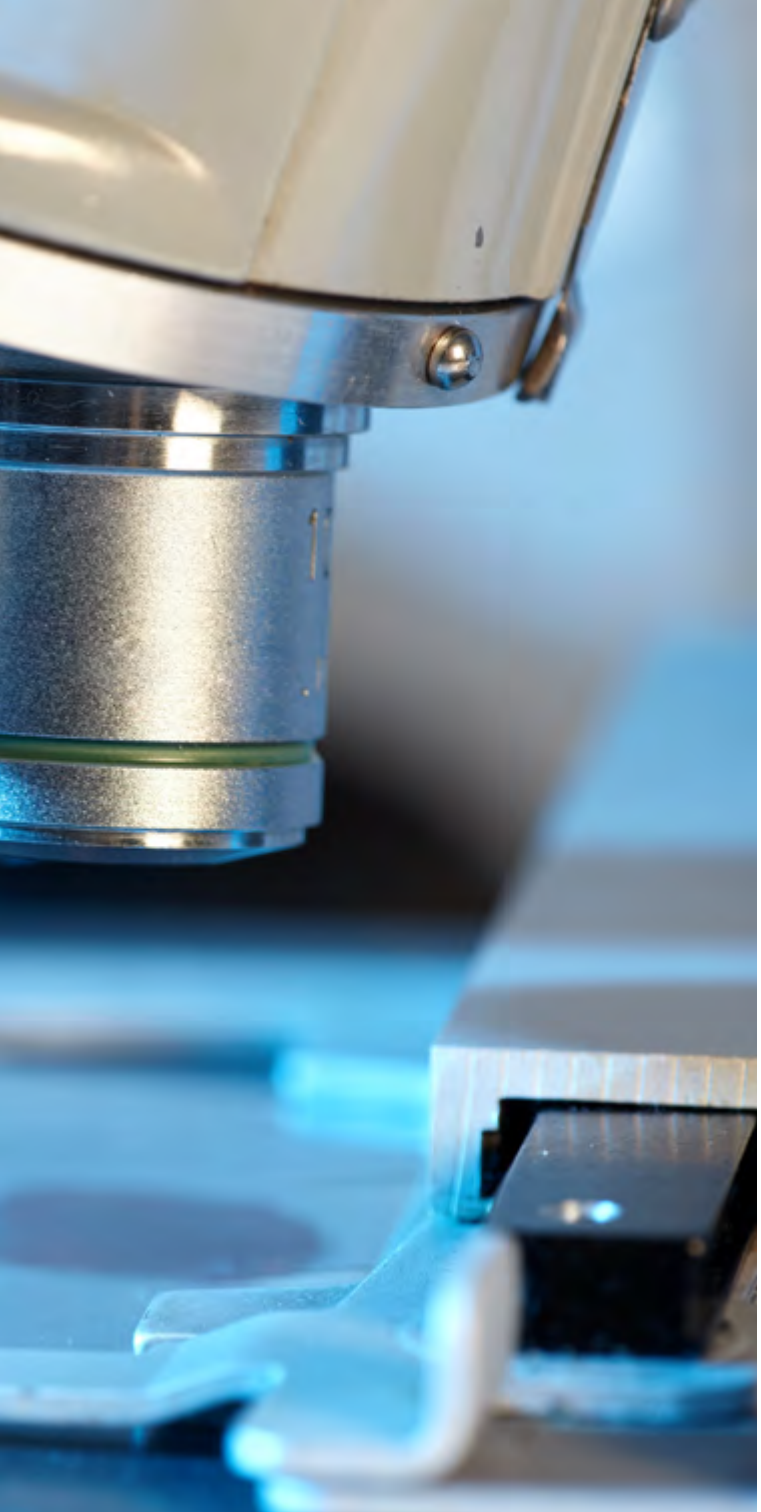

Biotechnology

Biotechnology is the application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services. It encompasses a broad range of technologies that use living organisms or systems—such as cells, enzymes, or DNA—to develop innovative solutions in sectors such as health, agriculture, the environment, and industry. As a key enabling technology, biotechnology plays a fundamental role in addressing global challenges, improving quality of life, and promoting sustainable economic development.

This catalogue presents the research and development (R&D) capabilities of the University of Vigo in the field of biotechnology, highlighting the scientific excellence and technological potential of its research groups. It aims to provide a comprehensive overview of the university's expertise, facilitating collaboration between academia, industry, and institutions committed to innovation, knowledge transfer, and investment.

The research groups included here are classified according to their main areas of application within the subsectors defined by the Strategy for the Consolidation of Biotechnology in Galicia 2021–2025. This strategic framework identifies key areas where biotechnology can drive sustainable growth, specialization, and international competitiveness.

By showcasing the strengths and specializations of the University of Vigo's research community, this publication seeks to promote strategic partnerships, foster interdisciplinary synergies, and reinforce the university's role as a key player in the development of Galicia's bioeconomy.

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Several research groups align themselves with various subsectors of the Strategy for the Consolidation of Biotechnology in Galicia

	Development and production of drugs and vaccines	New technologies for personalized medicine	Agricultural, livestock, and forestry production and utilization	Functional food and nutraceuticals for health and active ageing	Environment, circular economy, and bioenergy	Management and utilization of marine resources
Immunology Research Group	✔	✓				✓
Organic Chemistry – Orchid Team	✔					
New Materials		✔				
Bioengineering & Chronobiology Labs		✔				
Next Generation Computer Systems Group (SING)		✔				
Genomics and Biomedicine		✔				
Hybrid Nanomaterials (HNG)		✔				
Functional Nanobiomaterials		✔				
Agrobiotech for Health			✔	✓	✓	
Chemical Engineering Team (EQ4)			✔			✓
Innovation in Agri-food and Health				✔		
Biomass and Sustainable Development			✓	✔	✓	✓
Biorefinery and Biomass Valorization (Bio2Val)			✓	✔	✓	✓
Food and Health Omics				✔		
Agricultural and Food Research				✔		
Animal Ecology			✓		✔	
Chemical Engineering Team (EQ10)	✓		✓		✔	
Team Nano Tech - Nanotechnology group		✓			✔	
Industrial Biotechnology and Environmental Engineering (BiotecnIA)				✓	✔	✓
Group of Bioengineering and Sustainable Processes (BIOSUV)				✓	✔	
Biotechnology, Energy and Environmental Engineering					✔	
Ecology and Zoology						✔
PHYStoFiSH Lab					✓	✔
Biotechnology and Quality in Agro-food Industries and Environment (ByCIAMA)						✔

IMMUNOLOGY RESEARCH GROUP

Research lines

- **Nanomedicine:** potential application of nanostructures in the biomedical field.
  - Standardization of methods to check biocompatibility, toxicity and immunogenicity of nanoparticles.
  - Biosensors using antibodies and nanoparticles.
- **Oncology:** development of new immunotherapeutic approaches to fight hard-to treat cancers.
  - Testing new antitumoral drugs.
  - Characterization of combined treatments to find synergistic therapeutic effect.
  - Development of new preclinical models (spheroids, tumoroids, organoids).
  - Immunotherapy: monoclonal antibodies, therapeutic vaccines, CAR-T.
- **Aquaculture:** Design of immunological techniques to detect the presence of different marine organisms and toxins.
- **Vaccines:** Immune response to nanovaccines using different routes of administration (intranasal or intramuscular) on animals' models.
- **Theoretical Immunology:** Mathematical modeling of molecular and cellular processes of immune responses

Offer

- Basic, clinical and applied immunology.
- Vaccines.
- Development of monoclonal antibodies: human therapy/ cell identification.
- Nanotechnology: toxicity and immunogenicity of nanomaterials.
- Cell culture (tumoral and primary cultures).
- Molecular biology techniques: PCR, RT-PCER, sequencing, massive transcriptomics.
- Phagocytosis studies
- Cytotoxicity assays (MTT, LDH, Xcelligence...)
- Western blot, dot blot.
- Handling of animals (rat, mouse): study of the immune response for the development of effective vaccines.
- ELISA: quantification of cytokines, antibodies and other molecules.
- Flow cytometry, confocal microscopy.
- SEM and TEM microscopy.
- Histology.
- Searching for immunoregulatory substances.
- Experimental models
- Mathematical models and Biocomputing.
- Organoids (human, mouse and hybrids).

Keywords

Nanotechnology, nanotoxicology, vaccines, tuberculosis, monoclonal antibodies, massive transcriptomic, biocomputing, autoimmunity, immunotherapy, immune response, mathematical modeling, Western blot, flow cytometry, ELISA, dot blot, phagocytosis, immunodetection, chromatography, molecular biology, cancer, biosensor, immunohistochemistry, animal models (pre-clinical assays).

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ORGANIC CHEMISTRY TEAM - ORCHID (QO1)

Research lines

- Chemistry and Biology of Retinoids, Carotenoids and Related Polyenes.
- Stereocontrolled Synthesis.
- Design and Synthesis of Epigenetic Modulators Based on Natural Products.
- Computational Analysis of Pericyclic Reactions and Organometallic Catalytic Processes.
- The new vitamin A5 in Health.
- Apocarotenoids and rice growth.

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 their use on the treatment of cancer and obesity.
- Novel epigenetic drugs inspired in the structure of natural products for the treatment of cancer and CNS diseases, such as 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 diagnosis.
- Structural determination of natural pigments.
- Synthetic processes in tandem and sequences catalysed 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, retinoids, carotenoids, apocarotenoids, vitamin A5, NMR, organic synthesis, medicinal chemistry, synthetic methods, structural determinations, mass spectrometry, epigenetics, biosensing nanoparticles, catalysis.

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NEW MATERIALS

Research lines

- **Biofabrication of Functional Materials:** Synthesis, characterization of advanced materials based on graphene-related structures. Development of biofabrication processes for creating advanced materials for applications in biomedicine, sensors, and functional devices. The group focuses on manufacturing structures with tailored chemical and mechanical properties for tissue engineering, regenerative medicine, and controlled drug delivery systems.
- **Biosensor Surfaces and Functional Interfaces:** Design and development of functionalized surfaces with biosensing capabilities for detecting biomolecules and pollutants. The group works on advanced coatings and self-assembled monolayers to enhance sensitivity and selectivity in biosensors and microfluidic devices.
- **Microfluidic Devices for Biomedical and Environmental Applications:** Fabrication and optimization of microfluidic devices for biomedical analysis, rapid diagnostics, and environmental monitoring. Research focuses on micro-scale interactions to design efficient fluid-handling systems in miniaturized environments.

Offer

- Biofabrication of scaffolds by 3D printing technologies.
- Laser techniques for the manufacture of biosensors and microfluidic devices.
- Physico-chemical characterization and cytotoxicity in vitro tests of advanced biomaterials.

Keywords

Biomaterials, biomedicine, biofabrication, biosensors.

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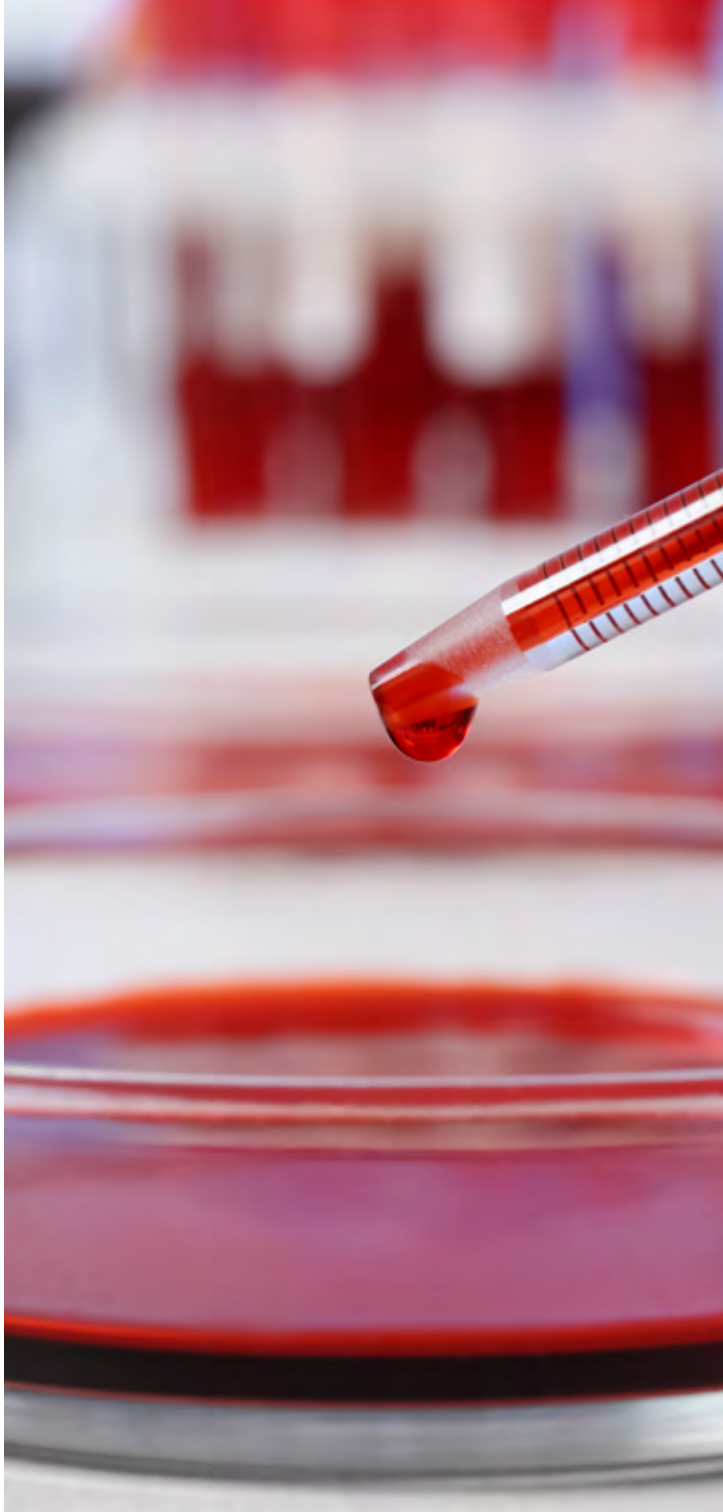

BIOENGINEERING & CHRONOBIOLOGY LABS

Research lines

- Line Chronobiology and chronotherapy.
- Ambulatory blood pressure monitoring and hypertension diagnosis.
- Blood pressure telemonitoring in community pharmacies.
- Cardiovascular, metabolic, and renal risk assessment.
- Assessment of the effects of antihypertensive therapy.
- Healthy aging.
- Early-identification and prophylaxis of gestational hypertension and pre-eclampsia.

Offer

- Design and coordination of clinical trials in the fields of hypertension, cardiovascular risk, diabetes, and kidney disease.
- Design and management of electronic notebooks for data collection from patients participating in clinical trials.
- Processing of clinical signals and data in chronobiology and chronotherapy studies.
- Processing of ambulatory monitoring signals: hypertension, cardiovascular risk, diabetes, and kidney disease.
- Telemonitoring and telemedicine; applications for managing hypertension, diabetes, and kidney disease.

Keywords

Hypertension, cardiovascular risk, chronotherapy, ABPM, circadian rhythms, diabetes, kidney disease.

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NEXT GENERATION COMPUTER SYSTEMS GROUP - SING

Research lines

- Artificial Intelligence.
- Machine Learning.
- Text Mining and Data Bases.
- Bioinformatics.
- Clinical Decision Support Systems.

Offer

- **Artificial intelligence:**
  Development and application of techniques and algorithms to solve problems that are currently best solved by humans. Specifically, the group has experience in solving complex problems by taking advantage of machine learning, case-based reasoning, appropriate knowledge representation, the use of intelligent agents, as well as optimisation through evolutionary computation.
- **Machine learning:**
  Extensive experience in the application of techniques and algorithms to solve problems requiring automatic knowledge discovery from large amounts of data, creating automatic prediction models and/or applying structuring or dimensionality reduction techniques.
- **Natural language processing:**
  Application of advanced semantic natural language processing techniques for spam filtering or automatic extraction of information from biomedical literature.
- **Bioinformatics**:
  Development, application and fine-tuning of techniques for computer-based biological problem solving through the analysis of large amounts of experimental data (high throughput), including next generation sequencing or proteomics, as well as the integration of information from publicly available biological databases.
- **Clinical decision support systems:**
  Development of clinical decision support systems based on the use of artificial intelligence, machine learning and deep learning techniques for the exploitation of electronic medical records, including structured and unstructured information, as well as for the creation of CAD (Computer Aided Diagnosis) systems from medical images.

Keywords

- **Artificial intelligence:** Case-based reasoning, Agents and multi-agent systems, Evolutionary computing. Representation and acquisition of knowledge.
- **Machine learning:** Classification, Clustering, Combination of classifiers, Continuous learning, Deep learning, Neural networks.
- **Natural language processing:** Anti-spam filtering, Biomedical text mining, Large-scale biological and clinical data integration.
- **Bioinformatics:** Genomics, Proteomics, Metagenomics.
- **Clinical decision support systems:** Automatic analysis of medical images.

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GENOMIC AND BIOMEDICINE

Research lines

- Cancer and age-related disorders.
- Single-cell genomics.
- Bioinformatics.
- New nanomaterials for medicine.

Offer

- DNA and RNA high-throughput sequencing.
- Bioinformatic analysis of high-throughput DNA and RNA sequencing data.
- Population genetics, phylogenetics, and molecular evolution studies.
- Engineering of extracellular vesicles (EVs) as delivery vectors for therapeutic cargo.
- Design and development of mRNA-based therapies.
- In vitro, ex vivo, and in vivo models for studying age-related diseases and cancer.
- Design and development of metallic nanoparticles using green methods for medical applications.

Keywords

Genomics, biodiversity, bioinformatics, cancer, nanomaterials, aging, age-related diseases, rare disorders, therapies, biomarkers.

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HYBRID NANOMATERIALS (HNG)

Research lines

- Magnetism and Magnetic Bio-Devices.
- Self-assembled Molecules and Materials.
- Nanomedicine.

Offer

Magnetic (Bio)materials:
- Synthesis and bio-functionalization of magnetic nano- and micro-beads.
- Structural characterization (Raman spectroscopy).
- Magnetic Characterization (Magnetometry, Magnetic Induction and Temperature Kinetics).

Biomedicine:
- Biocompatibility and therapeutic evaluation of different nanomaterials for biomedical applications (mainly cancer).
- Evaluation of Surface Coatings for Tumor-Specific Targeting.

Bioengineering:
- Magnetic manipulation of microbeads in different environments (aqueous solution and bio-related media, cell cultures and 3D spheroids).
- Design and production of microfluidic systems.
- Magnetically targeted drug and heat delivery.

Services:

- Structural and Magnetic Characterization of Nanomaterials.
- In vitro biocompatibility testing of nanomaterials.
- Biocompatibility and toxicity studies of nanomaterials in animal models.

Keywords

Magnetic Nanoparticles, Bioengineering, Bio-functionalization (proteins, virus, DNA and RNA, etc.), Nanomedicine, Nanobiotechnology, Cancer, Molecular Biology, Animal Models.

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FUNCTIONAL NANOBIOMATERIALS

Research lines

- Design, synthesis, and assembly of metallic/hybrid nanostructured materials with catalytic properties and kinetic studies (nanocatalysis) for biomedical, industrial and environmental use.
- Design, synthesis, surface modification, and assembly of metal/hybrid nanoestructures with application as biosensors, electronic devices.
- Study and modification of the optical properties of nanoparticles (nanoplasmonic) for sensors design with application in high-throughput screening and real time analysis.
- Development of biotechnology and biomedical applications of nanomaterials employing molecular and cellular biology techniques.

Offer

- Synthesis of a wide variety of nanoparticles with specific electrical, optical or magnetic properties thanks to the strict control of their size, shape and composition.
- Design and manufacture of nanoparticles or colloidal compounds of greater size that have magnetic and optical properties, for biomedical uses such as biolabelling and hyperthermia and composition.
- Development and manufacture of biosensors based on nanoparticles. Detection, in real time, using technologies such as surface plasmon resonance (SPR) and RAMAN spectroscopy (SERS).
- Design and use of nanoheterogeneous systems (micelles, microemulsions, vesicles and metallic nanoparticles) to modify the kinetic, catalytic activity of chemical reactions.
- Implementation of biological tools in material science such as recombinant DNA technology, microbial and cell culture, fluorescence microscopy, immunodetection, protein expression and purification.

Keywords

Sensing, nanocatalysis, nanoplasmonics, bionanoplasmonics, nanotechnology, biotechnology, nanoparticles.

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AGROBIOTECH FOR HEALTH

Research lines

Cutting-edge biotechnological and computational tools to enhance plant health, production, and the valorization of plant-derived compounds. Our interdisciplinary research lines include:

- **Advanced Plant Cultivation Technologies:** Implementing and optimizing plant culture in soil and soilless systems, encompassing plant tissue culture, hydroponics (indoor vertical farming), and aeroponics.
- **Artificial Intelligence for Plant Systems:** Utilizing AI and machine learning to model, predict, and optimize natural and biotechnological processes in plant science, including the design of plant substrates, nutrient solutions, and culture media.
- **Bioactive Plant Metabolites**: Investigating and identifying specialized plant metabolites with antioxidant, anticarcinogenic, anti-allergenic, anti-inflammatory, and natural antimicrobial properties.
- **Interface Science for Food and Health:** Controlling the oxidative stability of lipid-based emulsions using natural antioxidants.
- **Plant Propagation and Conservation:** Developing efficient propagation strategies (germination, macro- and micropropagation) for the cloning, conservation, reintroduction, and valorization of plants with ecological, agroforestry, medicinal, and/or industrial significance.
- **Sustainable Plant Production:** Focusing on soil fertility, plant nutrition, biostimulants, and microbiota to promote sustainable agriculture and plant production.

Offer

- **Antioxidant Formulation Design:** Development of antioxidant systems to control oxidative processes, particularly in food and cosmetic emulsions.
- **Development of Bio-based Solutions and Valorization Services:** Comprehensive elemental and metabolomic analysis, and bioactivity screening of plant extracts and natural compounds with beneficial properties.
- **Optimized Plant Propagation:** Enhancement of germination, multiplication, rooting, and acclimatization protocols for plants of ecological, medicinal, industrial, cosmetic and commercial value.
- **Plant Micropropagation:** Tailored formulation of culture media, nutrient solutions, and natural substrates for efficient plant multiplication (AI-enhanced options available).

Keywords

Plant biotechnology, sustainable plant production, agroforestry, biotic and abiotic stress, natural antioxidants, emulsions, bioactive compounds, metagenomic and metabolomic analysis.

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CHEMICAL ENGINEERING TEAM (EQ4)

Research lines

- Biochemical and microbiological characterization of traditional dairy and meat products with a view to their industrialization.
- Typification and biochemical and microbiological characterization of fish products, vegetables and beverages.
- Elaboration of autochthonous starter cultures for traditional dairy and meat products.
- Use of waste from the food industry and reincorporation as ingredients/additives in new foods.
- Development of new foods with more nutritious and healthy ingredients.
- Optimization of the preservation processes of vegetables and fish.
- Development of new canned vegetables and fish.
- Cheese rheology.
- Chemical characterization of the fruits of autochthonous chestnut (Castanea sativa, Miller) varieties from northern Spain.

Offer

- Biochemical, microbiological and rheological characterization of meat, dairy, vegetable and fish products.
- Study and optimization of technological processes for the production of foods (meat, dairy products, vegetables, fish, preserved foods and beverages).
- Development of new foods.
- Advice and training in the food industry: control and optimization of processes, sensory analysis and development of new food products.

Keywords

Starter cultures, meat products, dairy products, vegetables, preserved foods, food rheology, new food products, food preservation processes.

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INNOVATION IN AGRI-FOOD AND HEALTH

Research lines

- Detection, isolation, identification and typing of microorganisms (bacteria, yeasts and fungi). Study of the microbiome, its alterations and modulation.
- Search, characterization, selection and improvement of new microorganisms (and their products) for the production of conventional foods, functional foods and probiotics. Starter cultures.
- Search, selection and improvement of new microbial enzymes of interest to the food and pharmaceutical industry, recycling and/or revaluation of waste and as biocontrol agents. Enzymatic biocatalysis.
- Process optimization for the food industry and improvement of its quality, functionality and organoleptic characteristics.
- Development of methods for the study of the microbiome and its relationship with different diseases using different meta-omics.
- Search, identification and determination of new bioactive compounds in foods of plant origin.
- Study of biomolecules with antioxidant properties in dietary vegetables and their derivatives (seeds, fruits, juices, fermented beverages) of interest to the food industry.
- New functional properties in autochthonous and organically grown foods, providing added value and contributing to the sustainability of the local agri-food sector.
- Study of the presence of melatonin in plants, its functions and its application for a more efficient and sustainable agricultural production.
- Improvement of the germination capacity of seeds of high agricultural and food value under adverse environmental conditions.

Offer

- Identification of microorganisms by biochemical and molecular methods.
- Synthetic microbiology.
- Isolation, cloning and expression of genes.
- Heterologous expression of proteins (in prokaryotic and eukaryotic systems).
- Selection and production of starters for the oenological, dairy and new fermented products industries.
- Identification and analysis of new functional properties of plant foods.
- Tests to control the maturation and abscission of fruits of economic and commercial interest.
- Biotechnological applications to improve the germination capacity of seeds and crop production under adverse environmental conditions.
- Detection of research, development and innovation opportunities for companies related to the research work of the team and advice on the search for financing to carry them out.

Keywords

Microbial biodiversity, microbiome, meta-omics, synthetic microbiology, microbial biotechnology, wine, dairy products, flavourings, enzymes, antimicrobials, probiotics, biocontrol, functional foods, antioxidants, bioactive compounds, melatonin, agri-food industry, food, seeds, fruits, fermented beverages, germination, ripening, abscission, sustainability.

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BIOMASS AND SUSTAINABLE DEVELOPMENT

Research lines

- New prebiotic ingredients.
- Production and evaluation of antioxidants and biopolymers.
- Production of base compounds and biocomposites from lignocellulosic materials.
- Biofuels.
- Production of microbial metabolites.
- Extraction and purification of bioactive compounds.
- Formulation of microparticles systems with biological activity.

Offer

- Service Experimental evaluation of separation operations for specific purposes.
- Chemical transformations.
- Analytical characterisation of samples.
- Experimental evaluation of antioxidant capacity.
- Experimental evaluation of prebiotic effects.
- Functional food ingredients.
- Simulation and evaluation of processes.
- Experimental assessment of thermorheological properties.

Keywords

Biomass, biorefinery, bioactives, prebiotics, antioxidants, new materials, base compounds.

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BIOREFINERY AND BIOMASS VALORIZATION (Bio2Val)

Research lines

- Sustainable biomass processing within biorefinery schemes.
- Extraction and characterization of bioactive composts using advanced alternative technologies: microwaves, deep eutectic solvents, ultrasonics, etc.
- Bioprocesses for obtaining biofuels and organic acids: development of biocatalysis and fermentation strategies.
- Development of biopolymer-based materials.

Offer

- Chemical characterization of agroindustrial feedstocks, including carbohydrates, antioxidants and protein determination.
- Development and Optimization of Sustainable Biomass Processing Protocols. Design of tailor-made biorefinery schemes for industrial biomass.
- Extraction of Bioactive Compounds Using Advanced Green Technologies. Custom extraction services using microwaves, deep eutectic solvents (DES), ultrasonics, etc.
- Characterization of Bioactive Compounds (e.g., polyphenols, flavonoids, antioxidants).
- Evaluation of biological activities (antimicrobial, antioxidant, prebiotic, etc.).
- Development of Biocatalytic Processes. Enzyme screening and optimization for industrial biotransformations. Immobilization techniques for enhanced biocatalyst performance and reuse.
- Fermentation Process Design and Optimization.
- Customized fermentation strategies for the production of biofuels (e.g., bioethanol, biobutanol) and organic acids (e.g., lactic, succinic, xylitol).
- Synthesis and characterization of biomaterials.
- Consulting and R&D Collaboration. Joint research projects tailored to industrial needs. Technical advisory services on implementing sustainable bioprocesses.

Keywords

Biorefinery, Green Extraction Technologies, Bioactive Compounds, Biocatalysis, Fermentation Processes, Sustainable Biomass Valorization

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FOOD AND HEALTH OMICS

Research lines

- Bioactive compounds and health.
- Contaminants and environmental health.
- Phytosanitary products and fermentative microbiota.
- Relationship between technological processes and sensory quality.

Offer

- Extraction, purification, characterization and application of bioactive components obtained from food, food byproducts and food wastes.
- Assessment of digestibility, bioaccesibility, metabolism and bioavailability.
- Enzymatic activity and Health.
- Food-Host microbiota crosstalk.
- Relationship between technological processes and sensory quality.
- Application of omic techniques (transcriptomics, proteomics, and metabolomics) in the field of food safety and quality.

Keywords

Bioactive compounds, contaminants, techniques omics, health, food quality.

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AGRICULTURAL AND FOOD RESEARCH

Research lines

- Food Biotechnology
- Environmental Contaminants and Food
- Food Nanotechnology
- Circular Economy Strategy

Offer

Food safety and quality
(Prof. Responsible: J. C. Mejuto)

- 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 high value compounds (bioactive peptides, enzymes, polymers, bacteriocins, food hydrocolloids, biopolymers).
- New functional and healthy products.

Processing and ingredients formulation
(Prof. Responsible: M. L. Rúa)

- Enzymology: search for hydrolases for specific applications
- Desing of biotechnological proceses based on enzymatic technology for the valorisation of subproducts from the agrofood industry trough the production of biomolecules with application in the food, feed and cosmetic industries
- Design of micro- and nano-biostructures for the encapsulation and functionalisation of food ingredients
- Food proteins from algae and green vegetables
- Food processing by high hydrostatic pressure

Keywords

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

Enzymatic Technology, encapsulation, microemulsions, novel proteins, high hydrostatic pressure.

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ANIMAL ECOLOGY

Research lines

- Biology And Ecology of Earthworms.
- Vermicompost of organic waste.
- Treatment of organic waste by biological systems: composting and vermicomposting.
- Study and production at pilot scale of biofertilizers and biopesticides through vermicomposting of grape marc and distilled grape marc of white and red grapes.
- Physical, chemical and biological characterization of compost and vermicompost: fertilizing capacity, potential toxicity and persistence of pathogens for humans and crops.
- Metagenomic and metabarcoding approaches to study the interactions and changes in the composition, structure and function of microbial communities in vermicompost, soil, rhizosphere and filosfera of the crops.
- Application of fertilizers (vermicompost) in vines, flowers, horticulture and other crops: In solid and liquid phase and biopesticides in foliar sprays.

Offer

- Biotreatment of organic waste in solid phase: vermicomposting and composting.
- Pilot-scale study and production of biofertilizers and biopesticides through vermicomposting of grape bagasse and grape bagasse distilled from white and red grapes.
- Physical, chemical and biological characterization of compost and vermicompost: fertilizer capacity, potential toxicity and persistence of pathogens for humans and crops.
- Metagenomic and metabarcoding approaches to study the interactions and changes in the composition, structure and function of microbial communities in vermicompost, soil, rhizosphere and phyllosphere of the crops.
- Application of fertilizers (vermicompost) in vines, flowers, horticulture and other crops: in solid and liquid phase and biopesticides in foliar sprays.
- Physical, chemical and biological characterization of soils, organic waste and vegetable substrates.
- Physical, chemical and biological characterization of compost and vermicompost.
- Bioinformatic analysis for the study of metagenomes and/or microbiomes (DNA metabarcoding), in a field that can be called environmental genomics or genomics of communities. Our services range from the processing of the sequences to the statistical analysis of the data obtained.

Keywords

Oxidative stress, DNA damage, molecular biology, microbial ecology, soil ecology, vermicomposting, big data, soil health.

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CHEMICAL ENGINEERING TEAM (EQ10)

Research lines

- Valorization of Residual Streams from the Food Industry including dairy industry focusing on the production of biosurfactants of microbial origin with potential applications in various industrial sectors: food, cosmetic, agrochemical, pharmaceutical and environmental. The primary objective is to characterize and study the most suitable application of biosurfactant extracts obtained from different secondary raw materials.
- Strategies to combat antibiotic resistance through the Biotechnological production of new antibiotics, like Gramicidin S analogs and antimicrobial biosurfactants involving sustainable alternatives.
- Production of bioadsorbents from agrifood residues using biotechnological process.

Offer

- Valorization of dairy streams through the production of biosurfactants.
- Biotechnological production of extracellular biosurfactants: optimization of operational conditions and characterization.
- Biotechnological production of cell bound biosurfactants: optimization of operational conditions and characterization.
- Inclusion of biosurfactants in agrifood formulations and validation.
- Inclusion of biosurfactants in pharmaceutical formulations and validation.
- Inclusion of biosurfactants in agrifood formulations and validation.
- Inclusion of biosurfactants in cosmetic formulations and validation.
- Biotechnological production and downstream of new Gramicidin S analogous.
- Production of bioadsorbents from agrifood residues.
- Treatment of wastewater using eco-friendly adsorbents.
- Formulation of eco-friendly adsorbents based on alginate beads. Optimization of the formulation conditions.

Keywords

Biosurfactants, Antibiotics, Gramicidin S, Sporulated bacillus, Lactobacillus, Bioadsorbents, Biopesticides, Food streams, Circular economy, Industrial synergy, Cosmos ingredients.

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TEAM NANO TECH – NANOTECHNOLOGY GROUP

Research lines

- Manufacture of new micro-nanomaterials and their implementation in the development of new applications in the field of nanoscience and nanotechnology.
- Development from conceptual research to its application in the industrial sector.

Offer

Fabrication of complex nanoarchitectures: high-performance sensors (relevant for detection of contaminants, biomarkers, gases and drugs), novel drug delivery carriers (endowed with selective and stimuli-responsive capabilities), catalytic nanosystems (suitable for photo-controllable bioorthogonal reactions, organic transformations and pollutants degradation), and biocompatible theranostic platforms (capable of highly active targeting), among other applications.

- Nanostructures to produce coatings:
  - Disinfectant (e.g., bacteria or viruses related to covid-19).
  - Self-cleaning (super hydrophobic surfaces).
  - Photocatalytic (sunlight-assisted) decontamination.
  - Solar shielding, either from visible or infrared radiation (e.g., applications in crystals).
- Sensory nanostructures to:
  - Pathogens detection.
  - Nanoparticles (e.g., TiO2, Ag) detection in water.
  - Pollutants detection in air and water.
- Nanostructures to produce decontaminating surfaces, such as the elimination of molecules as dangerous as nervous gases (e.g., degrading 2-Chloroethyl ethyl sulphide, analogous to mustard gas).
- Production of nanostructures to decontaminate water using sunlight.
- Nanoreactors to facilitate smart drug release.
- Heterogenous catalysts based on TiO2, Pd, Au, Pt, -Ag, Ni (magnetically recoverable systems, membrane incorporation) for different reactions, such as H2 production using sunlight.

Keywords

Nanomaterials, nanostructures, nanoscience, nanosensors, nanoparticles, drug delivery, biocompatible, nanoreactors, organic transformations, pollutants degradation, photocatalysis, hydrogen production, catalytic nanosystems.

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Ag
Silver
107.87
Cd
Cadmium

INDUSTRIAL BIOTECHNOLOGY AND ENVIRONMENTAL ENGINEERING (BiotecnIA)

Research lines

Industrial biotechnology line
(Prof. Responsible: J. M. Domínguez).

- Isolation and characterization of microorganisms.
- Recovery of bioactive substances from various wastes.
- Design of bioreactors and optimization of bioprocesses for the use of agro-industrial residues and the obtaining of natural food additives.

Line of new sources of protein
(Prof. Responsible: J. M. Salgado).

- Bioprocessing of insects to obtain protein hydrolysates.
- Solid state fermentation to increase the protein content of macroalgae and agricultural by-products.
- Preparation of low-cost nutritious diets to be applied in aquaculture.

Environmental engineering line
(Prof. Responsible: C. Cameselle).

- Remediation and recovery of contaminated soil and groundwater.
- Management and treatment of water and industrial effluents.
- Management, treatment and recovery of industrial waste.

Aroma and sensory line
(Prof. Responsible: Sandra Cortés).

Sustainability of processes and projects
(Prof. Responsible: C. Cameselle).

Offer

Recovery of waste from the agri-food industry and marine resources:

- Characterization of residues and by-products of the agri-food industry and marine resources.
- Waste biorefinery to recover bioactive, sustainable and ecological metabolites such as lipids, polyphenols and proteins.
- Development of ionic liquids and deep eutectic solvents to improve carbohydrate extraction.

Development of biotechnological processes for the preparation of compounds of industrial interest:

- Isolation, selection and identification of microorganisms.
- Use of liquors rich in sugars as a culture medium for the production of bioactive molecules: biosurfactants, bacteriocins and natural additives.
- Design and scaling of novel bioreactors.
- Enzymatic 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 by solid state fermentation.
- Production of foods of high nutritional value for feeding in aquaculture.
- Biological treatment of effluents from industrial activities in the textile and food sectors.
- Production of protein hydrolysates with application in the agri-food and aquaculture sector.

Valuation of edible insects:

- Extraction of proteins from edible insects (approved as food by EFSA).
- Elaboration of products derived from chitin with application in the agri-food sector.

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

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

Environmental remediation and water/wastewater treatment:

- Advanced processes for the elimination of contaminants in water and industrial effluents.
- Recovery of waste.
- Elimination of nutrients.
- Treatment and removal of contaminants in soil and groundwater.

Keywords

Biotechnology, biorefinery, bioeconomy, bioconversion, bioprocesses in the agri-food industry, marine resources, additives, natural additives, bioreactors, insects, chitin, protein, bioremediation, traditional drinks, soil remediation, advanced water treatment, waste recovery.

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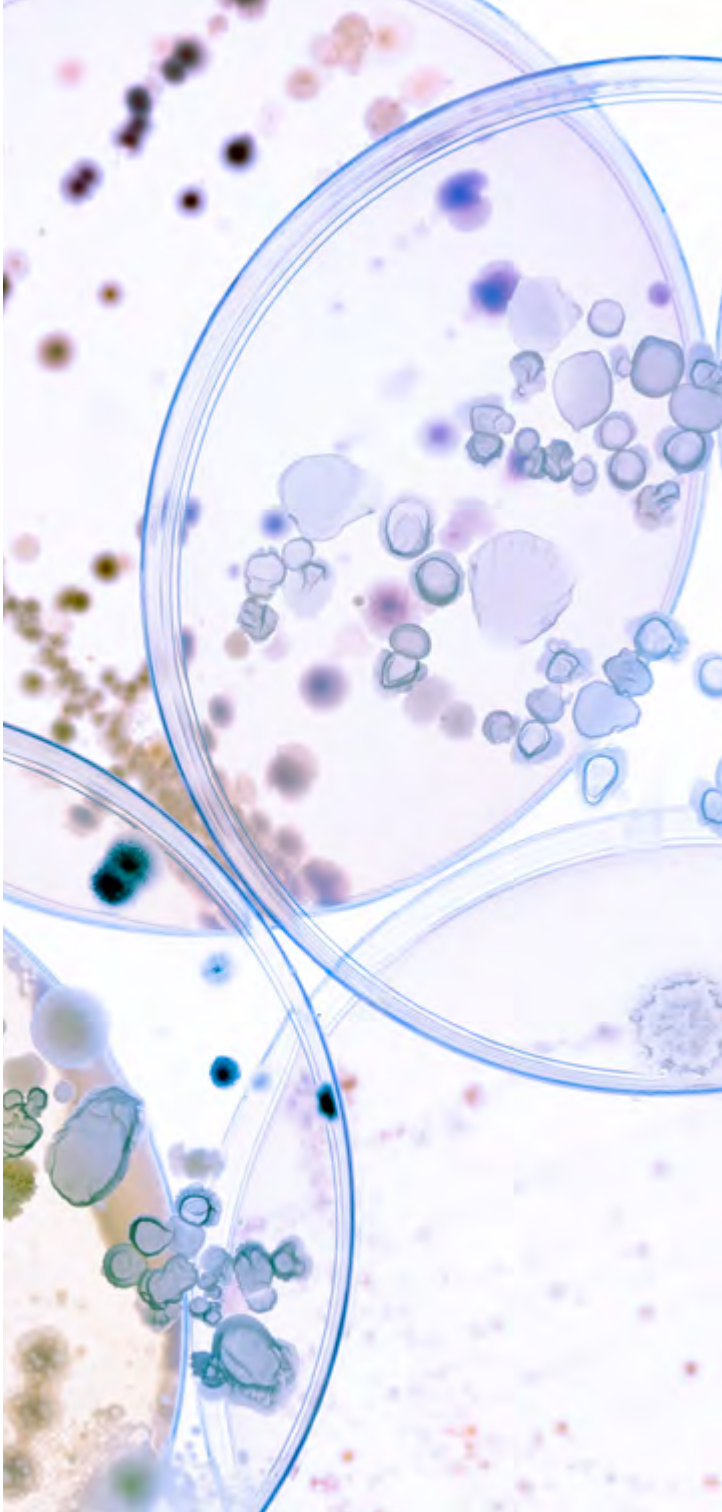

GROUP OF BIOENGINEERING AND SUSTAINABLE PROCESSES - BIOSUV

Research lines

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.
- Immobilization techniques for enzyme and biocative products.
- Production of bioactive products (e.g. polyunsaturated fatty acids) from microalgae and other microorganisms.
- Scale-up of probiotic production.
- Use of wastes from the 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.
- On-demand biosorbent synthesis from industrial wastes.
- Development of eco-friendly systems for the disinfection of pathogens in water and surfaces.
- Innovation in green fuel technologies.
- CO2 conversion processes.

Green chemistry for biotechnological processes:
- Design of new separation strategies.
- Enzymatic grafting for improvement of wood properties.
- Lignin valorisation as green binder and coating.
- Green H2 production.

Offer

- Characterization of materials.
- Water characterization and treatment.
- Synthesis of materials with environmental applications.
- Waste recovery: Circular Economy.
- Evaluation and design of production processes.
- Organization of training courses.

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, energy, CO2 conversion.

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BIOTECHNOLOGY, ENERGY AND ENVIRONMENTAL ENGINEERING

Research lines

- **Extraction of molecules of industrial interest:** Focus on the development of methods to obtain valuable compounds, probably related to sectors such as pharmaceutical, agroindustrial or energy.
- **Synthesis and application of new solvents:** Specialization in sustainable chemistry solutions with impact on the circular economy, which is relevant in contexts of stricter environmental regulation.
- **Design of processes for the elimination of contaminants:** A clear environmental approach, with applications in the remediation of water, soil and atmosphere

Offer

- **Greener extraction of molecules of industrial interest:** Focus on the development of sustainable methods to obtain valuable compounds, probably related to sectors such as biotechnological, pharmaceutical, agroindustrial or energy.
- **Synthesis, characterization and application of new solvents:** Specialization in sustainable chemistry solutions involving eutectic mixtures and ionic liquids with impact on the circular economy, which is relevant in the context of a stricter environmental regulation.
- **Design of processes for the elimination of contaminants and CO2 capture:** A clear environmental approach, with applications in the remediation of water, soil and atmosphere.
- **Technological optimization and evaluation of biofuel production processes:** Design of more sustainable solutions for the synthesis of synthetic fuels like bioalcohols and biodiesel.

Keywords

Eutectic mixtures, ionic liquids, greener extraction processes, biofuels, CO2 capture, contaminants remediation, industrial bioprocesses, value-added metabolites, bioprocess modelling.

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ECOLOGY AND ZOOLOGY

Research lines

Marine pollution
- Sensitivity of marine invertebrate to pollutants.
- Toxicity of antifouling products.
- Chemical speciation and bioavailability of metals.
- Integrated assessment of marine pollution.

Environmental asessment
- Organisation and structure of benthic communities and ecosystem functioning.
- Impacts of invasive species and climate change on ecosystem.
- Nature-based solutions to mitigate climate change.
- Environmental impact of plastics.

Marine resources
- Study of the effects of global warming on invertebrates of commercial interest, reproductive and larval biology.
- Mapping of commercially important resources, including algae and invertebrates, using remote technology.

Cryopreservation of marine biological resources
- Development of advanced cryopreservation protocols for marine biological resources, from model organisms to those of commercial interest.
- Theoretical cryobiology development.

Offer

Marine resources
- Assessment of marine resources.
- Assessment and study of the reproductive status of marine resources.
- Growth analysis of cultured marine species: assessment of the effects of culture conditions.
- Larval and marine invertebrate culture.

Marine pollution assessment
- Determination of the presence and concentration of metals, Zn, Cd, Pb, Cu in water.
- Determination of polycyclic aromatic hydrocarbons and organochlorine compounds.
- Chemical, toxicological and biological analysis of water.
- Assessment of coastal marine pollution.

Environmental assessment
- Quantification of the production and biomass of marine ecosystems.
- Analysis of marine ecosystems for conservation and impact studies.
- Stable isotope analysis of food webs.
- Impact of invasive species and climate change.
- Evaluation of microhabitats in buffering impact of climate change.
- Evaluation of the potential of coastal ecosystems to absorb CO2.

Cryopreservation of marine biological resources
- Development of advanced cryopreservation protocols with long-term post-recovery evaluation.
- Cryoprotecting solutions development and testing.
- Cryodamage detection.
- Biotechnology development and testing in slow cooling and vitrification.
- Assessment of protocol implementation.
- Biobanking.

Dissemination and courses
- Environmental impact and quality assessment.
- 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, plastics, cryobiology, cryopreservation, biobanking, new technologies for monitoring, carbon storage, ecosystem functioning, coastal habitats.

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PHYStoFiSH Lab

Research lines

- Control of feed intake in fish by metabolic, neuroendocrine, and environmental factors.
- Nutrient sensing mechanisms and energy metabolism in fish.
- Interaction between mechanisms controlling feed intake in fish and stress response.
- Daily and seasonal rhythms in fish. Molecular mechanisms of the circadian clock.
- The hypothalamus-pituitary-interrenal axis and stress response in fish.

Offer

- Service Feeding monitoring in fish under culture.
- Assessment of parameters involved in feed intake and appetite regulation in cultured fish.
- Development and integral assessment (appetite, nutrition, intestinal health, digestibility, microbiota) of ingredients for sustainable aquafeeds.
- Characterization and assessment in fish of stress and welfare indicative parameters in culture conditions and during slaughter.

Keywords

Aquaculture, fish, physiology, trout, sole, turbot, zebrafish, gilthead sea bream, nutrition, feeding, feed intake, metabolism, nutrient sensors, welfare, stress, growth, ingredients, aquafeeds, rhythms.

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

Research lines

Microbiology of water, food, cosmetics and environment, microbiological quality control, microbial diversity, bacterial populations in natural resources, water and food and validation of new diagnostic techniques.

Parasitology associated with aquaculture and heliciculture:
- Diagnosis and control of parasitic diseases.

Microbiology of the aquatic environment:
- Levels of microbial contamination.
- Autotrophic microbiota of aquatic environments and aquatic organisms.
- Selection and application of marine bacteria as probiotics.
- Bacterial identification.

Microbiology and Parasitology in quality control:
- Control of industrial quality.
- Plans of cleaning and disinfection.
- Antimicrobial activity.
- Procedures of good practices.
- Zoonotic parasites in fishery products.

Parasites, global change and biodiversity conservation.

Microbiology applied to production and sustainability:
- Search for wild microorganisms for food and beverage industries.
- Optimization of fermentative processes.
- Exploitation and enhancement of agro-industrial waste. Engineering aspects of fermentation in food and forestry, etc.

Offer

- Microbiological analysis and control of food, food raw materials and water in the officially accredited Microbiology Laboratory on the Ourense Campus (certified by AENOR and accredited by ENAC).
- Product improvement and useful life studies.
- Optimization and selection of microorganisms for use in fermentative processes.
- Studies of biofilms in the agri-food sector.
- Diagnosis of parasites in water, food, wild and cultured organisms.
- Development of immunological tools for diagnosis and control of parasitic diseases and immune response studies in fishes.
- Advice to different interest groups on the control of parasites and microbial pathogens in food, water and various zootechnical activities.
- Advice on microbiological aspects related to agroecology, water and food.

Keywords

Parasites, monoclonal antibodies, diagnosis, control, zoonosis, One Health, microbial safety, aquatic microbiology, yeast, bioprocesses, agroforestry waste, industrial waste, foods, fermentation, biomass, antimicrobial activity.

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Support centers

The University of Vigo has research support centres whose aim is to provide instrumental, scientific and technological assistance in research, development and innovation work, either developed by the university itself or by other public bodies or companies, providing equipment and facilities which, due to their specificity, technological level or cost, it is advisable to maintain centrally.

Notably, in the field of biotechnology, the Centre for Scientific and Technological Support for Research (CACTI) the Research, Transfer and Innovation Center (CITI) and the Pilot plant for food industries play a prominent role.

Scientific and Technological Research Support Center (CACTI)

The CACTI at the University of Vigo offers the biotechnology sector and research community access to cutting-edge scientific infrastructure distributed across its Vigo and Ourense campuses. Its services include structural characterization of biomolecules using mass spectrometry, nuclear magnetic resonance, and X-ray diffraction, as well as advanced analysis of proteins and nucleic acids through proteomic and genomic techniques. The center also provides state-of-the-art capabilities in electron microscopy (SEM, TEM, confocal), surface analysis, and nanotechnology—essential tools for studying biocompatible materials, biosensors, and drug delivery systems.

CACTI further supports biotechnology research through specialized services in chromatography, atomic and molecular spectroscopy, elemental and isotopic analysis, and food safety technologies. Its highly qualified technical staff ensures personalized guidance and optimal use of scientific equipment.

CACTI positions itself as a strategic partner for research groups, companies, and institutions aiming to drive innovation in biotechnology, fostering knowledge transfer and sustainable technological development.

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Rerearch, transfer and innovation centre (CITI)

The CITI seeks to promote the development of R&D&I in companies by creating collaborative spaces to promote and transfer knowledge from the university to the business community through joint R&D&I projects related to the agro-food field, biotechnology, energy, environment and information technologies.

- Its main lines of work are focused on:
- 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.

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 agro-food, environmental and biotechnological fields. The service lines are mainly:

- Chemical and biological transformation lines.
- Separation, extraction and purification of compounds line.
- Food sanitation and preservation line.
- New Materials development line.

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Pilot plant for food industries

The pilot plant for agro-food industries will allow studies and scaling of processes and their control under conditions similar to those used in the agro-food industry. These facilities provide great technological support for the teaching, research and transfer functions of the research community and at the service of the agro-food industry sector:

- Design and development of new products.
- Study and optimize food preparation processes.
- Processing and control of food under similar conditions in agro-food industries.

With the aim of covering the most important areas of the Galician food sector, four product processing lines have been designed:

- Dairy products line.
- Line of meat and fish and meat and fish products.
- Line of vegetable and preserved products and baking and pastry products.
- Alcoholic beverage line: wines and beer.

Equipment:

- Fermentation or maturation chambers.
- Refrigeration and freezing chambers.
- Vacuum packaging equipment.
- New generation texturometer.
- Auxiliary equipment (pHmeters, conductivity meters, refractometers, drying ovens, centrifuge, water baths, etc.).
- Weighing platform; crusher-destemmer; stainless steel press; stainless steel tanks; always full vats; isothermal tank; plate filter; semi-automatic bottling machine; semiautomatic corking machine.
- Automatic maceration and cooking equipment, table plater, filler.

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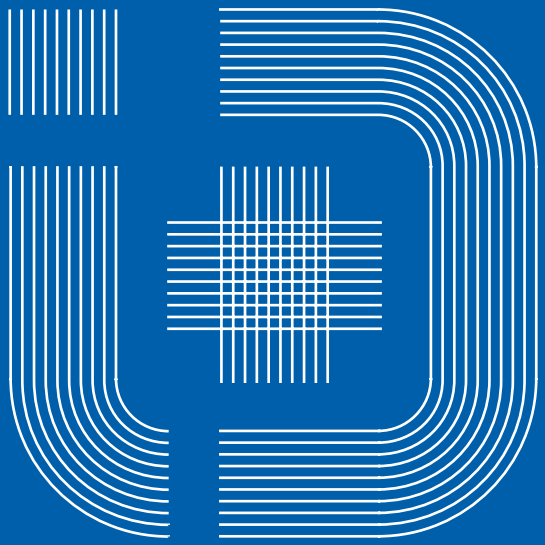

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