Mar3Bio

Biorefinery and biotechnological exploitation of marine biomasses

MarineBiotech

PROJECT FACTSHEET

CALL 1 | NOVEMBER 2015

ABSTRACT

The marine biomasses to be used in Mar3Bio are brown algae and crustacean byproducts. These abundant but underexploited renewable biomasses have great potential for production of high value biomolecules. The current bottlenecks for a bio-refinery focusing on these raw materials are low yields, high energy consumption and incomplete spectrum of recovered biomolecules. Mar3Bio will tackle this by a multidisciplinary and intersectorial R&D approach, and contribute to the development of efficient and sustainable bio-refinery processes for exploitation of the selected biomasses. The main objective is to advance technology beyond state-of-the-art to I) increase the yield and quality of the products arising from early process streams by optimizing the isolation and fractionation steps performed on the raw materials, and II) modify selected fractionated biomolecules to high value products. The expected achievements will have great impact on the fulfilment of the ambitions of ERA-MarineBiotech.

Håvard Sletta, Project Coordinator
SINTEF Materials and Chemistry
Norway

Topic:

- Materials
- Cosmeceuticals (e.g. skincare)
- Health (e.g. food supplements)
- Pharmaceuticals

Marine biomass:

- Macroalgae
- Crustacea

Keywords:

Extraction, high value products, enzymes in processing steps, reduced energy consumption

Total costs*: € 3.378.920

Funding granted*: € 2.181.032

Duration: 3 years (2016-2018)

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

CONSORTIUM

Name	Organisation	Country
Håvard Sletta	SINTEF Materials and Chemistry	Norway
Vincent Bulone	Royal Institute of Technology (KTH)	Sweden
Finn Lillelund Aachmann	Norwegian University of Science and Technology	Norway
Sergio Paoletti	University of Trieste	Italy
Olav Gåserød	FMC Biopolymer AS	Norway
Gudmundur Hreggvidsson	MATIS	Iceland
Blaž Likozar	National Institute of Chemistry	Slovenia

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December 2013 - November 2017

MARBioFEED

Enhanced biorefining methods for the production of marine biotoxins and microalgae fish feed

MarineBiotech

PROJECT FACTSHEET

CALL 1 | NOVEMBER 2015

ABSTRACT

Shellfish production sites in the EU are prone to closures due to the accumulation of biotoxins, with over 26 EU regulated toxins requiring statutory monitoring. Further impacts are exerted on fish farming industries through the production of feed from contaminated shellfish. The focus of this proposal is to isolate large quantities of biotoxins using enhanced biorefining methods for the preparation of reference materials and to allow for research to be conducted on the effects of biotoxins on other important aquaculture industries. Further work will focus on enhanced production of microalgae as fish feed. Biotoxins will be sourced from contaminated shellfish, bulk algal culturing, harvesting of algal blooms in situ and enzymatic conversions. Biorefining processes will be enhanced through optimisation of algal culturing, the development and use of novel immunoaffinity and polymeric columns, reducing cost and increasing economic viability.

Dr Jane Kilcoyne, Project Coordinator
Marine Institute
Ireland

Topic:

- Feed
- Materials
- Environment and monitoring (e.g. biosensors, anti-fouling technology, bioremediation…)

Marine biomass:

- Molluscs
- Microalgae
- Fish

Keywords:

Marine biotoxins, biorefining, fish feed, reference materials, LC-MS, NMR, structure elucidation, HP20 resin, Harmful algal blooms, shellfish, monitoring, aquaculture

Total costs*: € 749.949

Funding granted*: € 749.949

Duration: 3 years (2016-2018)

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

CONSORTIUM

Name	Organisation	Country
Jane Kilcoyne	Marine Institute	Ireland
Christopher Owen Miles	Norwegian Veterinary Institute	Norway
Beatriz Reguera	Instituto Espanol de Oceanografia (IEO)	Spain
Pearse McCarron	National Research Council Canada	Canada
Fidel Delgado	Neoalgae Microseaweeds products	Spain
Stephen Burrell	Marine Institute	Ireland
Joe Silke	Marine Institute	Ireland
Ingunn Anita Samdal	Norwegian Veterinary Institute	Norway

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MicroMBT

Discovery and training of microbial biocatalysts for biomass conversion using moving bed technology (MBT)

MarineBiotech

PROJECT FACTSHEET

CALL 1 | NOVEMBER 2015

ABSTRACT

A culture collection of >100 genome sequenced marine bacteria from the Arctic region, and the Moving Bed Technology (MBT) will be used as tools to increase the value of marine rest raw materials. The bacterial isolates have been screened for biocatalyst activities (e.g., PUFA production, lipases, proteases), and hence represent an excellent starting point for this project. Inspired by the RAS (Recirculating Aquaculture system) technology, the idea is to establish and optimize microbial communities on MBT biobeads. The bacterial communities will be specifically trained into microfactories for conversion of low value rest-raw material from the fish industry. The process will be analogous to RAS, where biofilters are used to convert waste into non-toxic products. Water and lipid phases from spent medium will be collected and screened for potential products. In summary, the robust MBT method will be used in a completely new area, to convert cheap marine biomasses into new products.

Dr Peik Haugen, Project Coordinator
UiT-The Arctic University of Norway
Norway

Topic:

- Food
- Feed
- Materials
- Cosmeticeuticals (e.g. skincare)
- Health (e.g. food supplements)
- Pharmaceuticals

Marine biomass:

- Fish
- Crustacea
- Molluscs
- Macroalgae

Keywords:

Moving bed technology, Recirculating Aquaculture System, RAS, metagenomics, metabolomics, microbial factories, microbial communities.

Total costs*: € 1.832.446

Funding granted*: € 1.503.285

Duration: 3 years (2016-2018)

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

CONSORTIUM

Name	Organisation	Country
Peik Haugen	UiT-The Arctic University of Norway	Norway
Ragnhild D Whitaker	Norwegian Institute of Food, Fisheries and Aquaculture Research	Norway
Elin Moe	Instituto de Tecnologia Quimica e Biologica	Portugal
Fredrik Almqvist	Umeå University	Sweden

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NEPTUNA

Novel Extraction Processes for mulTiple high-value compoUNds from selected Algal source materials

MarineBiotech

PROJECT FACTSHEET

CALL 1 | NOVEMBER 2015

ABSTRACT

Novel enzyme-based extraction technologies will be applied to algal biomass derived from selected algal taxonomic groups including macroalgae (seaweeds), microalgae and cyanobacteria. Algal species will be chosen according to their potential to produce high bioactive levels which will be further enhanced by applying abiotic stresses. Algal extracts produced by enzymatic and traditional approaches will be tested for multiple applications, concentrating on antioxidant and antimicrobial activities with applications in food, cosmetics, animal health (aquaculture) and personal/home care. Extracts that exhibit high activities will be chemically characterised to identify active components.

Dr Dagmar Stengel, Project Coordinator
National University of Ireland Galway
Ireland

Topic:

- Food
- Feed
- Materials
- Cosmeticeuticals (e.g. skincare)
- Health (e.g. food supplements)
- Pharmaceuticals
- Environment and monitoring (e.g. biosensors, anti-fouling technology, bioremediation…)

Marine biomass:

- Microalgae
- Microalgae
- Bacteria

Keywords:

Algae, antioxidant, antimicrobial, aquaculture, bioactive, cosmetics, cyanobacteria, enzymatic extraction, food, home care

Total costs*: € 894.918

Funding granted*: € 759.976

Duration: 2 years (2016-2018)

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

CONSORTIUM

Name	Organisation	Country
Dagmar Stengel	National University of Ireland Galway	Ireland
Alan Dobson	University College Cork	Ireland
Peter Bossier	Ghent University	Belgium
Sarah Hosking	Unilever	UK
Jeanette Andersen	UiT- The Arctic University of Norway	Norway

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SeaRefinery

The Seaweed Biorefinery – for high value added products

MarineBiotech

PROJECT FACTSHEET

CALL 1 | NOVEMBER 2015

ABSTRACT

SeaRefinery will develop eco-friendly chemical and enzymatic processing technologies to extract and purify high value-added components such as antioxidants, antimicrobial components and hydrocolloids from cultivated seaweed species (e.g. Saccharina latissima) in an integrated biorefinery. Bioactive compounds, e.g. phlorotannins, fucoidan, and laminarin, will be selectively tested for bioactivity. In addition, laminarin and marine proteins will be tested in nutraceutical and selected food model systems. Alginate will be tested as additive for textile applications via coating and extrusion technologies. In order to maximise the value of the biorefinery feedstock (input) and derived products (output), we will grow monocultures on innovative textile cultivation substrates with high yield biomass production. Seasonal variation, replicated over two years, of the selected biomolecules will be a measuring tool for harvesting the seaweeds with maximum contents of bioactive compounds.

Dr Anne-Belinda Bjerre, Project Coordinator
Danish Technological Institute
Denmark

Topic:

- Feed
- Materials
- Cosmeticeuticals (e.g. skincare)
- Health (e.g. food supplements)
- Pharmaceuticals

Marine biomass:

- Macroalgae

Keywords:

Seaweed, Saccharina latissima, cultivation, harvesting, storage, preconversion, biorefinery, bioactive, hydrocolloids, protein, nutraceuticals, functional foods, pharmaceuticals, biobased materials, extraction, enzymes, green solvents

Total costs*: € 2.607.074

Funding granted*: € 1.406.156

Duration: 3 years (2016-2018)

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

CONSORTIUM

Name	Organisation	Country
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Rósa Jónsdóttir	MARINOX EHF	Iceland
Sarah Hotchkiss	CyberColloids Ltd	Ireland
Bert Groenendaal	SIOEN Industries NV	Belgium
Guy Buyle	Centexbel	Belgium
Job Schipper	Hortimare AS	Norway
Jan Alexander Villadsen	ViVoX ApS	Denmark
Helen Oshea	Cork Institute of Technology	Ireland

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ThermoFactories

Thermophilic cell factories for efficient conversion of brown algae biomass to high-value chemicals

MarineBiotech

PROJECT FACTSHEET

CALL 1 | NOVEMBER 2015

ABSTRACT

Brown algae biomass is a promising and challenging resource for industrial bioconversions, but there is a need to develop efficient cell factories to convert the constituent carbohydrates into high-value added products. In this proposal, four metabolically different environmental bacteria, inherently suitable to harsh process conditions, will be engineered for production of a number of industrially important platform and specialty chemicals, including 1,2-propanediol, cadaverine, propanol and lycopene. The project will implement and integrate systems biology and metabolic engineering, including rounds of model-driven metabolic optimization. Feedstock development and process engineering are important parts, to optimize fermentability of the algal hydrolysates, and ensure integration with downstream processing and product recovery. At the end of the project, use of all major carbohydrate fractions from brown algae through integrated processing will be demonstrated at small pilot scale.

Dr Trygve Brautaset, Project Coordinator
Norwegian University of Science and Technology
Norway

Topic:

- Materials
- Energy as by-product
- Production of other commodities or services

Marine biomass:

- Macroalgae
- Bacteria

Keywords:

Microbial metabolic engineering, systems biology, value-added chemicals, integrated bioprocess, fermentations

Total costs*: € 2.485.677

Funding granted*: € 1.981.507

Duration: 3 years (2016-2018)

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

CONSORTIUM

Name	Organisation	Country
Trygve Brautaset	Norwegian University of Science and Technology	Norway
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Steinn Gudmundsson	University of Iceland	Iceland
Eva Nordberg Karlsson	Lund University	Sweden
Jochen Förster	Technical University of Denmark	Denmark
Gudmundur Oli Hreggvidsson	Matis Ohf	Iceland
Bruno Ferreira	Biotrend SA	Portugal
Simão Soares	SilicoLife Lda	Portugal

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