

BOLSA DE INVESTIGAÇÃO (M/F)

Referência: PTDC/CVT/100386/2008

Título do Projecto: “The role of iron-related acute phase proteins during bacterial infection in fish”

Código interno: PR100805

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: IBMC - Instituto de Biologia Molecular e Celular (Grupo IRIS – Iron Genes and Immune System), Porto, Portugal

Programa de trabalho: ver anexo.

Perfil pretendido:

Os candidatos devem pelo menos ter o grau de licenciatura nas áreas de Ciências Biológicas, nomeadamente Biologia, Bioquímica, Microbiologia, Veterinária ou área afim, dando-se preferência a quem tiver média de licenciatura igual ou superior a 14 valores e manifesta experiência com técnicas necessárias à boa execução do referido projecto.

O prazo para recepção de candidaturas decorre de 12 a 26 de Abril de 2010.

As propostas deverão incluir carta de motivação, CV, e duas cartas de recomendação e ser enviadas por correio electrónico para candidaturas@ibmc.up.pt com indicação do código interno (PR100805).

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).

“The role of iron-related acute phase proteins during bacterial infection in fish”**Supervisor:**

Pedro N. S. Rodrigues

Project Summary:

Due to the continuous decrease in natural fish stocks observed during the last decades, many commercial fish species are currently the target of a growing intensive aquaculture industry. The ever-increasing pressure on fish production and subsequent intensification of aquaculture has produced several problems. Fish health is often compromised under intensive aquaculture conditions with bacterial diseases having disastrous effects on fish production and being responsible for significant economic losses. This situation is expected to get worse if no measures are taken to prevent and control bacterial outbreaks in cultivated fish.

Under normal conditions, fish maintain a healthy state using their innate defense mechanisms in conjunction with their specific immune responses. Unlike the acquired immune responses, the protection given by the innate defense mechanisms is non-specific and does not depend upon recognition of distinctive molecular structures. Due to the considerable time needed for the specific immune response to be effective in animals unable to control their body temperature, such as fish, the first line of defense provided by the innate immune system is of crucial importance. One of the most important innate response mechanisms is the acute phase response, a pervasive physiological response of the body to injury, trauma or infection, involving metabolic changes in several organ systems. This response is induced by plasma-borne signals, such as pro-inflammatory cytokines, that lead to altered rates of membrane and plasma protein synthesis. One clear indication of the response is the increase in synthesis and secretion by the liver of several plasma proteins, with simultaneous decreases in others. These acute phase proteins are involved in several defense-related activities such as limiting the dispersal of infectious agents, tissue damage repair, protease inactivation, killing microbes and other potential pathogens, and restoration of the healthy state. Some of these proteins have been found to have clinical diagnostic value in humans and there are indications that they might have the same potential application in other vertebrates, such as fish.

Many of these acute phase proteins are known to be related to iron metabolism. Recently, an important study profiled the liver transcriptional changes of rainbow trout experimentally infected with *V. anguillarum*, highlighting an unexpected number of genes involved in the acute phase response. Among those were some genes encoding proteins involved in iron metabolism, from which it can be inferred that sequestration of iron is likely to be a major component of the trout innate immune response.

Pathogenic bacteria need to obtain iron from host tissues for their life cycle. In order to establish a successful infection, bacteria developed mechanisms to obtain iron from the host, whereas to limit bacterial virulence the hosts have developed mechanisms to tightly regulate iron availability. Though the role of iron in host/pathogen interactions has been fairly well described in mammalian models, information for other vertebrates, particularly fish, is scarce. Recently, genes encoding for proteins playing a major role in both immune response and iron metabolism have been described for some teleost fish, however, little is known about their functional interactions and transcriptional regulation in vivo. Therefore, the dissection of the molecular mechanisms linking iron metabolism and immunity will provide crucial information about the development of bacterial infection in fish.

The growing importance of sea bass (*Dicentrarchus labrax*) in European aquaculture, and the frequent economic losses caused by *Photobacterium damsela* infections led us to select the sea bass immune response to *P. damsela* and the host/pathogen interactions to be the objects of study in the proposed project. We aim to clarify the role of iron-related genes during bacterial infection, particularly during the acute phase response. For that, we will isolate and identify several immune and iron related genes in sea bass (such as hepcidin, ferritin, ferroportin, DMT1, haptoglobin, intelectins and others), evaluate their expression during bacterial infection and iron modulation in vivo, by real-time PCR and Northern blot, and determine their cellular localization by in situ hybridization. Changes in the protein levels will also be determined by immunodetection techniques, such as ELISA, immunofluorescence microscopy and Western blot. Most of the techniques to be used are already optimized for sea bass samples and are routinely performed in our lab. We hope to elucidate mechanisms important for the understanding of the innate immune response in sea bass and in turn produce indicators that could be used to monitor and improve fish health status.