IBMC
INSTITUTO DE BIOLOGIA MOLECULAR E CELULAR
INSTITUTE FOR MOLECULAR AND CELL BIOLOGY

BOLSA DE INVESTIGAÇÃO - MESTRE (m/f)

Encontra-se aberto concurso para a atribuição de uma Bolsa de Investigação no âmbito do projecto**:** Cyanobacterial extracellular polymeric substances (EPS): synthesis, export and interactions with metal cations, FCOMP-01-0124-FEDER-028314-PTDC/BIA-MIC/2889/2012, financiado por fundos nacionais através da FCT/MEC (PIDDAC) e co-financiado pelo Fundo Europeu de Desenvolvimento Regional (FEDER) através do COMPETE – Programa Operacional Factores de Competitividade (POFC), nas seguintes condições:

Refª Interna: PR451501

Requisitos de admissão: Os candidatos devem possuir à data Mestrado em Biologia ou áreas afins e uma média final de licenciatura igual ou superior a 15 valores, dando-se preferência a quem tiver experiência comprovada em cianobactérias, polímeros extracelulares e técnicas de biologia molecular.

Plano de trabalhos: Cyanobacteria are an ancient group of prokaryotes with the ability to perform oxygenic photosynthesis. Many strains can also fix dinitrogen, being key players in the nitrogen cycle. Owing to their long evolutionary history, autophototrophy and diazotrophy, cyanobacteria thrive in a wide range of habitats (fresh to salt water, soils and extreme environments) and exhibit diverse morphologies, including unicellular, colonial and filamentous. In addition, many strains produce extracellular polymeric substances (EPS), mainly composed of polysaccharides, which serve as a boundary between the cell and its immediate environment. The cyanobacterial EPS can remain attached to the cell surface, being designated as sheaths, capsules or slimes, or be released into the surrounding environment (released polysaccharides – RPS). These polymers have distinctive characteristics compared to those of other bacteria: (i) they frequently contain two different uronic acids, (ii) are composed by a larger number of different monosaccharides, and (iii) possess sulphate groups (unusual in bacterial EPS). Consequently, cyanobacterial EPS are very attractive for biotechnological applications, and their overall negative charge (conferred by the uronic acids and sulphate groups) is particularly promising for heavy metals bioremediation . Indeed, several studies confirmed that EPS-producing cyanobacteria (or the isolated EPS) are very efficient in the removal of metal ions from aqueous solutions. This capacity results from the presence of different functional groups in the cells surface and EPS, including carboxyl (main contributors), hydroxyl, amide, phosphate and sulphate groups, which are able to bind metal ions mainly through an ion-exchange mechanism . Despite these advances, the use of systems based on cyanobacterial EPS is limited by the insufficient amount of information on the pathways leading to EPS production and the factors regulating this process. Studies performed in other bacteria strongly suggest that mechanisms involved in EPS production are relatively conserved, requiring three groups of proteins, namely (i) enzymes involved in the biosynthesis of nucleotide sugars, (ii) glycosyltransferases, which transfer the nucleotide sugars from activated donors to specific acceptors in the plasma membrane, and (iii) proteins involved in EPS assembly and export. The proteins belonging to the first two groups vary between different organisms leading to different EPS, and many are not specifically engaged in EPS synthesis, but also in the production of other cellular polysaccharides. In contrast, the last steps of EPS production seem to be well conserved, with the majority of bacterial EPS being assembled by one of two main mechanisms: the Wzy-dependent or the ABC transporter-dependent pathway . To provide a first insight on cyanobacterial EPS production, an *in silico* analysis of available cyanobacterial genome sequences was performed by our research group . The data obtained revealed the existence of multiple copies of the genes encoding proteins involved in EPS assembly and export (EPS-related genes), scattered throughout the genomes, either isolated or in small clusters. The identification of genes encoding proteins specify engaged in the Wzy-dependent pathway, suggests that the assembly and export of cyanobacterial EPS follows this mechanism. Using this information and that available for other bacteria, a working model for the last steps of cyanobacterial EPS production was proposed. Nevertheless, it is still necessary to unveil the evolutionary events leading to the pattern observed for EPS-related genes in cyanobacterial genomes, determine the exact role of the encoded proteins, and evaluate the transcriptional regulation of these genes correlating it with the regulatory profiles of other genes to unveil additional contributors. Moreover, for the use of cyanobacterial EPS in heavy metals bioremediation, it is important to clarify the mechanistic interaction between the polymers and the metal ions. In this project, we propose to: (i) reconstruct the phylogenetic history of cyanobacterial EPS-related genes, (ii) generate and (iii) characterize knockout mutants, (iv) analyze transcriptional regulatory networks, and (v) evaluate interactions between EPS and different metals/metal combinations. This will be achieved by a multidisciplinary team with extensive expertise on cyanobacterial EPS. The data generated by this work will give an important contribution for the basic knowledge on this field, allowing in the future the implementation and optimization of metal-removal systems based on cyanobacterial EPS.

Legislação e regulamentação aplicável: "Estatuto do Bolseiro de Investigação Científica, aprovado pela Lei nº 40/2004, de 18 de agosto, alterado e republicado pelo Decreto-Lei nº 202/2012, de 27 de agosto."; Regulamento de Bolsas de Investigação Científica da Fundação para a Ciência e a Tecnologia, I.P., 2013 e Regulamento de Bolsas de Investigação Científica do IBMC aprovado pela Fundação para a Ciência e a Tecnologia.

Local de trabalho: O trabalho será desenvolvido no Grupo *Bioengeneering and Synthetic Microbiology* do Instituto de Biologia Molecular e Celular, sob a orientação científica da Professora Paula Tamagnini.

Duração da(s) bolsa(s): A bolsa terá à duração de 6 meses, não renováveis, com início previsto em 1 de abril de 2015, e de acordo com o estipulado no Regulamento de Bolsas de Investigação da Fundação para a Ciência e a Tecnologia, I.P. — 2013

Valor do subsídio de manutenção mensal: O montante da bolsa corresponde a € 980,00, conforme tabela de valores das bolsas atribuídas directamente pela FCT, I.P. no País (http://alfa.fct.mctes.pt/apoios/bolsas/valores) e será paga mensalmente por transferência bancária (preferencialmente).

Métodos de selecção: Será efetuada uma avaliação tendo em conta os requisitos de admissão. A avaliação curricular terá uma valoração de 15 valores e a experiência na área de 5 valores. Será realizada entrevista aos candidatos que obtenham uma classificação superior a 18 na avaliação. Se houver lugar a entrevista, a avaliação terá uma valoração de 60% e a entrevista de 40%.

Composição do Júri de Selecção: O Júri será presidido por Paula Tamagnini e pelos vogais: Sara B. Pereira, Investigadora no IBMC e Paulo Oliveira, Investigador no IBMC.

Forma de publicitação/notificação dos resultados: Os resultados finais da avaliação serão publicitados, através de lista ordenada por nota final obtida, publicada no site do IBMC, sendo o candidato(a) aprovado(a) notificado através de e-mail.

Prazo de candidatura e forma de apresentação das candidaturas: O concurso encontra-se aberto no período de 5 a 18 de março de 2015.

As candidaturas devem ser formalizadas, obrigatoriamente, através de submissão electrónica de CV onde deverá mencionar média de licenciatura e mestrado (não se aceita formato Europass) e certificado de habiliatções em: http://www.ibmc.up.pt/gestaocandidaturas/index.php?codigo=PR451501