

BOLSA DE INVESTIGAÇÃO (M/F)

Referência: PTDC/MAR/102258/2008

Título do Projecto: “Secondary metabolites and nitrogen fixation of benthic marine Cyanobacteria: how different from freshwater relatives?”

Código interno: PR051705

Está aberto concurso para recrutamento de um(a) bolseiro(a) de Investigação para colaborar no projecto acima referido, financiado pelo programa COMPETE - Programa Operacional Factores de Competitividade na sua componente FEDER e pelo orçamento da Fundação para a Ciência e a Tecnologia na sua componente OE.

A bolsa, em regime de exclusividade, terá a duração de 1 ano eventualmente renovável, com início previsto em 1 de Maio de 2010.

O valor mensal da bolsa será de € 745,00, pago por transferência bancária (preferencialmente).

Local de trabalho: Unidade de Investigação de Microbiologia Celular Aplicada, IBMC, Porto.

Programa de trabalho: (ver sumário em anexo).

Perfil pretendido:

Os candidatos devem possuir licenciatura ou grau superior na área das Ciências Biológicas, Bioquímica ou afins. Dá-se preferência a candidatos com experiência na área.

O prazo para recepção de candidaturas decorre de 7 a 21 de Abril de 2010.

As propostas deverão incluir CV e uma carta de referência e ser enviadas por correio electrónico para candidaturas@ibmc.up.pt com indicação do código interno (PR041704).

Após avaliação do CV, os candidatos pré-seleccionados poderão ser chamados para entrevista.

A contratação será regida pelo estipulado na legislação em vigor relativamente ao Estatuto de Bolsheiro de Investigação Científica, nomeadamente a Lei 40/2004, de 18 Agosto, e o Regulamento de Bolsas de Investigação Científica do IBMC (www.ibmc.up.pt/fellowships.php).

Secondary metabolites and nitrogen fixation of benthic marine Cyanobacteria: how different from freshwater relatives?

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Project Summary:

Cyanobacteria are ubiquitous prokaryotes with important roles of the main biogeochemical cycles. They were the first organisms on Earth able to perform oxygenic photosynthesis, and it is estimated that they still contribute up to 30% of the annual oxygen production. In oceans, cyanobacteria play a major role in the global carbon cycle being important primary producers, and the diazotrophic taxa are fundamental to the nitrogen cycle. Until now, most marine studies have focused on open oceans waters, where the phytoplankton communities are represented mainly by picocyanobacteria. The LEGE culture collection has 140 marine cyanobacteria strains isolated from different sites along the Portuguese coast, belonging to more than 40 different morphotypes. Currently, the strains are being characterized by morphological and molecular methods in a collaborative work involving CIIMAR and IBMC. Some cyanobacteria are able to produce potent toxins and/or have the ability to fix atmospheric N₂, properties with obvious ecological and environmental implications, and also with a biotechnological interest.

In this project the identification of cyanobacteria will be done a polyphasic approach, that will utilize light and transmission electron microscopy as well as molecular methods like the sequencing of the 16S rRNA gene. To screen the capability of the isolates to fix atmospheric nitrogen, the presence of *nifK*, one of the genes encoding to the complex responsible for nitrogen fixation, the nitrogenase, will be assessed. Cyanobacteria may produce a large variety of secondary metabolites. Concerning their structure, the majority of bioactive metabolites isolated so far are polyketides, non-ribosomal peptides or a hybrid of the two. Polyketides (PK) are a large and diverse group of natural products that include antibacterial, antifungal, anticancer, antiparasitic, and immunosuppressant activities, among others. Like PK, non-ribosomal peptides (NRP) are a very diverse family of secondary metabolites with a broad range of biological properties. They are synthesized by non-ribosomal peptide synthetases (NRPS) characterized by a modular organization in which each module is responsible for the activation, thiolation, modification and condensation of a amino acid unit. Secondary metabolism has evolved into the existence of hybrid PK/NRP structures. An example of a hybrid metabolite is the well known cyanobacterial metabolite microcystin. The presence of genes encoding cyanotoxins synthetases will be examined to ascertain the existence of potentially toxic isolates. For this task, the aminotransferase domain, which is located on the modules *McyE* and *NdaF* of the microcystin and nodularin synthetase enzyme complexes, will be used to distinguish possible hepatotoxicogenic strains. Furthermore, lyophilized samples from the main different isolates will be analysed by MALDI-TOF mass spectrometry to evaluate the production of cyanotoxins – e.g. microcystins – or other secondary metabolites. Global biogeographic patterns in cyanobacteria have not yet been assessed. Therefore due to its wide distribution and its relevance for water quality and public health it is imperative to elucidate the biogeographic dispersion patterns of cyanobacteria in temperate Atlantic areas

At the end of this project we expect to gather concise knowledge on the diversity of marine benthic cyanobacteria from Atlantic areas and compared them phylogenetically with others from all over the world. The importance of these cyanobacteria mats in terms of nitrogen fixation will be quantified and new bioactive compounds produced by them in special polyketides or non-ribosomal peptides will be studied and identified. Differences between marine and freshwater cyanobacteria will be highlighted in special in terms of the cyanotoxin profiles, adding data to better assess human health risk. A book on the morphology, diversity, ecology and toxicity of benthic marine cyanobacteria is aimed to be published under the auspices of the Porto University.