

MASTER BIOTECHNOLOGIES

## PARCOURS MASTER INTERNATIONAL EN BIOTECHNOLOGIES MARINES

semestre 9

MICROALGAE AND MICROORGANISMS

### Biotechnological potential of marine microorganisms

#### Objectifs

The main objective of this course is to provide students with general information for better understanding the biotechnological potential of marine heterotrophic microorganisms. The unit will focus on acquiring a broad knowledge on the biodiversity and physiology of marine microorganisms, in order to target specific populations according to the desired industrial applications. Molecular tools applied to data mining will be presented. New strategies for the screening, isolation and culture of marine heterotrophic microorganisms as well as the production of biomass and/or metabolite in bioreactors will be also described. This unit will be illustrated by different research projects using marine microorganisms for biotechnological applications.

**3 crédits ECTS**

Volume horaire

Travaux Pratiques : 6h

Cours Magistral : 26h

#### Pré-requis nécessaires

Basic knowledge on microbial structure, growth and physiology (practical and theoretical)

#### Compétences visées

At the end of this course, students will:

- be aware of the huge diversity of marine heterotrophic micro-organisms
- understand the link between biodiversity, microbial physiology and potential biotechnological applications
- have a basic knowledge on the use of molecular tools for biotechnological applications
- have a thorough knowledge of innovative approaches used for the isolation and culture of marine heterotrophic microorganisms
- be aware of the classically used screening methods
- know the basic principles of biomass and metabolites production in bioreactors
- have examples of research applications for the industries with the use of marines microorganisms or metabolites

#### Descriptif

Chapter 1: Presentation of the huge diversity of heterotrophic marine microorganisms focusing on the link between biodiversity (adaptation to different habitats, metabolism, communication/interaction..) and their potential biotechnological applications (4h G Le Blay)

Chapter 2 : Presentation of innovative approaches used for marine heterotrophic microorganism isolation (dilution to extinction, micro-encapsulation, optical tweezers, diffusion chambers etc..) and culture (high throughput cultural techniques and design of culture media) (4h G Le Blay)

Chapter 3 : Screening methodologies (cultural and molecular techniques) used for industrial targets (antimicrobial, antifouling, polyhydroxyalkanoate...) (4h C Hellio)

Chapter 4 : Presentation of the basic principles of marine microbial biomass and metabolite production (bioreactor design and operation modes, yields and stoichiometry) (4h G Le Blay)

Chapter 5 : Presentation of examples of research applications for the industries with the use of marines microorganisms or metabolites (biofouling, -Presentation of examples of research applications for the industries with the use of marines microorganisms or metabolites (biofouling, exopolysaccharides, polyhydroxyalkanoates..) (8h C Hellio, C Simon-Colin)

Chapter 6 : Presentation of molecular tools (data mining..) for biotechnological applications (8h M Jebbar, G Burgaud, L Meslet )

#### Bibliographie

New approaches for bringing the uncultured into culture. S L'Haridon, GH Markx, CJ Ingham, L Paterson, F Duthoit & G Le Blay. In The marine microbiome – an untold resource of biodiversity and biotechnological potential Editors: L.J. Stal & M.S. Cretoiu Publisher: Springer 2016

Screening microorganisms for bioactive compounds. S Giubergia, C Schleissner, F de la Calle, Pretsch, D Pretsch, L Gram & MS Thøgersen. In The marine microbiome – an untold resource of biodiversity and biotechnological potential Editors: L.J. Stal & M.S. Cretoiu Publisher: Springer 2016

Exploring the microbiology of the deep sea. M Jebbar, P Vannier, G Michoud & VT

Marteinsson. In The marine microbiome – an untold resource of biodiversity and biotechnological potential Editors: L.J. Stal & M.S. Cretoiu Publisher: Springer 2016

Marine fungi. V Rédou, M Vallet, L Meslet-Cladière, A Kumar, KL Pang, YF Pouchus, G Barbier, O Grovel, S Bertrand, S Prado, C Roullier & G Burgaud. In The marine microbiome – an untold resource of biodiversity and biotechnological potential Editors: L.J. Stal & M.S. Cretoiu Publisher: Springer 2016

Entrapment of anaerobic thermophilic and hyperthermophilic marine microorganisms in a gellan/xanthan matrix. Landreau M, Duthoit F, Claeys-Bruno M, Vandenaabeele-Trambouze O, Aubry T, Godfroy A, Le Blay G. J Appl Microbiol. 2016 Mar 1.

Discovery of a mcl-PHA with unexpected biotechnical properties: the marine environment of French Polynesia as a source for PHA-producing bacteria. Wecker P, Moppert X, Simon-Colin C, Costa B, Berteaux-Lecellier V. AMB Express. 2015 Dec;5(1):74.

Meslet-Cladiere, L., Delage, L., Leroux, C.J., Goulitquer, S., Leblanc, C., Creis, E., Gall, E.A., Stiger-Pouvreau, V., Czjzek, M., and Potin, P. (2013). Structure/Function analysis of a type III polyketide synthase in the brown alga *Ectocarpus siliculosus* reveals a biochemical pathway in phlorotannin monomer biosynthesis. *Plant Cell* 25, 3089-3103.

## Modalités de contrôle des connaissances

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### Session 1 ou session unique - Contrôle de connaissances

Nature de l'enseignement	Modalité	Nature	Durée (min.)	Coefficient	Remarques
	CT	Ecrit - devoir surveillé	120	100%	