marmed

Development of innovating biomedical products from marine resources valorisation

ATLANTIC AREA
Transnational Programme

European Community

European Regional
Development Fund

INVESTING IN OUR COMMON FUTURE

marmed

MARMED Project is co-funded by the Atlantic Area Transnational Cooperation Programme 2007-2013. The consortium is made up by ten organisms from the five European countries included in the Atlantic Area: Portugal, Spain, France, Ireland and United Kingdom. The execution period covers the years 2012 and 2013.

The oceans continue to provide new opportunities for the discovery of marine-derived medicines. These compounds encompass a wide variety of chemical structures and functionalities. Nature has yielded several materials and compounds with large biomedical efficacy. So far, over 50% of the estimated drugs currently used to alleviate human diseases and suffering are derived in some manner from natural products. In this context, marine and fluvial resources are a vast reserve for the discovery of novel biomedicine principles and materials. Among the many bioactive molecules already isolated from marine sources, only few candidates have reached the stage of clinical trials and pharmaceutical market. Any natural products from marine or aquatic origin have to necessarily compete with man-designed alternatives produced by computational and synthetic chemistry. Nevertheless, there is still an enormous scientific gap on what concerns the potential combined or isolated use of biomolecules and biopolymers in the context of regenerative medicine and cellular complementary therapies.

These gaps can only be solved by the academic and industry inputs, to produce waste solutions, benefits and savings. In this sense, MARMED has the ambition to allow the continuous, sustainable and economically viable exploitation of the natural resources of coastal regions and fluvial basins and aquaculture by increasing the added value of many of the constituents of these resources. It aims to develop ecologically friendly technologies for the conversion of residues into products with industrial application through: (i) the establishment of simple, efficient and economically viable methods to extract and purify the substances found in marine and fluvial flora/fauna and aquaculture; (ii) the valorization of the extracted components by biochemical and biotechnological methods; (iii) the development of innovative products for applications in the biomedical field, which represents a step further, since instead of just showing what can be done, already aspires to obtain market driven products.

In this frame, the MARMED project exploits the valorisation of marine and aquaculture residues through the exploitation and valorisation of two parallel and related vectors:

1. The isolation and purification of biomolecules and biopolymers with potential biomedical application and;
2. The development of naturally inspired materials to be applied in the context of pharmaceutical, medical and nutraceutical areas.

The current concern with the environment is a manifestation of the unbalance caused by human exploitation of natural resources. Finding new ways of overcoming or at least better exploiting natural derived resources is a challenging task. Therefore, MARMED follows the Europe 2020 Strategy, namely the priority for a Sustainable Growth, ensuring a sustainable development of the technologies created through the valorisation of the natural resources. Associated to this development are the social-economical benefits brought by a project with this dimension and focus, relying on tradition and know-how of the regions involved.

Partners

1. 3B's Research Group (Coordinator)

Universidade do Minho.
Portugal
www.3Bs.uminho.pt

2. Aquatic Production Department

Instituto de Ciências Biomédicas Abel Salazar.
Universidade do Porto. Portugal
www.icbas.up.pt

3. Food Biochemistry Group

Agencia Estatal Consejo Superior de Investigaciones Cientificas (CSIC).
Spain
www.csic.es
www.im.csic.es

4. Applied Physics Department

Universidade de Vigo. Spain.
www.uvigo.es

5. Fishing products technology department and Control & management of marine environment and resources department

Centro Tecnológico del Mar – Fundación CETMAR. Spain.
www.cetmar.org

6. Aquaculture and Seafood Upgrading Division (DiAV)

Instituto Português do Mar e da Atmostera/
Departamento do Mar e dos Recursos Marinhos

www.ipma.pt

7. Marine environment sciences laboratory LEMAR, UMR CNRS/UBO/IRD

Université de Bretagne Occidentale. France

www.univ-brest.fr
www-iuem.univ-brest.fr/UMR6539/

8. School of Biological Sciences

Queen's University Belfast. United Kingdom

www.qub.ac.uk/bb

9. Irish Seaweed Research Group - ISRG and Dept. of Biochemistry - NFB NUI Galway. Ireland.

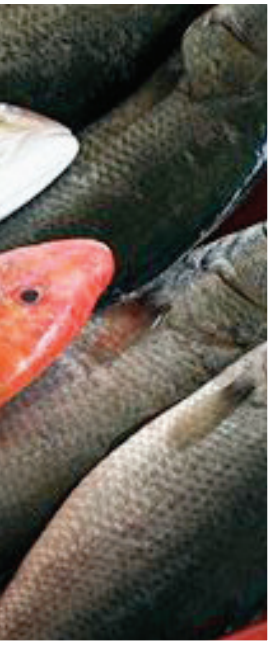
www.nuigalway.ie
www.irishseaweed.com
www.nfb.ie

10. Dpt of Biomedical Sciences and Medicine, University of Algarve. Portugal.

www.ualg.pt

MORE ABOUT MARMED

and this document



This document shows briefly the trouble with by-products from marine origin and their potential industrial valorisation along with the importance of marine organisms as a source to identify remarkable active principles.

Likewise It includes details regarding capabilities of the Research groups and Organisms which are part of the consortium of MARMED project and there is also a short description of the project with its goals, scopes and purposes.

The extracting and processing industry of fishing products is widely and historically rooted in the Atlantic Area countries. Its activity produces a wide range of by-products from many different species in remarkable amounts. These wrongly named by-products contain a great amount of bio-molecules and biopolymers which are highly potential and applicable to pharmacology, nutraceutical and biomedicine. Likewise marine organisms generally represent a huge reservoir of molecules and possibilities practically tireless and yet to be discovered. Others such as macro algae have a great potential despite their uneven use and exploitation along the Atlantic Area. Some of their applications are effluent treatment methods, source of biopolymers or food uses.

The under-use of these by products involves a double end: on one hand leads to a negative environmental impact in many cases –trophic and parasite ecology- and on the other hand means a way of wasting. This is opposite to the official position which stands for an integral use of resources aiming to their sustainable exploitation.

Despite the unquestionable benefits of a higher use of by-products we are still far away from reaching an acceptable valorisation rate. On one hand there is a certain logistics trouble as the spreading nature of the origin or the heterogeneous quality. On the other hand the need to promote research is still a key factor to discover and identify the value hid inside those by-products and organisms.

MARMED Project, whose title is Development of innovating biomedical products from marine resources valorisation, is more concisely described below. It's a clear example of collective, interdisciplinary and supranational research at the service of research and industry within this field.

3B's Research Group

Universidade do Minho. Portugal

History

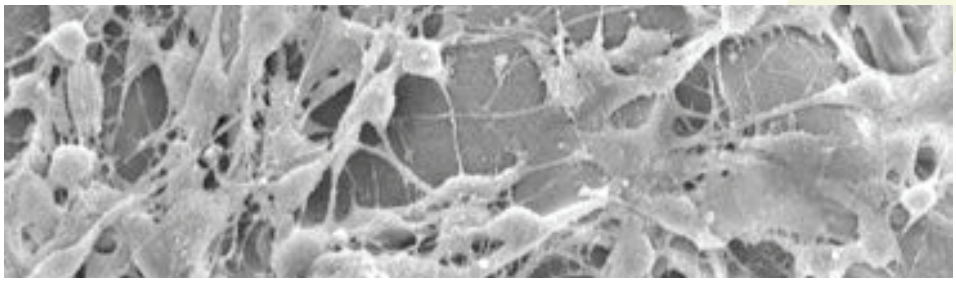
The 3B's Research Group (Biomaterials, Biodegradables and Biomimetics) was established in 1998 at the University of Minho and supports a multidisciplinary and highly skilled team which works at the interface of biotechnology, biology, biomedical engineering and materials science. Major research areas at our group include, among others, new materials development, drug delivery, tissue engineering, regenerative medicine, nanomedicine, and stem cell isolation and differentiation. The group belongs to the new Portuguese Government Associate Laboratory ICVS/3B´s, the only one of these laboratories totally based in the University of Minho. This is collaboration with the Institute of Health and Life sciences of U. Minho. It also leads the European Institute of Excellence on Tissue Engineering and Regenerative Medicine that has branches in 22 locations in 13 different countries.

The goal of the 3B's Research Group is to develop novel biomaterials (hydrogels, scaffolds, membranes, nano/microparticles) based on natural polymers for applications in drug delivery and tissue engineering of bone, cartilage and skin.

The 3B's Group is also engaged in finding workable solutions to certain societal problems. Stemmatters is a spin-off of the 3B's Group developing services and products in the areas of stem cells and materials technology. 3Bs's multi and inter disciplinary integrated research environment thus gives the Group a strategic advantage over other groups in finding solutions and in transferring those results for public use and society benefit.

Research Areas

- Tissue engineering (TE) of bone, cartilage and osteochondral defects
- Production of porous biomaterials and TE scaffolds, including rapid prototyping approaches
- Systems for the controlled release of bioactive agents
- Development and modification of natural origin materials
- Polymer science applied to the development of new materials
- Characterization of biomaterials under dynamic loads
- Behaviour in simulated physiological solutions and degradation mechanisms
- Processing and characterization of biodegradable systems including the development of bioactive and bioinert composites
- Surface modification of biomaterials and TE scaffolds, including patterning (nano and micro)
- Bioactivity, biomineralization, biomimetic coatings and bioceramics
- Biomaterials-protein interactions
- Hydrogels and novel degradable bone cements



- Nanobiotechnology applied to regenerative medicine
- Smart and responsive materials for tissue engineering and sustained release
- Membranes and wound dressings of natural origin
- Biocompatibility and immunological responses to biomaterials
- Adult Stem cells: Isolation, culturing and differentiation
- Co-culture systems for tissue engineering applications
- In-vivo tests for biocompatibility and TE constructs functionality assessment

Research developed under MARMED project

The contribution of the 3B's Research Group for the MARMED project centres on the valorisation of resources and subproducts of aquatic origin for biomedical applications, through:

- Isolation and characterization of polymers and ceramics from aquatic origin materials.
- Chitin and chitosan, hydroxyapatite, collagen, carrageenans, ulvan.
- Processing of biopolymers and ceramics from aquatic origin.
- Mechanical and Biological characterization.
- Development of biomedical applications using a wide range of methodologies.
- Scaffolds, particles, membranes, hidrogels.

External Services

- Materials Characterization (Mechanical testing including static testing and high-frequency dynamic fatigue testing in a tensile, compression and flexural mode; Measurements of viscoelasticity; Determination of storage and complex modules; Module determination depending on temperature, frequency or time).
- Biological Characterization (Sectioning, staining and permanent mounting of cryo-preserved in vitro and in vivo samples; Sectioning, staining and permanent mounting of chemically preserved in vitro and in vivo samples; Microscopic analysis of all obtained samples).
- Polymers Processing (Processing of polymers and composites; Development of materials for specific applications).

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Aquatic Production Department

Instituto de Ciências Biomédicas Abel Salazar da Universidade de Porto. Portugal

U.PORTO

INSTITUTO DE CIÊNCIAS BIOMÉDICAS ABEL SALAZAR
UNIVERSIDADE DO PORTO

History

With origins dating back to the eighteenth century, the University of Porto (U. Porto) is currently the largest education and research institution in Portugal. Close to 31000 students, 2300 teachers and researchers along with 1700 administrative staff attend its 15 schools and 69 scientific research units, spread across 3 university campuses located in the city of Porto. With 69 research units, the University is responsible for over 20% of the Portuguese articles indexed each year in the ISI Web of Science.

ICBAS is a Faculty of the University of Porto with structure of university school and centre of activities including teaching, scientific research, culture and service to community. It is divided in 10 Departaments, the Department of Aquatic Production (DPA) being one of them.

Research Areas

- Aquaculture production systems
- Mollusc physiology and growth
- Fish nutrition
- Fish health and welfare
- Aquatic Ecology
- Aquatic Toxicology
- Seafood technology, quality and safety
- Seafood waste management

Research developed under MARMED project

- Identification and characterization of fish processing industries that produce waste
- Identification of adequate preservation methods and upgrading technologies for each type of residue and corresponding geographical source
- Collection of data about quality, quantity, transport and obtaining costs of residues
- Dissemination of results, mainly at medical, biological and pharmacological levels

External Services

- Bioterium (approved for research purposes)
- Optical and electronic microscopy
- Veterinary consultancy
- Human infertility studies
- Pharmacological studies
- Support to aquaculture projects in all implementation phases
- Analytical work and consultancy support in food technology, microbiology, hygiene and safety, fish farm sanitary pathology

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Food Biochemistry Group

Marine Research Institute (IIM). Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC). Spain

History

The Institute of Marine Research (IIM) is part of the Higher Council Scientific Research (CSIC), founded in 1951 as a coastal laboratory depending on the Instituto de Investigaciones Pesqueras (Barcelona). In 1978 the laboratory became independent, under the name of "Instituto de Investigaciones Pesqueras de Vigo". In 1986 the current name "Instituto de Investigaciones Marinas" (IIM) was adopted, more consistent with its present-day multidisciplinary marine research focus. The Seafood Biochemistry Group starts its activity in 2000 focusing on the development of methods for the identification and quantification of fish species in food products along with the management and valorization of fishery discards and fish by-products generated along the food chain.

Research Areas

- Total catch use: analysis and characterization of useful components in discards and fish wastes. Development of technological processes at laboratory and pilot plant level.
- Modifications of the fish components during preservation processes: changes in lipids and proteins.
- Estimation of fish quality: analysis methods for seafood quality indexes.
- Development of methods for the identification and quantification of species in fishery products based on nucleic acid analysis.

Research developed under MARMED project

Identification of marine origin materials potentially useful for biomedical application (fishery discards and by-products). Identification of companies (fishing vessel owners, fish processors, valorisation industries) that can collaborate with the project and promotion of the establishment of contact between these actors. The IIM-CSIC is the leader of this task.

Development of semi-industrial processes for the production of collagen and collagen hydrolyzates from fish skin to be used in the preparation of value added biomedical or pharmacological materials.

Isolation and characterization of chitin/chitosan from marine crustaceans and squid pen, testing their potential application in the biomedical field.

External Services

The Group has created along with the USC a spin-off for the exploitation of molecular methods for species identification and similar technologies. Xenotechs laboratorios S.L. also offers other types of quality and food safety control analysis as well as services of technology and innovation advice.

BA group also develops research and innovation projects and contracts adapted to Fishing and Aquaculture companies.

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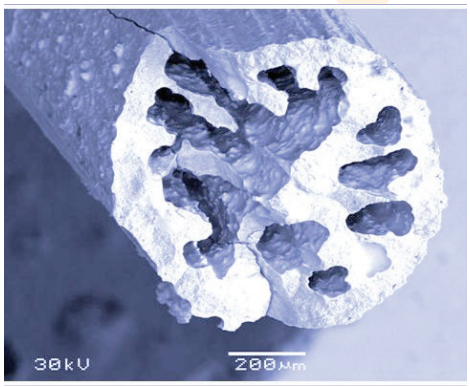
Applied Physics Department

Escuela de Ingeniería Industrial. Universidade de Vigo

Universidade Vigo

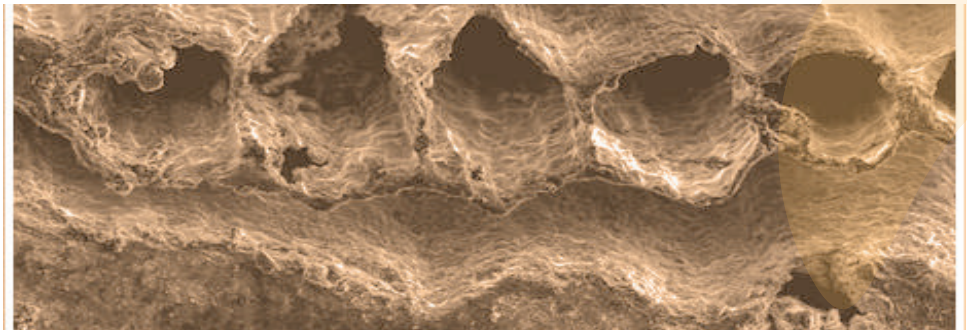
History

The Research groups began their activities in 1982, in the Department of Applied Physics at the School of Industrial Engineering, dedicated to the development of new methods and laser techniques for manufacturing materials for micro and optoelectronic devices anf for protecting metals against corrosion and wear towards industrial application. Throughout their career, they experienced a high degree of expansion and specialization forming two independent research groups ("New Materials" and "Industrial Application of Lasers") covering areas in the use of laser technology oriented, among others, to biomedical engineering and processing of materials with high power lasers for aerospace, automotive and energy applications.



Research Areas

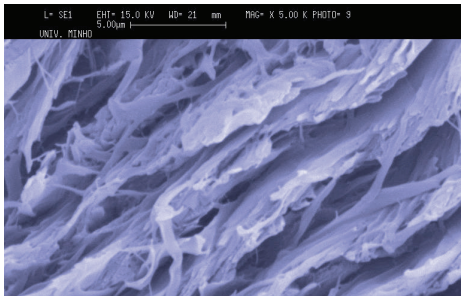
- Designing and processing of bioactive and biomimetic coatings.
- Production of bio-inspired SiC ceramics for dental and orthopedic implants.
- UV-laser assisted growth of group IV thin film semiconductors and of dielectric coatings for applications in photovoltaic, micro- and nano-electronics, photonics and biosensors.
- Morphological and chemical micro- and/or nanostructuring of metallic and polymeric surfaces for biosensors, drug delivering implants and solar cells, using nano- and femtosecond lasers.
- Characterization of thin films, surfaces, interfaces, interfaces and nanostructures.
- Simulation of the interactions between laser radiation and solids through numerical methods.
- Macro-processing of substractive materials (cutting materials with high viscosity) and additive materials (surface treatments, laser recharge and rapid prototyping).
- Laser micro-processing of materials (surface texturing, micro-drilling and laser microrecharge).
- Nano-processing of materials (synthesis of nanoparticles and nanofibers) with applications in different sectors as for a biomedical, aerospace, automotive and energy.



Research developed under MARMED project

The research activities undertaken under the project MARMED are focused towards their application as scaffolds for tissue engineering, ceramic filters for antimicrobial purposes, new coatings for orthopedic and dental metal implants and new susbstituted HA granulate as bone fillers. Thus, the different tasks to carry out will deal with:

- Biomimetic coatings on marine ceramic scaddolds
- Functionalization of CaP porous structures (from Coralline officinalis)
- New doped apatites from shark teeth (pellets, nanoparticles and coatings)
- Identification of CaP content on crustacean exoskeleton (collaboration IIM-CSIC)
- Production of CaP from fish bones
- Production of HA nanoparticles from fish bones
- Synthesis of nanofibers from marine origin
- Identification of CaP content on shark's skin



External Services

- Technologies for processing of biomaterials coatings of CaP, bioceramic scaffolds, nanoparticles and nanofibers.
- Laser technologies for surface treatment.
- Analyticla Techniques as FTIR and Raman Spectroscopy, Electron Microscopy (SEM; TEM), Ellipsometry, Profilometry, Bioactivity tests.
- Consultancy and training in laser technologies.
- Feasibility studies of laser-based processes.
- Designing of applications based on laser.

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Centro Tecnológico del Mar Fundación CETMAR. Spain

Fishing products technology department
Control & Manegement of marine environment and resources department

CETMAR
CENTRO TECNOLÓGICO DEL MAR

History

This department is one of the seven areas included into Cetmar's structure from its origin in 2001 when its activity started. According to the foundational principle its activity has been focused on promoting and facilitar contacts between scientific, administrative and business sectors. The way to put that idea into practice has been projects coordination and managing, development of all types of studies, organization of seminars, organization of dissemination and transfer events for the service of ideas which are key for the fishing and maritime sectors. This department intends to promote projects that make the most of capacities and skills of the different stakeholders included in the Galician R&D system as well as other national and European organisms. This developed establishing sinergies give results as the above mentioned initiatives.

Research Areas

- Implementation of new preserving technologies by minimum processing in the manufacture and preservation of fishing products.
- Valorisation of products derived from the value chain coming from the Fishing and Aquaculture sector.
- Food safety: Traceability, diagnosis and assessment of parasites; development of active packaging.
- Fishing resources: Technological valorisation of alternative species as a source of raw material: sustainable exploitation of resources.

Research developed under MARMED project

- Raw material supply for experimentations by research groups inside the consortium.
- Socioeconomics studies:
  Search of biomedical companies in Spain and/or abroad inside the Atlantic Area
  Listing of potentially commercial products from resources of marine origin
- Interaction with companies:
- Design and implementation of a marine by-products on-line marketplace (based on the previous one developed by Biotecmar Project).
- Start-up of pilot experiences shared by industry-research groups
- Dissemination activities:
  Edition of the book "Nutraceuticals and functional food of marine origin"
- Organization of seminars
- Design and implementation of the project's website
- Design and edition of the project's flyer

External Services

- Viability studies related to by-products valorisation and similar issues.
- Analysis of products in the market: technical specifications, formats, origin, etc.
- Organization of events: seminars, workshops, conferences.

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Aquaculture and Seafood Upgrading Division (DivAV)

Instituto Português do Mar e da Atmósfera.
Departamento do Mar e dos Recursos Marinhos. Portugal

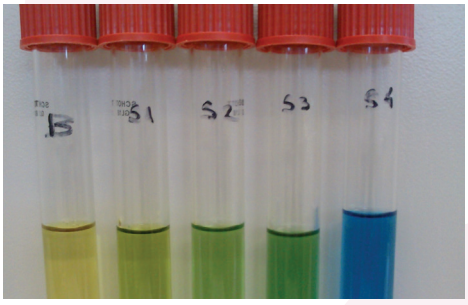
ipma
instituto português do mar e da atmosfera

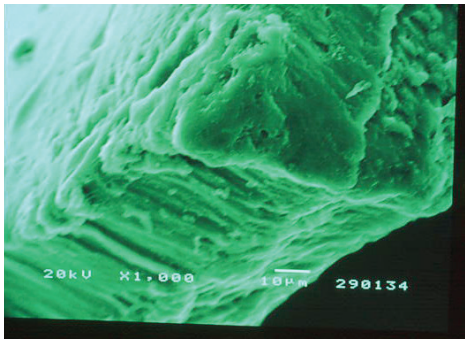
History

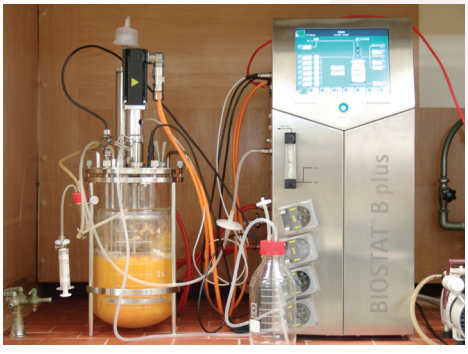
IPMA, I.P., is a public research institute created in 2012 following the merging of Instituto de Meteorologia (IM) and Instituto de Investigação das Pescas e do Mar (IPIMAR). IPMA is devoted to carry out research, technological development, innovation, services and dissemination activities on the areas of the sea and atmosphere. IPMA also acts as counsellor to the national authorities on fisheries, fishing industry, aquaculture, and fishery organisations, and is member of a high number of national and international commissions. The activities on sea research are developed in the Sea and Marine Department (Departamento do Mar e dos Recursos Marinhos) of IPMA. They include studies on the sustainable exploitation of marine resources, marine biodiversity, aquaculture, and upgrading and processing of high quality seafood and aquaculture products. The latter activities are developed in the Division of Aquaculture and Seafood Upgrading Division (DivAV).

Research Areas

- Research activities on the aquaculture production of different fish species and bivalve molluscs.
- Optimization of diets for the different stages of the cycle life of targeted fish species, improvement of the sanitary control prevention and treatment of farmed marine species.
- Development of technologies on fish preservation and processing, upgrading of underutilized species and fish by-products by biotechnological processes.
- Quality and safety of fish products in the value chain.







Research developed under MARMED project

- Identification and characterization of marine origin materials and by-products from fish processing industries in order to evaluate their geographical distribution and to select alternatives for their upgrading.
- Evaluation of the state of the art on marine resources and by-products upgrading.
- Technical developments on the upgrading of marine biomaterials and their biomedical applications. The activities will be focussed on the:
- Development of new methodologies for the preparation of fish protein hydrolysates and characterisation of their biological activities.
- Study of fish oil applications in cosmetics and health products.
- Production of squalene and n-3 fatty acids from marine microalgae produced under heterotrophic conditions. Identification of biomedical companies that may use added value materials prepared from marine resources.

External Services

- Support to the fishing and aquaculture sectors in the biochemical, nutritional, microbiological and sensory characterization of fishery and aquaculture products, as well as in the evaluation and communication of the risk-benefit associated.
- Development of research projects and contracts with enterprises of the aquaculture, fishing and processing sector.
- Promote the application of biotechnology and innovative technologies for the production of marine products for health, convenience and consumer welfare.

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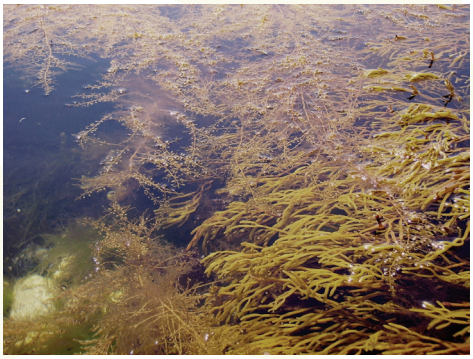
Marine environment sciences laboratory, UMR,CNRS/UBO/IRD

Université de Bretagne Occidentale. France

History

The Université de Bretagne Occidentale (UBO) was established in 1971 and regroups today more than 2500 people, among them 950 researchers. 20 years later, in 1991, the European Institute for Marine Studies (IUEM) and the Marine Environmental Sciences Laboratory (LEMAR) were created. IUEM regroups 350 researchers that study all aspects of marine sciences developed in polar, tropical and temperate areas: biology, biochemistry, chemistry, economy, geography, geology, law, physic, etc.

Since 1991, the LEMAR brings together biologists, chemists and physicians with the objectives (1) to understand and model marine systems of the biosphere, (2) to define characteristics of organisms and their environment and (3) to make detailed descriptions of their interactions. So a strong multidisciplinary approach is essential. With 160 people, the LEMAR research unit has an interdisciplinary policy, based on strong skills in different disciplines, which is in put into practice in the everyday scientific activities of the unit.



Research Areas

- Responses of organisms to global change: an integrative approach (Team 1)
- Physiological responses to environmental pressures: adaptative consequences.
- Adaptations of organisms to environmental variations: Individus, life-cycle, populations
- Biotic interactions and environmental variability (INTERBIOL, Team 2)
- Ecology and Evolution of virus-bacteria-eukaryotes interactions
- Sestons - filter-feeding organisms interactions
- Chemical ecology of microalgae and macrophytes

- Integrative studies in the functioning of ecosystems (Team 3)
- Biogeochemical cycle and marine chemistry
- Hydrodynamism, biogeochemical cycle and marine ecosystems
- Structure and dynamic of ecosystems
- Biogenic archives of the functioning of costal ecosystems

Research developed under MARMED project

- Updated data about Seaweed companies in France
- Cartography of Seaweed companies in France
- Estimation of biomass harvested in Brittany concerning macrophytes
- Extracts from marine plants (halophytes and seaweeds).
- Hydrolysates of fish or crustacean by-products
- Hydrolysates of seaweeds polysaccharides
- Screening of antioxidant and antimicrobial activities
- Supplier of:
- Active extracts from seaweeds and /or halophytes
- Hydrolysates from seaweed, fishes, crustaceans...
- Cocktails of compounds

External Services

- Applied techniques.
- Marine chemistry and biochemistry.
- Biochemical analysis .
- Biological activities (in vitro tests).
- Enzymatic hydrolysates technologies (bioreactors)
- Chromatography, spectrometry Extraction, separation, centrifugationFractionation / purification
- Added value working lines
- Collagen and gelatins
- Enzymes (pepsins, Phosphatases alkaline, etc.)

Fishmeal and fish oil
Hydrolysates and/or ensiled products
Peptides (neuroactive, inmunoactive, etc.)
PUFAS (Polyunsaturated fatty acids)
Chitin and chitosan
Phenolic compounds
Polysaccharides.

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School of Biological Sciences

Queen's University Belfast. United Kingdom

Queen's University Belfast

History

The current QUB School of Biological Sciences developed by a series of mergers. The Departments of Botany, Zoology and Biochemistry fused to form the School of Biology and Biochemistry. In 2005 the School of Biological Sciences was joined by the new Institute of Agri-Food & Land Use and the School currently has over 60 academic staff. The School is one of four in the Faculty of Life and Health Sciences. Its academic staff members have diverse research interests ranging from cancer biology and molecular biology of plants to conservation of biodiversity. The whole School, including the new Institute of Global Food Security will move to a new building in 2016. In addition, the Queen's University Marine Laboratory is at Portaferry on Strangford Lough.

Research Areas

- Macroalgae as novel sources of biomaterials including ceramics
- Macroalgae as novel sources of bioactives such as quorum sensing inhibitors and anti-viral compounds
- Macroalgae as potential sources of biofuels
- Other marine organisms with potential for biomimetic design, such as sponges
- Phylogenetic analyses of marine algae and sponges clarifying their positions in their respective branches of the Tree of Life.
- Nomenclature of marine algae: to determine systematic relationships and correct names with regard to type materials
- Extraction and analysis of "ancient DNA" from old important herbarium specimens to determine correct application of names – which could be important in patent development.

Research developed under MARMED project

- Within MARMED we will collaborate with other groups to supply marine algae and sponges with application for biomaterials, as well as for the potential incorporation of bioactives in the materials to reduce harmful biofilm development e.g. on biomedical implants. We will explore the potential use of some marine algae as "organic" remedies for minor ailments, to be exploited via the health food market.
- In particular, we will provide:
- Marine ceramic scaffolds from Corallina officinalis for exploitation by our partners
- Extracts of algae shown to be active against common human pathogens, with the potential for incorporation into biomaterials
- Assays of anti-viral activity of various red algae to our SME partner Algaran.
- Laboratory analyses of green seaweeds potentially effective in reducing diabetes.

External Services

- Biodiversity and conservation services through the School's Quercus Natural Heritage Partnership www.qub.ac.uk/sites/Quercus/NaturalHeritageResearchPartnership/
- Sensor Technology Research http://www.qub.ac.uk/research-centres/ASSET/
- Metabolomic/Proteomic Research
- Spectroscopic and Isotopic Fingerprinting with a focus on food safety
- Analyses of stable isotopes for ecology and community studies

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Irish Seaweed Research Group - ISRG and Dept. of Biochemistry - NFB

NUI Galway. Ireland

History

The ISRG was established in 1994 by Prof. Michael D. Guiry as the Irish Seaweed Industry Organisation (ISIO), which operated as the connecting bridge between the seaweed industry and research centres in Ireland. In 1998, when Prof. Guiry took direction of the Martin Ryan Institute for Marine Science, and also under the recommendations of the National Seaweed Forum Report (2000), a seaweed research group was established, the Irish Seaweed Centre. The ISRG is a group of scientists led by Prof. Mark Johnson working on different areas of algal research in several national and EU funded projects.

The Network of Excellence for Functional Biomaterials, NFB, was initially established in 2003 by Centre Director Prof. Abhay Pandit. The centre was incorporated into a Strategic Research Cluster (SRC) in 2007 with funding from Science Foundation Ireland (SFI) to establish collaborative partnerships with national and international universities and industries. NFB is a multidisciplinary research centre, based at the National University of Ireland, Galway, which hosts over seventy biologists, chemists, scientists, engineers, and clinicians. NFB specialises in the development of biomaterials platforms with focus on clinical targets in the areas of musculoskeletal and cardiovascular reconstruction, neural regeneration, soft tissue repair and ophthalmic applications, and is continuously developing functional biomaterials for innovative therapeutic solutions. Functionality for these forms is achieved through custom chemistries which facilitate the attachment of surface tethered moieties or encapsulated therapeutic factors including drugs, genes, cells, growth factors, hormones and other active agents to specific target sites.

Research Areas

- Focus on fundamental and applied areas of algal research- molecular systematics and taxonomy, chemical analysis: nutrition and bioactivities, aquaculture, heavy metal analysis and resource management.
- At NFB, inter-disciplinary teams are developing innovative functional biomaterial solutions to address current clinical challenges. The current focus areas include: Musculoskeletal Research, Neural Regeneration, Soft Tissue Repair and Cardiovascular Regeneration.

Research developed under MARMED project

The research activitiesundertaken by the two groups in NUI Galwayare focused towards the technical developments of marine biomaterial's valorisation and biomedical application. The ISRG is the lead Partner on this activity which aims to establish a review of state of the art methodologies for valorisation of marine resources. The Marmed project aims to produce "real cases" of valorisation. In this area the ISRG are investigating the valorisation avenue of producing dietary supplements based on macroalgae enriched with trace elements. NFB's interest lies in the development of marine algae (diatoms) as a novel drug delivery system for application in the pharmaceutical industry..

External Services

ISRG

- Biological activities (in vitro tests, in vivo tests).
- Molecular biology.
- Extraction, fractionation, purification of seaweed compounds.
- Identification of seaweeds.
- Ecological surveys.
- Advice on seaweed best harvesting practices.
- Seaweed cultivation expertise: onshore (tank) and offshore (long-line).
- Guidance on seaweed (including by-product) utilisation opportunities.
- Proximate chemical analysis- ash, moisture, protein, lipid and carbohydrate content.
- Biochemical analysis- amino acid and fatty acid analysis.
- Marine chemistry and biochemistry- analysis of phenolic compounds and antioxidant properties.
- Heavy metal analysis.

NFB

- Biomaterials Science.
- Formulation.
- Characterisation.
- Nanostructures.
- Linking Systems.
- Drug Delivery.
- Design on Clinical/Market Need.

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UAlg
UNIVERSIDADE DO ALGARVE

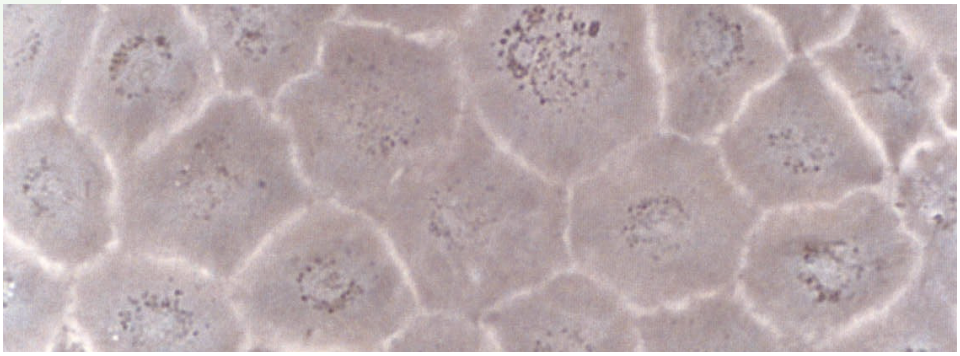
EDGE
Molecular Biology Laboratory

History

Created in 1994 and located at the University of Algarve (Faro, Portugal), EDGE research group is headed by M. Leonor Cancela (Full professorat the University of Algarve). Itis integrated in the Centre of Marine Sciences (CCMAR) and is composed by approximately 22 persons (including 8 PhDs). Major research activities are related to skeletogenesis, bone formation, molecular evolution of mineralization-related proteins, using fish as model organisms. Additional areas of interest are: biotechnological exploitation of marine biodiversity, use of Perkinsus to uncover anti-malarial drugs, and genetic characterization of economically relevant fish broodstock/progeny. EDGE is also actively involved in science dissemination in schools through the Project Lab-it created and developed by the coordinator of the EDGE.

Research Areas

- Bone related-mechanisms involved in the onset of skeletal anomalies and development of ectopic cartilage-like tissues,
- Skeletogenic and osteogenic effects of nutritional factors (vitamins, fatty acids) and environmental pollutants,
- Zebrafish endoskeleton in an evo-devo perspective,
- Development of in vitro cell systems capable of mineralization,
- Transcriptional and posttranscriptional regulation of mineralization marker genes by bone-specific transcription factors and microRNAs
- Development of a high throughput screening for osteogenic molecules
- Characterization of the role of matrix Gla protein and Gla-rich protein in skeletogenesis
- Use of zebrafish as model system for human diseases affecting bone and cartilage development and mineralization.



Research developed under MARMED project

- Molecules/extracts purified/prepared within the scope of MARMED project from by-products of marine organisms will be tested in vitro for proliferative and mineralogenic activities. Marine molecules will be either supplemented in cell culture medium using suitable vehicle (e.g. EtOH or DMSO) or used to coat culture dish surface.

Offered Services

- Valuation of the mineralogenic properties of molecules/extracts using in vitro (fish cell lines) and in vivo (zebrafish fin regeneration) bone-derived systems.
- Evaluation of skeletal deformities in farmed fish
- Consultancy and training in tissue calcification

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MARMED