BlueShell

Exploring Shellfish By-products as sources of Blue Bioactivities

MarineBiotech

PROJECT FACTSHEET

CALL 2 | DECEMBER 2016

ABSTRACT

About 70% of annual shellfish production ends up as by-products. Apart from use in chitin/chitosan, this marine biomass is either used to make fertilizer/low value products or is sent to landfill, incinerated or dumped at sea. BlueShell will address this problem by exploring 3 typical shellfish by-products; shrimp shells, crab shells and defect mussels, for potential (bio)active compounds targeted at the sustainable supply of safe, healthy foods. Research indicates that the abundance of hepatopancreas tissue, the open circulatory system, the filtering nature and the shell structures render crustaceans and bivalves as sources of unique proteins/peptides, unusual fatty acids, pigments and chitin. Applying enzymatic hydrolysis or fermentation will enhance bioactivity through controlled proteolysis, lipolysis and production of low molecular weight compounds. It will facilitate fractionation through lipid-protein disconnections and demineralization/de-proteinisation. Different starter cultures will be tested against a standardized enzymatic hydrolysis as reference. Peptide-, lipid- and chitin-enriched fractions will be explored for (bio)activities relevant to: (i) functional foods development, (ii) food safety applications and (iii) plant health applications. Molecular characterisation of the most active fractions will help identify the specific compounds involved. BlueShell will investigate upscaling feasibility and market potential for the most interesting cases.

Katleen Raes, Project Coordinator
Ghent University, Belgium

Topic:

- Shellfish by-products

Marine biomass:

- Crustacea

Source of marine biomass:

- marine biomass processing by-products and waste fractions

Keywords:

fermentation, enzymatic hydrolysis, mussel, crab, shrimp, nutrition, food safety, plant health, antifouling, antimicrobial

Total costs*: € 1.319.000

Funding granted*: € 1.152.000

Duration: 3 years (2017-2019)

** Exact amount may change after completion of national contracts*

CONSORTIUM

Name	Organisation	Country
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Ingrid Undeland	ChalmersUniversity of Technology	Sweden
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Ragnhild Whitaker	Whitaker Nofima	Norway
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BLUETEETH

Marine Origin Biopolymers as Innovative Building Blocks from the Sea for the Development of Bioresorbable Multilayered Membranes for Guided Bone Regeneration

MarineBiotech

PROJECT FACTSHEET

CALL 2 | DECEMBER 2016

ABSTRACT

Natural origin polymers from algae and arthropods can be obtained in large scale, and a great effort has been paid to find applications for such high-added value materials. Periodontal disease is frequent in humans and constitutes, together with dental caries, the principal cause of tooth loss in adults. Currently, one of the available treatment strategies for periodontal disease comprises the use of non-resorbable or resorbable membranes as barrier membranes for guided tissue/bone regeneration (GTR/GBR). Such membranes will act as a physical barrier to protect the defect site and to prevent soft tissue to reach the injured area, as well as "guide" the bone regeneration process. Several synthetic and natural membranes are currently being used for GTR/GBR to improve periodontal regeneration but, so far, complete regeneration has not yet been reported. In this concern, BLUETEETH intends to create a pioneering and innovative biocompatible and bioresorbable free-standing (FS) multilayered membrane that would address the limitations of the current ones, in terms of regeneration potential, by promoting an effective GTR/GBR to treat periodontal disease. Such multilayered membrane will have a special design and composition, thus allowing the spatiotemporal control of several parameters, including biocompatibility, biodegradability, mechanical performance, bioactivity and bioadhesion. This project attempts to develop the entire pipeline, bridging the isolation of the marine raw materials up to the final device, with expected improved medical performance and technical characteristics suitable to accelerate market entry.

João Mano, Project Coordinator
University of Aveiro (UAVR), Portugal

Topic:

- Marine origin biopolymers

Marine biomass:

- Crustacea

Source of marine biomass:

- marine biomass processing by-products and waste fractions

Keywords:

Blue biotechnology, Marine environment, Value-added marine origin by-products, Chitosan/Chitosan chemical modification, Bioactive agents, Layer-by-Layer assembly, Bioresorbable membranes, Biomedical applications, Guided bone regeneration, Periodontal disease

Total costs*: € 1.005.000

Funding granted*: € 797.000

Duration: 3 years (2017-2019)

CONSORTIUM

Name	Organisation	Country
João Mano	University of Aveiro (UAVR)	Portugal
Már Másson	University of Iceland (UI)	Iceland
Hélène Lauzon	Primex ehf (PRIMEX)	Iceland
Janne Reseland	University of Oslo (UiO)	Norway

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CYANOBESITY

Cyanobacteria as a source of bioactive compounds with effects on obesity and obesity-related co-morbidities

MarineBiotech

PROJECT FACTSHEET

CALL 2 | DECEMBER 2016

ABSTRACT

An urgent demand for new anti-obesogenic compounds is present, and marine cyanobacteria promise to be an excellent source for natural-derived molecules and novel nutraceuticals. Some strains of cyanobacteria are commercially available for consumption due to their beneficial properties to human health. Preclinical studies have been performed in various animal models and demonstrated hypolipidemic activities in rats and mice, lowering hepatic cholesterol and triglyceride levels. In the proposed project, marine cyanobacterial strains of a culture collection will be screened for beneficial properties towards obesity and obesity-related co-morbidities (obesity, fatty liver disease, diabetes, appetite and hyperlipidaemia) and the chemical structure will be elucidated. By applying an innovative biotechnological platform, the interactions from oral administration to the blood stream will be analyzed, and with different target tissues *in vitro*. A proof of concept regarding the improvement of metabolism will be performed in a relevant physiological model. The general aim of the project is to develop novel nutraceuticals that have the potential to improve the quality of life for millions of people worldwide.

Ralph Urbatzka, Project Coordinator
CIIMAR - Interdisciplinary Center of Marine and Environmental Research, Portugal

Topic:

- Nutraceuticals

Marine biomass:

- Bacteria
- Microalgae

Source of marine biomass:

- Biobanks and repositories that are held within institutions/companies

Keywords:

obesity, metabolic disorders, white and brown adipocyte differentiation, phenotypic screening, cell-based bioassays, zebrafish-based bioassays, cyanobacteria collection, nanotechnology platform, lab-on-a-chip, chemical proteomics

Total costs*: € 1.893.000

Funding granted*: € 1.289.000

Duration: 3 years (2017-2019)

CONSORTIUM

Name	Organisation	Country
Ralph Urbatzka	CIIMAR - Interdisciplinary Center of Marine and Environmental Research	Portugal
Susana Cristobal	Linköping University	Sweden
Siegfried Ussar	Hemholtz Center Munich	Germany
Finnur Eiriksson	ArcticMass ehf.	Iceland
Margreth Thorteinsdóttir	University of Iceland	Iceland

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MARPLAST

Marine microorganisms for bioplastics production

MarineBiotech

PROJECT FACTSHEET

CALL 2 | DECEMBER 2016

ABSTRACT

The steady increase in microplastic concentration could result in dramatic effects on the vulnerable wildlife of the oceans and marine food supplies. It is therefore of immediate importance to develop novel types of polymeric materials that can be sustainably produced to address these environmental concerns. MARPLAST focuses on Polyhydroxyalkanoates (PHAs), a class of biodegradable bioplastics which are considered to be feasible replacements for current petroleum-based plastics. PHAs are polymers occurring in nature, produced among others by bacteria, and with properties similar to oil-derived polypropylene and polyesters, rendering them useful as an attractive biodegradable replacement. However, the naturally occurring PHA production pathways are not sufficiently understood, and currently known technologies for production are too costly to allow for a full-scale replacement. MARPLAST aims to develop and provide tools (bacteria, enzymes, and pathways) to enable efficient production of sustainable and biodegradable bioplastics from low-cost unexploited biomass. Focus will be on PHA-producing cold-adapted marine bacteria, which have a range of properties that make them especially suitable for industrial applications. MARPLAST will utilize expertise from the Univ of Tromsø (Norway), Univ of Bucharest (Romania) and Umeå University (Sweden) to make important progress and contributions to the transition to a bio-based European economy.

Arne Smalås, Project Coordinator
University of Tromsø – the Arctic University of Norway

Topic:

- Biodegradable bioplastics

Marine biomass:

- Bacteria

Source of marine biomass:

- culture collections
- from fishery or aquaculture activity
- marine biomass processing by-products and waste fractions
- biological materials collected from the foreshore (coastal areas between the limits of low and high water)

Keywords:

Marine bacteria, microbiology, enzymes, genomics, polyhydroxyalkanoates, bioplastic, biodegradable, sustainable resources, biomass conversion

Total costs*: € 1.793.000

Funding granted*: € 1.261.000

Duration: 3 years (2017-2020)

CONSORTIUM

Name	Organisation	Country
Arne Smalås	University of Tromsø – the Arctic University of Norway	Norway
Knut Irgum	Umeå University	Sweden
Ana-Maria Tanase	University of Bucharest	Rumania

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Novofeed

Novel feed ingredients from sustainable sources

MarineBiotech

PROJECT FACTSHEET

CALL 2 | DECEMBER 2016

ABSTRACT

The European aquaculture industry holds great promise as a provider of nutrient rich food to an increasing population. To ensure a sustainable and continued growth of the production, there is a need for an increased focus directed towards the development of effective approaches to prevent and control diseases in aquaculture species. One possibility is to develop functional feed ingredients that provide specific benefits to the fish. Such ingredients may be biologically active compounds, recovered from seafood processing by-products. This project aims to develop novel functional feed ingredients for the aquaculture industry through facilitating the recovery and utilization of valuable bioactive peptides from the salmon industry in Norway and the sea bass/sea bream industry in Italy. State of the art techniques within peptidomics and bioinformatics (often referred to as the in silico approach) will be used to identify peptides with predicted anti-inflammatory, immunostimulatory or anti-microbial properties in the different fractions of by-products. Based on the results, targeted hydrolysis and processing of the by-products will be performed to obtain fractions enriched in the relevant bioactive peptides. Assessments will be made of the degree of purification and up-concentration required before inclusion of these fractions in the feed formulations. The efficacy of the compounds as health promoting and disease-preventing ingredients will be assessed through in vitro studies and in vivo fish feed trials.

Fiona Provan, Project Coordinator
International Research Institute of Stavanger, Norway

Topic:

- Novel feed ingredients

Marine biomass:

- Fish

Source of marine biomass:

- from fishery or aquaculture activity
- marine biomass processing by-products and waste fractions

Keywords:

peptidomics, bioinformatics, peptides, bioactive, functional feed ingredients, aquaculture, value creation, in vitro, in vivo trials

Total costs*: € 1.421.000

Funding granted*: € 1.283.000

Duration: 3 years (2017-2019)

** Exact amount may change after completion of national contracts*

CONSORTIUM

Name	Organisation	Country
Fiona Provan	International Research Institute of Stavanger	Norway
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