BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Agostinho Antunes (Líder de Grupo – CIIMAR/Professor FCUP)

GRUPO: Genómica Evolutiva e Bioinformática

LOCAL DE REALIZAÇÃO DO TRABALHO: CIIMAR/FCUP

TEMA/Theme: Diversidade sensorial animal: estratégias genómicas para a perceção de estímulos ambientais/Animal sensory diversity: genomic strategies to perceive environmental stimuli

RESUMO/SUMMARY

Equipados com múltiplos órgãos sensoriais especializados, os animais interagem com um mundo multi-sensorial pela percepção química (aroma e gosto) e física (mecânico, som, visão e temperatura) de estímulos. A percepção sensorial animal diversificou durante mais de meio bilião de anos para produzir uma elevada variedade de intrigantes órgãos sensoriais, variando por exemplo, dos olhos simples dos moluscos gastrópodes até aos olhos sofisticados dos cefalópodes (com lente grande e uma retina de alta resolução) competindo em desempenho com os olhos avançados dos mamíferos. Órgãos sensoriais complexos geralmente desempenham múltiplas funções, p. ex. detecção simultânea de estímulos variados, incluindo substâncias químicas sexo-específicas e espécie-específicas, facilitando o reconhecimento de predadores, competidores e parceiros sexuais.

Compreender a base genética da diversificação de genes sensoriais em vertebrados e invertebrados pode fornecer importante informação para compreender a evolução de espécies, especialização ecológica, e novidades genéticas que poderão ser de elevada importância para a investigação ambiental e biomédica. Isso poderá levar a uma ampla gama de aplicações (p.ex. terapias genéticas, nova geração de desenho de drogas, etc).

OBJECTIVOS/OBJECTIVES:

Neste contexto, propomos um projeto de sequenciação genómica para caracterizar genes envolvidos na percepção sensorial em diversas espécies de metazoários. Especificamente, este estudo vai considerar mamíferos, aves/répteis e peixes (vertebrados) e moluscos e cnidários (invertebrados), mas outras espécies de metazoários serão também considerados para análises filogenéticas e de genómica comparativa. A estratégia proposta neste estudo baseia-se em análises comparativas da genómica/proteómica de genes envolvidos na percepção sensorial em espécies influenciadas por diferentes pressões selectivas (testando hipóteses sobre a contribuição da diversificação sensorial na adaptação animal; p.ex. (1) diferenças funcionais em sistemas sensoriais causadas por mecanismos genómicos (ao nível do gene/cromossoma); e (2) variabilidade no repertório de genes sensoriais a nível inter/intraespecífico correlacionado com maior aptidão e adaptação ambiental.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Identificação de substituições sinónimas (silenciosas) e não-sinónimas (substituições aminoacídicas) para testar evidências de selecção a nível molecular utilizando testes estatísticos robustos. Interacções funcionais importantes em sistemas enzimáticos (complexo receptor-ligando) e interacções proteína-proteína serão estudados em detalhe atómico utilizando técnicas computacionais. A integração final destes resultados irá permitir a simulação computacional de vários aspectos das complexas interacções biológicas que influenciam a evolução dos sentidos, que poderão ser validados através de testes funcionais experimentais com proteínas recombinantes. O significado evolutivo de determinadas mutações poderá ser de particular interesse para a saúde humana e investigação farmacêutica. Finalmente, os dados obtidos serão também utilizados para reanalisar a história evolutiva e as relações filogenéticas das espécies animais estudadas, o que poderá fornecer informação importante para compreender a diversificação sensorial em espécies animais.

Tarefas a desempenhar pelo estudante que se integrará na equipa deste projecto de investigação (PTDC/AAG-GLO/6887/2014) financiado pela FCT: Análise laboratorial e bioinformática de genes envolvidos na perceção sensorial em metazoários (vertebrados e invertebrados). O trabalho experimental incluirá a recolha de organismos e extracção de DNA/RNA, PCR, sequenciação e outras metodologias de genómica molecular. Interpretação dos resultados obtidos utilizando métodos filogenéticos e de adaptação molecular. Participação na elaboração de manuscritos.

REFERÊNCIAS/REFERENCES:

BORGES R, JOHNSON WE, O'BRIEN SJ, VASCONCELOS V, **ANTUNES A**. 2012. The emergence and the duplication events in the melanopsin gene family (OPN4m and OPN4x) during vertebrate evolution. PLoS One 7(12): e52413. (Factor de impacto: 4.092).

PHILIP S, MACHADO JP, MALDONADO E, VASCONCELOS V, O'BRIEN SJ, JOHNSON WE, **ANTUNES A.** (2012). Fish lateral line innovation: insights into the evolutionary genomic dynamics of a unique mechanosensory organ. Molecular Biology and Evolution 29(12):3887-3898. (Factor de impacto: 14.308).

SUNAGAR K, JOHNSON WE, O'BRIEN SJ, VASCONCELOS V, **ANTUNES A**. (2012) Evolution of CRISPs associated with toxicoferan-reptilian venom and mammalian reproduction. Molecular Biology and Evolution 29(7): 1807-1822. (Factor de impacto: 14.308).

DUTERTRE S, JIN A, VETTER I, HAMILTON B, SUNAGAR K, LAVERGNE V, DUTERTRE V, FRY BG, **ANTUNES A**, VENTER D, ALEWOOD P, LEWIS R (2014) Evolution of separate predation- and defence-evoked venoms in carnivorous snails. Nature communications 5:3521. (Factor de impacto: 10.015).

ZHANG G, LI C, LI Q, LI B, LARKIN DM, LEE C, STORZ JF, **ANTUNES A**, GREENWOLD MJ, MEREDITH RW, ET AL. 2014. Comparative genomics reveals insights into avian genome evolution and adaptation. Science. 346(6215):1311-1320. (Factor de impacto: 31.480).

KHAN I, YANG Z, MALDONADO E, LI C, ZHANG G, GILBERT MTP, JARVIS ED, O'BRIEN SJ, JOHNSON WE, **ANTUNES A.** (2015) Olfactory receptor subgenomes linked with broad ecological adaptations in Sauropsida. Molecular Biology and Evolution 32(11):2832-43. (Factor de impacto: 14.308).

BORGES R, KHAN I, JOHNSON WE, GILBERT MTP, ZHANG G, JARVIS ED, O'BRIEN SJ, **ANTUNES A**. (2015) Gene loss, adaptive evolution and the co-evolution of plumage coloration genes with opsins in birds. BMC Genomics 16(1):751. (Factor de impacto: 3.990).

SILVA L, **ANTUNES A**. (2017) Vomeronasal Receptors in Vertebrates and the Evolution of Pheromones Detection. *Annual Review of Animal Bioseciences* 5:53-370. (Factor de impacto: 4.348).

BORGES R, JOHNSON WE, O'BRIEN SJ, HEESY C, **ANTUNES A**. (2018) Adaptive genomic evolution of opsins reveals that early mammals flourished in nocturnal environments. BMC Genomics 19: 121. (Impact factor: 3.867).

Outros trabalhos do grupo publicados:
http://www.ncbi.nlm.nih.gov/pubmed/?term=Agostinho+Antunes
Referências na comunicação social:

ÁREA CIENTÍFICA: Genómica, Genética, Evolução Molecular, Bioinformática.

LICENCIATURAS ADMITIDAS: Biologia, Bioquímica, Ciências dos Computadores. Outras licenciaturas afins na área poderão eventualmente ser consideradas.

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CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Rita Azeredo

GRUPO/GROUP: Nutrimu

CO-ORIENTADOR(A)/CO-SUPERVISOR: Benjamín Costas

GRUPO/GROUP: Nutrimu

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR

TEMA/THEME: Arginine-mediated immunomodulation in fish

RESUMO/SUMMARY

This proposal aims to unveil potential applications of arginine as a functional ingredient for promoting farmed fish health and welfare. Arginine and its metabolites participate in several key immune mechanisms which might be used as evaluation tools to determine its role as an immunomodulatory ingredient for immune-enhancing diets. In comparison with mammals, from which a large amount of information is available regarding arginine metabolism and health implications, in fish it is still rather inconsistent, claiming further endeavors in order to be better understood. Specifically, arginine is going to be tested in a dose-response trial, where European seabass is going to be fed graded levels of arginine supplementation.

OBJECTIVOS/OBJECTIVES:

The main aim of this study is to add to the existent knowledge of arginine potential as a functional ingredient to improve health and welfare in farmed fish. Particularly, it will focus on i) the effects of dietary arginine supplementation on fish immune status and ii) its effects during the inflammatory response upon bacterial infection.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Fish will be fed graded levels of arginine-supplemented diets for 2 weeks before and/or after intraperitoneal infection. Different groups will be sampled for several tissues at different time-points before and after bacterial challenge. Immune status/response is going to be accessed by humoral, cellular and molecular analyses using several techniques such as microscopy, spectroscopy, real-time PCR, etc.

REFERÊNCIAS/REFERENCES:

1. Rodriguez et al. 2017. Arginine metabolism in myeloid cells shapes innate and adaptive immunity. Frontiers in Immunology

2. Albaugh et al. 2017. Arginine-dual roles as an onconutrient and immunonutrient. Journal of Surgical Oncology

3. Morris 2016. Arginine Metabolism Revisited. Journal of Nutrition

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Fish nutrition and immunology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Aquatic Sciences, Biology and related areas, Biochemistry.

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO

A realizar no ano letivo de 2018-2019

ORIENTADOR(A)/SUPERVISOR: Maria de Fátima Carvalho

GRUPO: ECOBIOTEC

CO-ORIENTADOR(A/CO-SUPERVISOR): Ana Paula Mucha

GRUPO: ECOBIOTEC

LOCAL DE REALIZAÇÃO DO TRABALHO: CIIMAR

TEMA/Theme: Biodegradation of the fluorinated pharmaceutical Atorvastatin

RESUMO/SUMMARY

During the last decades, environmental contamination by fluorinated organic compounds has received increasing attention because of their several uses (Key et al., 1997). Since 1970s, the market of fluorinated pharmaceuticals has been flourishing with perspectives to grow more and more (Isanbor and O'Hagan, 2006). Atorvastatin, a drug belonging to the statin family and marketed under the trade name Lipitor, is a cholesterol lowering agent that figures in the list of the top ten most sold drugs (Murphy et al., 2009). Due to its high prescription, this drug has been detected as contaminants of effluents of wastewater treatment plants and of natural waters (Ternes, 1998). The environmental occurrence of pharmaceuticals has been a subject of growing concern as they can cause ecological disturbances. This proposal intends to investigate the biodegradation of atorvastatin by natural microbial communities derived from different environmental matrices and by microbial communities enriched at CIIMAR with capacity to degrade diverse fluoroorganics. The outcomes of this investigation will allow to better understand the microbial potential to degrade this compound.

OBJECTIVOS/OBJECTIVES:

The specific objectives of this proposal are:

(i) To investigate the biodegradation of atorvastatin by microbial cultures obtained from different environmental matrices and by previously enriched cultures;

(ii) to investigate the role of alternative carbon sources in the biodegradation of atorvastatin;

(iii) to identify microorganisms involved in the biodegradation process;

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Environmental samples will be collected from different sources and used as inocula for enrichment experiments. Biodegradation of atorvastatin will be investigated in batch mode under aerobic conditions. Removal of atorvastatin will be followed using chromatographic methodologies such as HPLC and GC-MS. Another important indicator of biodegradation will be fluoride release, which will be analysed by potenciometry, using a fluoride selective electrode. If degradation occurs, microbial consortia will be characterized with molecular biology techniques. From the degrading consortia, attempts to obtain single degrading isolates will be made. Analysis of major metabolic intermediates and potential dead-end metabolites will be conducted with degrading cultures.

REFERÊNCIAS/REFERENCES:

- Isanbor, C., and O'Hagan, D. (2006). Fluorine in medicinal chemistry: A review of anti-cancer agents. Journal of Fluorine Chemistry 127, 303–319.

- Key, BD, Howell, RD, and Criddle, CS (1997). Fluorinated organics in the biosphere. Environmental Science and Technology 31: 2445-2454.

- Murphy, C.D., Clark, B.R., and Amadio J. (2009). Metabolism of fluoroorganic compounds in microorganisms: impacts for the environment and the production of fine chemicals. Applied Microbiology and Biotechnology 84, 617–629.

- Ternes TA.(1998). Occurrence of drugs in German sewage treatment plants and rivers, Water Research 32: 3245–60.

ÁREA CIENTÍFICA: Biotecnologia Ambiental

LICENCIATURAS ADMITIDAS: Biologia, Bioquímica, Ciências e Tecnologia do Ambiente e afins.

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PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Agostinho Antunes (Líder de Grupo – CIIMAR/Professor FCUP)

GRUPO: Genómica Evolutiva e Bioinformática

LOCAL DE REALIZAÇÃO DO TRABALHO: CIIMAR

TEMA/Theme: Guerra biológica: decifrando a genómica de venenos naturais e os mecanismos de resistência natural a venenos/Biological warfare: unraveling the genomics of natural venoms and the mechanisms of natural venom-resistance

RESUMO/SUMMARY

Famílias de genes que codificam proteínas e péptidos com actividade tóxica são sintetizados por vários animais, incluindo medusas, gastrópodes marinhos, peixes, cobras e mesmo mamíferos. A prospecção de toxinas tem-se focado mais recentemente em venenos de cobras, um campo de investigação promissor que resultou na descoberta de importantes drogas para o tratamento do cancro. Contudo, outros grupos de vertebrados (p.ex. peixes) e invertebrados (p.e.x. cnidários) possuem milhares de espécies venenosas, representando um inexplorado recurso para a caracterização genómica de genes que codificam venenos naturais. Compreender a base genética da diversificação de genes codificadores de venenos em vários vertebrados e invertebrados pode fornecer importante informação para compreender a evolução de espécies, especialização ecológica, e novidades genéticas que poderão ser de elevada importância para a investigação biomédica e genética.

Contrastando com o sucesso evolutivo dos compostos venenosos, algumas espécies de metazoários adquiriram naturalmente resistência ao efeito dos venenos. Os mecanismos moleculares responsáveis por essa resistência natural encontram-se ainda pouco caracterizados. Adicionalmente, os animais venosos estão protegidos dos seus próprios venenos. A caracterização e compreensão desses mecanismos de resistência natural aos venenos pode fornecer informação valiosa para o desenho de novos e mais eficientes antídotos, que será de grande importância para a investigação farmacêutica e a saúde humana. Essas toxinas, ligeiramente modificadas ou em diferentes doses, podem também ter importantes propriedades biomédicas em alguns organismos.

OBJECTIVOS/OBJECTIVES:

Neste contexto, propomos um projecto de sequenciação genómica para caracterizar: (1) genes codificadores de venenos em diversas espécies de metazoários, e (2) genes de resistência-a-venenos em metazoários naturalmente resistentes ao efeitos do veneno. Especificamente, este estudo vai considerar mamíferos, répteis e peixes (vertebrados) e moluscos e cnidários (invertebrados), mas outras espécies de metazoários serão também considerados para análises filogenéticas e de genómica comparativa. A estratégia proposta neste estudo baseia-se em análises comparativas da genómica/proteómica de genes codificadores de venenos em espécies influenciadas por diferentes pressões selectivas (distintas condições de habitat e alimentação), que produzem venenos para matar ou imobilizar as presas, ou para defesa contra predadores. Serão ainda efectuadas análises genómicas/proteómicas de genes candidatos de resistência-a-venenos em metazoários que naturalmente adquiriram resistência ao efeito dos venenos, porque se especializaram em alimentar-se de presas venenosas ou porque estabeleceram relações simbióticas com animais venenosos. Esta estratégia irá permitir estudar: (1) a diversificação de genes codificadores de venenos/resistência-a-venenos em vários organismos (vertebrados e invertebrados), e (2) serão comparados eventos de evolução paralela ou adaptativa de genes codificadores de venenos/resistência-a-venenos em diferentes ramos da árvore filogenética dos metazoários.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Esta estratégia irá permitir identificar substituições sinónimas (silenciosas) e não-sinónimas (substituições aminoacídicas) para testar evidências de selecção a nível molecular utilizando testes estatísticos robustos. Interacções funcionais importantes em sistemas enzimáticos (complexo receptor-ligando) e interacções proteína-proteína serão estudados em detalhe atómico utilizando técnicas computacionais. A integração final destes resultados irá permitir a simulação computacional de vários aspectos das complexas interacções biológicas que influenciam a evolução dos venenos, que poderão ser validados através de testes funcionais experimentais com proteínas recombinantes. O significado evolutivo de determinadas mutações poderá ser de particular interesse para a saúde humana e investigação farmacêutica, nomeadamente para produção de antídotos mais eficientes. Finalmente, os dados obtidos serão também utilizados para reanalisar a história evolutiva e as relações filogenéticas das espécies venenosas estudadas, o que poderá fornecer informação importante para compreender a recente expansão de espécies tóxicas em vários ecossistemas (p.ex. blooms de medusas, lesmas marinhas) provavelmente como resultado de alterações ambientais induzidas pelo homem ou pelo aquecimento global.

Tarefas a desempenhar pelo estudante que se integrará na equipa deste projecto de investigação (PTDC/AAG-GLO/6887/2014) financiado pela FCT: Análise laboratorial e bioinformática de genes codificadores de venenos em metazoários (vertebrados e invertebrados). O trabalho experimental incluirá a recolha de organismos e extracção de DNA/RNA, PCR, sequenciação e outras metodologias de genómica molecular. Interpretação dos resultados obtidos utilizando métodos filogenéticos e de adaptação molecular. Participação na elaboração de manuscritos.

REFERÊNCIAS/REFERENCES:

SUNAGAR K, JOHNSON WE, O'BRIEN SJ, VASCONCELOS V, **ANTUNES A**. (2012) Evolution of CRISPs associated with toxicoferan-reptilian venom and mammalian reproduction. Molecular Biology and Evolution 29(7): 1807-1822. (Factor de impacto: 14.308).

BRUST A, SUNAGAR K, UNDHEIM EA, VETTER I, YANG D, CASEWELL NR, RUDER T, JACKSON TN, KOLUDAROV I, ALEWOOD PF, HODGSON WC, LEWIS RJ, KING GF, **ANTUNES A**, HENDRIKX I, FRY BG (2013) Differential evolution of domains: comparative evolution of Psammophis and Echis snake venom metalloproteinases (SVMP). Molecular & Cellular Proteomics 12(3):651-663 (Factor de impacto: 7.398).

SUNAGAR K, FRY B, JACKSON TNW, CASEWELL NR, UNDHEIM EAB, VIDAL N, ALI SA, KING GF, VASUDEVAN K, VASCONCELOS V, **ANTUNES A** (2013) Molecular evolution of vertebrate neurotrophins: Co-option of the highly conserved nerve growth factor gene into the advanced snake venom arsenal. PLoS One 8(11):e81827 (Factor de impacto: 4.092).

DUTERTRE S, JIN A, VETTER I, HAMILTON B, SUNAGAR K, LAVERGNE V, DUTERTRE V, FRY BG, **ANTUNES A**, VENTER D, ALEWOOD P, LEWIS R (2014) Evolution of separate predation- and defence-evoked venoms in carnivorous snails. Nature communications 5:3521. (Factor de impacto: 10.015).

ZHANG G, LI C, LI Q, LI B, LARKIN DM, LEE C, STORZ JF, **ANTUNES A**, GREENWOLD MJ, MEREDITH RW, ET AL. (2014) Comparative genomics reveals insights into avian genome evolution and adaptation. Science. 346(6215):1311-1320. (Factor de impacto: 31.480).

FRAZÃO B, **ANTUNES A**. (2016) Jellyfish bioactive compounds: methods for wet lab work. Marine Drugs 4(4). (Factor de impacto: 3.345).

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GRIGOREV K, KLIVER S, DOBRYNIN P, KOMISSAROV A, WOLFSBERGER W, KRASHENINNIKOVA K, AFANADOR-HERNÁNDEZ YM, PAULINO LA, CARRERAS R, RODRÍGUEZ LE, NÚÑEZ A, SILVA F, HERNÁNDEZ-MARTICH D, MAJESKE AJ, **ANTUNES A**, ROCA AL, O'BRIEN SJ, MARTINEZ-CRUZADO JC, OLEKSYK TK (2018) Innovative assembly strategy contributes to the understanding of evolution and conservation genetics of the critically endangered Solenodon paradoxus from the island of Hispaniola. giy025, https://doi.org/10.1093/gigascience/giy025.

Outros trabalhos do grupo publicados:

http://www.ncbi.nlm.nih.gov/pubmed/?term=Agostinho+Antunes

Referências na comunicação social:

http://www.tvi24.iol.pt/503/tecnologia/caracol-veneno-ciencia-caracol-marinho-dor-cronica-tvi24/1548668-4069.html

http://www.jn.pt/paginainicial/interior.aspx?content_id=2622856#AreaComentarios

https://www.publico.pt/2018/03/16/ciencia/noticia/descodificado-genoma-de-mamifero-venenoso-que-surgiu-no-tempo-dos-dinossauros-1806991

ÁREA CIENTÍFICA: Genómica, Genética, Evolução Molecular, Bioinformática.

LICENCIATURAS ADMITIDAS: Biologia, Bioquímica, Ciências dos Computadores. Outras licenciaturas afins na área poderão eventualmente ser consideradas.

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CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Marisa Almeida

GRUPO/GROUP: EcoBioTec

CO-ORIENTADOR(A)/CO-SUPERVISOR: Carlos Rocha Gomes

GRUPO/GROUP: EcoBioTec

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR e Dep Química e Bioquímica FCUP

TEMA/THEME: Biorremediação dos efluentes de suinicultura através de leitos de macrófitas

RESUMO/SUMMARY

Implementação de sistemas de leitos de macrófitas para a biorremediação de efluentes de suiniculturas antes da sua utilização para produção de biofertilizantes para produção de microalgas.

OBJECTIVOS/OBJECTIVES:

O objectivo do presente trabalho é a remoção de contaminantes de efluentes de suiniculturas através de uma tecnologia amiga do ambiente antes da sua utilização como biofertilizante.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Implementação de leitos de macrófitas (por ex., Pragmites sp., Juncus sp.) para proceder a um passo inicial de biorremediação dos efluentes de suinicultura. Estas macrófitas serão testadas com diferentes substratos (por ex., solo, gravilha, rocha de lava e LECA) e com diferentes tipos de circulação de água (vertical, horizontal ou subsuperficial) e tempos de retenção hidráulica.

A qualidade do efluente será monitorizada antes e após tratamento, de forma a avaliar a eficiência de tratamento de cada tipo de Sistema. Para esta monitorização serão analisados nutrientes e diversos metais.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Ciências do Ambiente

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Química, Bioquímica, Ciências do Ambiente, Engenharia Química, Biologia, Engenharia do Ambiente.

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CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Sergio Fernández Boo

GRUPO/GROUP: Nutrimu group CIIMAR

CO-ORIENTADOR(A)/CO-SUPERVISOR: Marcos Rubal García

GRUPO/GROUP:LBC

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: FCUP LBC laboratory (2.54) and CIIMAR 2.4

TEMA/THEME: Comparative physiology and reproductive phenology of two intertidal species of gastropod.

RESUMO/SUMMARY

Gastropods play a central role in shaping the structure of intertidal assemblages (Coleman et al., 2006). In the last decades, many studies reported changes in the abundance and distribution range of intertidal gastropods in response of global warming (Rubal et al., 2013). These changes result in the arrival of new, hot water species and the local extinction of cold water species (Rubal et al., 2013). The arrival of a subtropical species, the gastropod *Phorcus sauciatus*, to north Portugal has been recently reported (Rubal et al., 2014). Nowadays, *P. sauciatus* can be found in North Portuguese coast together with *P. lineatus* sharing the same habitat. These two species have very different geographical distribution, probably as result of their different temperature tolerance. Temperature showed to play a critical role in determining the length of the reproductive period of intertidal gastropods. Therefore, in order to predict changes on the abundance of these species, we should investigate how temperature will modify their fitness and reproductive activity.

OBJECTIVOS/OBJECTIVES:

- To explore the differences on the reproductive phenology of *P. sauciatus* and *P. lineatus*
- Some aspects related with metabolism of the species and physiology will be measured in order to have a better knowledge of the species.
- To integrate previous results to predict changes on the abundance of the target species in a future scenario of global warming

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

- Field sampling of gastropods
- Sex determination of gastropods
- Qualitative determination of gonad development on gastropods
- Enzyme activity determination such as Lactate deshydrogenase, citrate synthase and phenol oxydase activity.
- DNA/RNA ratio.
- Humoral innate immune parameters such as protease activity, bactericidal activity, total protein concentration among others.

REFERÊNCIAS/REFERENCES:

Coleman RA, et al., 2006 A continental scale evaluation of the role of limpet grazing on rocky shores. Oecologia 147, 556–564

Rubal M, Veiga P, Cacabelos E, Moreira J, Sousa-Pinto I. 2013. Increasing sea surface temperature and range shifts of intertidal gastropods along the Iberian Peninsula. Journal of Sea Research 77: 1-10.

Rubal M, Veiga P, Moreira J, Sousa-Pinto I. 2014. The gastropod *Phorcus sauciatus* (Koch, 1845) along the north-west Iberian Peninsula: filling historical gaps. Helgoland Marine Research 68: 169-177.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Marine Biology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia e Ciências aquáticas

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Mafalda Baptista

GRUPO/GROUP: EcoBioTec

CO-ORIENTADOR(A)/CO-SUPERVISOR: Catarina Magalhães

GRUPO/GROUP: EcoBioTec

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR & FCUP

TEMA/THEME:

Expressão diferencial de genes desnitrificadores por bactérias estuarinas expostas a nanopartículas metálicas

Differential expression of denitrifying genes in estuarine bacteria exposed to metallic nanoparticles

RESUMO/SUMMARY

A nanotecnologia conquistou um lugar de relevo em quase todos os campos de produção nos últimos anos. Por essa razão, as nanopartículas (NP) acabam no meio aquático, ultrapassam estações de tratamento de águas residuais, e as zonas costeiras acabam por se tornar o seu repositório final. Nos estuários, os metais têm sido implicados na acumulação de N_2O e NO_2^- nos sedimentos, demonstrando um efeito inibitório em etapas específicas do sistema enzimático de desnitrificação. A desnitrificação, o processo em que o NO_3^- é reduzido a N_2, é uma das vias biogeoquímicas mais importantes, determinante da produtividade dos ecossistemas. Neste trabalho pretendemos testar a hipótese de que a deposição de NP metálicas em sedimentos estuarinos afectará as vias de desnitrificação das comunidades microbianas estuarinas.

Nanotechnology gained a relevant place in almost every field of production in recent years. Hence, nanoparticles (NP) end up in the aquatic environment, find their way through wastewater treatment plants, and the seashore eventually becomes their final repository. In estuaries, metals have been implicated in N_2O and NO_2^- accumulation in sediments, demonstrating an inhibitory effect on specific steps of the denitrification enzymatic system. Denitrification, the process where NO_3^- is reduced to ultimately N_2, is one of the most important biogeochemical pathways, determinant of ecosystems productivity. In this work we aim at testing the hypothesis that deposition of metallic NP in estuarine sediments will affect denitrification pathways of estuarine microbial communities.

OBJECTIVOS/OBJECTIVES:

Caracterização da diversidade das comunidades microbianas envolvidas na desnitrificação através da análise de genes funcionais da desnitrificação – ex. *nirS*, *nirK* e *nosZ*, usando técnicas de sequenciação de geração futura (NGS) e quantificação dos genes funcionais por PCR em tempo real, em resposta às concentrações de NP

Characterization of the diversity of the microbial communities involved in denitrification by targeting functional denitrifying genes – e.g. *nirS*, *nirK* and *nosZ* genes, by next generation sequencing (NGS) and quantification of the targeted genes by real time PCR, as a response to NP loads

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Métodos moleculares: PCR, PCR em tempo real; Métodos estatísticos: plataformas bioinformáticas para análise de dados de NGS e análise estatística multivariada

Molecular methods: PCR, real time PCR; Statistical methods: NGS bioinformatics platforms and multivariate statistical analysis

REFERÊNCIAS/REFERENCES:

Baptista MS, Miller RJ, Halewood ER, Hanna KS, Almeida CMR, Vasconcelos VM, Keller AK Lenihan HS (2015) Impacts of silver nanoparticles on a natural estuarine plankton community. Environ Sci Technol 49, 12968-12974, doi:10.1021/acs.est.5b0328

Almeida CMR, Mucha AP, Silva MN, Monteiro M, Salgado P, Necrasov T, Magalhães C (2014) Salt marsh plants as key mediators on the level of cadmium impact on microbial denitrification. Environ Sci Pollut Res 21, 10270-10278, doi: 10.1007/s11356-014-2953-1

Magalhães C, Matos P, Machado A, Bordalo AA (2011) Impact of copper on the diversity, abundance and transcription of nitrate, nitrite and nitrous oxide reductase genes in estuarine sediments. FEMS Microbial Ecology 77, 274-84, doi:10.1111/j.1574-6941.2011.01107.x

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Microbiologia/Microbiology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES:

Biologia; Bioquímica; Ciências do Meio Aquático; Ciências e Tecnologia do Ambiente; e áreas afins

Aquatic Sciences; Biology; Biochemistry; Environmental Sciences and Technology; and related areas

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Puri Veiga Sánchez

GRUPO/GROUP: Coastal Biodiversity

CO-ORIENTADOR(A)/CO-SUPERVISOR: MSc. Ana Catarina Torres

GRUPO/GROUP: Coastal Biodiversity

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: LBC (CIIMAR) and Lab 2.54 (Biology Department of Faculty of Sciences, UP)

TEMA/THEME: Effects of harvesting on mussel attributes and its biodiversity associated.

RESUMO/SUMMARY

Intertidal rocky shores provide goods and services to mankind as food or recreation (1). Moreover, many of their species are ecosystem engineers because they modify, create or maintain useful habitat for other organisms (2), enhancing biodiversity (3, 4). However, intertidal shores suffer effects of different anthropogenic stressors such as harvesting that may reduce the amount and value of their services (1), with consequences to human wellbeing (5).

The mussel *Mytilus galloprovincilis* is a widespread filter-feeding animal along the Atlantic rocky shores that is considered an ecosystem engineer because its clumps facilitate the establishment and persistence of a variety of invertebrates (6). Despite its importance, only one study have evaluated its associated biodiversity in the Iberian Peninsula (3). Moreover, this mussel is a species with commercial interest (7, 8) providing valuable ecosystem services such as food, mediation of toxic waste and other nuisances, habitat and supporting services (9). This proposal, using an experimental approach, will explore the effects of harvesting on attributes of mussels (density, biomass and condition index) and their associated biodiversity.

OBJECTIVOS/OBJECTIVES

The aims of this proposal are:

i) To study the effects of harvesting on different attributes of *Mytilus galloprovincialis*.

ii) To elucidate the effects of harvesting on biodiversity associated with *Mytilus galloprovincialis* clumps.

iii) To integrate results obtained to provide useful information for conservation and management purposes.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

To test the effect of mussel harvesting, a field manipulative experiment will be done at two rocky shores in North Portugal. At each shore, twelve experimental plots of 20 x 20 cm, dominated by *M. galloprovincialis*, will be chosen and permanently marked. Four plots will be considered as control (without harvesting) and the remaining plots will be manipulated in order to mimick a professional and a recreational harvesting.

Experimental plots will be maintained in the field for a period. At the end of this period, mussel atributtes and biodiversity associated with each plot will be studied and compared between treatments.

REFERÊNCIAS/REFERENCES:

1. Wyles KJ, Pahl S, Thompson RC. 2014. Perceived risks and benefits of recreational visits to the marine environment: Integrating impacts on the environment and impacts on the visitor. Ocean & Coastal Management 88: 53–63.

2. Jones CG, Lawton JH, Shachak M. 1994. Organisms as ecosystem engineers. Oikos 69: 373–386.3. Gestoso I, Arenas F, Rubal M, Veiga P, Peña M, Olabarria C. 2013. Marine Environmental Research 90: 85–95.

3. Gestoso I, Arenas F, Rubal M, Veiga P, Peña M, Olabarria C. 2013. Shifts from native to non-indigenous mussels: enhanced habitat complexity and its effects on faunal assemblages. Marine Environmental Research 90: 85–95.

4. Veiga P, Rubal M, Sousa-Pinto I. 2014. Structural complexity of macroalgae influences epifaunal assemblages associated with native and invasive species. Marine Environmental Research 101: 115–123.

5. Worm B, Barbier EB, Beaumont N, Duffy JE, Folke C, Halpern BS, Jackson JBC, Lotze HK, Micheli F, Palumbi SR, Sala E, Selkoe KA, Stachowicz JJ, Watson R. 2006. Impacts of biodiversity loss on ocean ecosystem services. Science 314: 787–790.

6. Arribas LP, Donnarumma L, Palomo MG, Scrosati A. 2014. Intertidal mussels as ecosystem engineers: their associated invertebrate biodiversity under contrasting wave exposures. Marine Biodiversity 44: 203–211.

7. Rius M, Cabral HN. 2004. Human harvesting of *Mytilus galloprovincialis* Lamarck, 1819, on the central coast of Portugal. Scientia Marina 68: 545–551.

8. Bertocci I, Dominguez R, Freitas C, Sousa-Pinto I. 2012. Patterns of variation of intertidal species of commercial interest in the Parque Litoral Norte (north Portugal) MPA: Comparison with three reference shores. Marine Environmental Research 77: 60–70.

9. TEEB. 2015. The Economics of Ecosystems & Biodiversity: Ecosystem Services. Hosted by UNEP TEEB office, Geneva, Switzerland.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Ecology, Zoology, Marine Biology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia, Ciências do Meio aquático

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Diana I. S. P. Resende

GRUPO/GROUP: Natural Products and Medicinal Chemistry

CO-ORIENTADOR(A)/CO-SUPERVISOR: Madalena M. M. Pinto

GRUPO/GROUP: Natural Products and Medicinal Chemistry

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: Faculdade de Farmácia da Universidade do Porto

TEMA/THEME: From nature to the lab bench: how medicinal chemists prepare biological promising compounds inspired by the sea

RESUMO/SUMMARY

Almost three quarters of the earth's surface is occupied by seas and oceans.[1] To date, a high number of bioactive compounds have been isolated from marine invertebrates such as sponges, tunicates and mollusks, in addition to several algae and marine microorganisms, such as cyanobacteria and fungi.[2] In particular, marine-derived natural halogenated compounds possess a variety of bioactivities such as cardiovascular, antibacterial, antifungal, cytotoxic, antiviral, insecticidal[3] and antifouling activities.[4]

Recently, a promising chlorinated compound was isolated from a marine-derived fungus and exhibited potent antifouling activity. In order to obtain new halogenated xanthone derivatives based on marine natural models, a methodology towards their synthesis will be planned and the obtained compounds will be further screened for their biological activities.

OBJECTIVOS/OBJECTIVES:

The main goal of this work is the synthesis of halogenated xanthone derivatives, with further biological screening and structure-activity relationship studies.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

1. Synthesis of halogenated xanthone derivatives

Our approach will involve initially the synthesis of compounds with xanthone scaffold through different methodologies previously tested in our research group.[2] Further halogenation studies will be performed in order to obtain several halogenated derivatives and all the synthesized compounds will be fully characterized by spectroscopic methods (1D and 2D NMR studies, IR, GC-MS and HRMS).

2. Biological screening and structure-activity relationship studies

In collaboration with other research groups, the synthesized compounds will be tested for antibacterial, antitumoral, antiviral and antifouling activity. Analogues of the most promising compounds with potential as drug candidates or industrial applications will be prepared by molecular modifications in order to perform structure-activity relationship studies.

REFERÊNCIAS/REFERENCES:

[1] Saleem, M.; Ali, M. S.; Hussain, S.; Jabbar, A.; Ashraf, M.; Lee, Y. S. *Nat. Prod. Rep.* **2007**, *24*, 1142.

[2] Sousa, M. E.; Pinto, M. M. M. "Synthesis of Xanthones: An Overview." *Curr. Med. Chem.* **2005**, *12*, 2447.

[3] He, K.-Y.; Zhang, C.; Duan, Y.-R.; Huang, G.-L.; Yang, C.-Y.; Lu, X.-R.; Zheng, C.-J.; Chen, G.-Y. *J. Antibiot.* **2017**, *70,* 823.

[4] Nong, X.-H.; Zhang, X.-Y.; Xu, X.-Y.; Qi, S.-H. *Nat. Prod. Commun.* **2015**, *10*, 1033.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Medicinal Chemistry

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Chemistry, Biochemistry, Medicinal Chemistry

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Marisa Almeida

GRUPO/GROUP: EcoBioTec

CO-ORIENTADOR(A)/CO-SUPERVISOR: Carlos Rocha Gomes

GRUPO/GROUP: EcoBioTec

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR e Dep Química e Bioquímica FCUP

TEMA/THEME: Hydrocarbons removal from oil contaminated waters using a magnetic clean-up method

RESUMO/SUMMARY

Occurrence of oil spills in the Atlantic Ocean is of major concern due to their recognized immediate and long-term detrimental impact on ecosystems' health and heavy economic consequences. However, technologies available for spills clean-up and mitigation are yet of limited recovery efficiency or have unaffordable energetic demands. Recently, MIT researchers proposed a magnetic clean-up method. However, evaluation of the reduction in the chemical load and toxicity potential to fully assess the efficiency of this methodology to clean-up water is necessary.

OBJECTIVOS/OBJECTIVES:

This project aims to evaluate the reduction of the chemical load in water after application of the magnetic clean up methodology.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

The oil-phase in the polluted water will be magnetized with the established methodology and the resulting magnetized mixture will then be placed into the magnetic separator unit for the phase separation process. The process may be applied up to five times consecutively to assess the efficiency of the magnetic separation process. Water resulting from each of these cleaning cycles will be analysed to evaluate clean up methodology performance.

Various classes of hydrocarbons are abundant in crude oils and their refined products, usually accounting for >75% of the total composition. Chemical analysis will thus be done mainly by evaluating total petroleum hydrocarbons (TPHs) before and after magnetic oil separation from water.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Chemistry, Environmental Science

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Chemistry, Environmental Sciences, Biochemical, Chemical Engineering

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Sergio Fernández Boo

GRUPO/GROUP: Nutrimu

CO-ORIENTADOR(A)/CO-SUPERVISOR: Benjamin Costas Refojos

GRUPO/GROUP: Nutrimu

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR

TEMA/THEME: Identification of novel antimicrobial peptides in the sea urchin *Paracentrotus lividus*.

RESUMO/SUMMARY

Marine species compose around half of the total global biodiversity and currently are been explored as potential sources of novel bioactive natural products (Cheung et al. 2015). Bioactive peptides are important natural products present in many species and extensive research has recently been directed on them. These bioactive peptides have high nutraceutical and medicinal potential due to their wide spectrum of bioactivities such as antimicrobial, antiviral, antitumor, antioxidative, cardioprotective, immunomodulatory and analgesic, among others. Therefore, bioactive or antimicrobial peptides (AMPs) have attracted the attention of the industry with the aim of designing applications for their use in the treatment or prevention of many diseases. In sea urchins, several AMPs have been described. Almost all the AMPs described in sea urchins were found in the immune cells (coelomocytes).
Included in this task is the collection of sea urchins from coastal areas of Portuguese coast to extract the coelomic fluid and the mucosa that covers the body. Coelomic fluid id formed by coelomocytes whose are the cells responsible to defend the organism from external agents with possible microbicidal compound content (Pinsino and Matranga, 2015).

OBJECTIVOS/OBJECTIVES:

Isolation and characterization of novel antimicrobial compounds from different tissues of the sea urchin *P. lividus.*

Confrontation of this compounds with bacteria and parasites which causes mortality events in bivalve molluscs, with the aim of mitigate diseases.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

High Performance Liquid Cromatography (HPLC).

Microbiology.

Molecular techniques.

Microscopy.

Data analysis.

REFERÊNCIAS/REFERENCES:

Cheung, R.C.F., Ng, T.B., Wong, J. H. (2015). Marine peptides: Bioactivities and applications. Marine Drugs 13, 4006-4043.

Pinsino, A. & Matranga, V. (2015). Sea urchin immune cells as sentinel of environmental stress. Developmental and comparative immunology 49: 198-205.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Biología.

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Licenciatura em Biología, Bioquímica, Química e Farmacia.

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Francisco Guardiola

GRUPO/GROUP: Nutrition and Immunobiology

CO-ORIENTADOR(A)/CO-SUPERVISOR: Benjamín Costas

GRUPO/GROUP: Nutrition and Immunobiology

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR

TEMA/THEME: *In vitro* evaluation of probiotics candidates on the innate immune response in aquaculture fish

RESUMO/SUMMARY

Aquaculture intensification is a response to the increased food supply demand of rising worldwide population. Intensive aquaculture systems promote fish stress and consequently fish susceptibility to disease. Despite its health and environmental concerns, antibiotics are used to control disease outbreaks in aquaculture. In contrast, immunostimulants are a promising method to avoid antibiotics usage by improving fish health [1]. *In vivo* probiotics administration brings several benefits to the host as increase of their immunocompetence. However, *in vitro* studies are essential not only to better calculate the effective dose of a probiotic but also to analyze how the viability of the bacteria influence the immune modulation in order to perform the *in vivo* studies in the future.

OBJECTIVOS/OBJECTIVES:

The objective of this proposal is to allow a better understanding of the influence *in vitro* of several probiotics candidates such as bacteria and yeasts on primary cells of the head-kidney of two species of fish of great importance for aquaculture, such as European seabass (*Dicentrarchus labrax* L.) and Senegalese sole (*Solea senegalensis*).

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Cells isolation and culture

Bacteria and yeast culture

Cellular immunological techniques to assess the *in vitro* innate immune response to probiotics

Molecular techniques to assess the gene expression on head-kidney leucocytes:

- RNA extraction and cDNA synthesis of samples
- A real-time polymerase chain reaction (Real-Time PCR) to assess the expression of several immune-related genes

REFERÊNCIAS/REFERENCES:

[1] Wang, W., Sun, J., Liu, C., Xue, Z., 2016. Application of immunostimulants in aquaculture: Current knowledge and future perspectives. Aquac. Res. 1–23.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Aquaculture – Fish Immunology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia, Bioquímica, Ciências do Meio Aquático, Medicina Veterinária

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Luisa Valente

GRUPO/GROUP: LANUCE

CO-ORIENTADOR(A)/CO-SUPERVISOR: Ana Basto

GRUPO/GROUP: LANUCE

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR - LANUCE

TEMA/THEME: Insects as rich protein sources to use in aquafeeds: impact on flesh quality

RESUMO/SUMMARY

The expansion of aquaculture industry necessarily implies an increase of aquafeeds production, where high quality fishmeal (FM) has been over the years the preferred protein source, in particular for carnivorous species. However, the world availability of this resource is finite and their use is environmentally and economically unsustainable. Thus, the decrease of global availability and rising price of this feed ingredient have challenged industry to find more sustainable and cost-effective alternatives to FM [1,2,3].

Insects are rich protein sources (>50%) with well-balanced amino acids that might partially replace the environmental and economically unsustainable fish meal (FM) in diets for fish. Recently, inclusion of insect meal (IM) in aquafeeds was approved in EU, but their potential as alternative protein source to FM remains largely unexplored, namely in marine fish species [3].

This internship will focus on the identification of the maximum inclusion of insect meal in diets for marine fish species with high value for European aquaculture without compromising fish growth, welfare and flesh quality through classical and cutting-edge approaches.

OBJECTIVOS/OBJECTIVES:

- Evaluate the potential of using insect meal in diets for fish with importance to European Aquaculture

- Identify the maximum dietary level of insects inclusion recommended to promote fish growth, without compromise fish welfare and assuring the organoleptic characteristics of the flesh

- Acquire practice in classical and cutting-edge technologies applied to flesh quality evaluation in fish

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

- Evaluation of physiological parameters able to be used as welfare indicators (plasma metabolites) [1,2].

- Evaluation of flesh organoleptic properties using sensory analysis (sensory panel) and determination of the nutritional value of the fillets (total lipids and fatty acid profile) [1,4].

- Evaluation of muscle texture using instrumental methods and histology, and molecular biology (expression of texture-related genes) [4].

REFERÊNCIAS/REFERENCES:

1. CAMPOS, I., MATOS, E., MARQUES, A., VALENTE, L.M.P., 2017. Hydrolyzed feather meal as a partial fishmeal replacement in diets for European seabass (Dicentrarchus labrax) juveniles. Aquaculture 476: 152-159. doi.org/10.1016/j.aquaculture.2017.04.024
2. CONDE-SIEIRA, M., M. GESTO, S. BATISTA, F. LINARES, J.L.R. VILLANUEVA, J.M. MÍGUEZ, J.L. SOENGAS, L.M.P. VALENTE. 2018. Influence of vegetable diets on physiological and immune responses to thermal stress in Senegalese sole (Solea senegalensis). PLoS ONE 13(3): e0194353.https://doi.org/10.1371/journal. pone.0194353
3. HENRY, M., GASCO, L., PICCOLO, G., FOUNTOULAKI, E., 2015. Review on the use of insects in the diet of farmed fish: past and future. Animal Feed Science and Technology 203, 1-22
4. VALENTE, L.M.P., E. CABRAL, E., V., SOUSA, L.M. CUNHA, J.M.O. FERNANDES, 2016. Plant protein blends in diets for Senegalese sole affect skeletal muscle growth, flesh texture and the expression of related genes. *Aquaculture,* 453: 77-85. 10.1016/j.aquaculture.2015.11.034
5. VALENTE, L.M.P., K.A. MOUTOU, L. CONCEIÇÃO, S. ENGROLA, J.M.O. FERNANDES, I.A. JOHNSTON. 2013. What determines growth potential and juvenile quality of farmed fish species? *Reviews in Aquaculture*, 5: S168-S193. doi: 10.1111/raq.12020.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Biological Sciences - Fish Nutrition / Aquaculture

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology, Aquatic Sciences, Biochemistry

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Maria de Fátima Carvalho

GRUPO/GROUP: ECOBIOTEC

CO-ORIENTADOR(A)/CO-SUPERVISOR: Pedro Leão/Ana Paula Mucha

GRUPO/GROUP: Cyanobacterial Natural Products/ECOBIOTEC

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR

TEMA/THEME: Investigation of diversity and bioactive potential of actinobacteria isolated from deep-sea samples

RESUMO/SUMMARY

Actinobacteria are a large group of Gram-positive bacteria, highly prolific in the production of bioactive secondary metabolites with a wide range of biological and pharmaceutical properties. Most of known actinobacterial species are of terrestrial origin, but it has been recently shown that they are also "true" habitants of the oceans and are a proven source of novel relevant secondary metabolites, such as antibiotics, antitumor, anti-inflammatory and antiviral compounds, biosurfactants, etc. (Dharmaraj, 2010; Olano et al., 2009).

The deep sea is a unique environment characterized by extreme conditions, such as high pressure, low temperature, lack of light and variable salinity and oxygen concentrations, causing unique evolutionary pressures on microorganisms. These habitats are highly underexplored in terms of their biotechnological potential. Deep-sea sediments are known to contain a high diversity of actinobacteria, a great proportion of which are predicted to be novel species and genera (Bull and Stach, 2007). This proposal intends to investigate the diversity of actinobacteria associated with several deep-sea sediment samples collected in Portugal and explore their potential to produce bioactive compounds, namely antimicrobials, anticancer and biosurfactants.

OBJECTIVOS/OBJECTIVES:

At the moment, a collection of approximately 250 unidentified bacterial strains recently isolated from deep-sea samples collected in Portugal is available at CIIMAR.

In this proposal it is intended to:

(i) taxonomically identify the isolated strains;

(ii) investigate the potential of actinobacterial strains to produce bioactive compounds, namely antimicrobials, anticancer and biosurfactants.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Microbial strains isolated from deep-sea samples will be identified through 16S rRNA gene sequencing. A preliminary assessment of the production of bioactive compounds by all actinobacterial isolates identified will be performed by culturing each isolate in selective liquid medium, followed by extraction of culture medium with organic solvents and screening the obtained extracts for selected bioactivities, as antimicrobial and anticancer and biosurfactants production.

REFERÊNCIAS/REFERENCES:

- Bull, A. T. and Stach, J.E. (2007). Marine actinobacteria: new opportunities for natural product search and discovery. Trends in microbiology, 15(11): 491-499.

- Dharmaraj, S. (2010). Marine Streptomyces as a novel source of bioactive substances. World Journal of Microbiology and Biotechnology, 26 (12): 2123–2139.

- Olano, C., Méndez, C. and Salas, J.A. (2009). Antitumor compounds from marine actinomycetes. Marine Drugs, 7(2): 210–248.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Ciências Biológicas

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia, Bioquímica, Ciências do Meio Aquático, Ciências e Tecnologia do Ambiente e afins.

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Maria Emília Sousa

GRUPO/GROUP: Natural Products and Medicinal Chemistry

CO-ORIENTADOR(A)/CO-SUPERVISOR: Isabel Almeida

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: Faculdade de Farmácia da Universidade do Porto

TEMA/THEME: Compostos inspirados no mar com potencial atividade anti-envelhecimento/ Marine-inspired compounds with anti-aging potential

RESUMO/SUMMARY

Natural products are privileged sources of antioxidants. Particularly, seaweeds, chlorophyll-containing photosynthetic marine macroscopic algae, can be valuable source of natural antioxidant compounds since they have a well-developed antioxidant defence system, and include sulfated polysaccharides, phlorotannins, bromophenols, fucoxanthins, xanthones, among others.

Nevertheless, some of them contain complex structures with unfavorable stability properties and/or isolation of small quantities of pure bioactive compounds can be limiting.

The synthesis of a polyoxygenated xanthone derivative will be accomplished. It is expected to determine its in vitro antioxidant effect.

OBJECTIVOS/OBJECTIVES:

The main purpose of this proposal is to use analogue-drug design based on promising antioxidants marine natural products to obtain innovative, stable, safe, and affordable new ingredients for the topical treatment as antioxidants.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Organic synthesis, purification and isolation procedures and structural elucidation of organic substances. The structure elucidation will be performed by spectroscopic methods (UV, IR , 1H and 13C NMR), and mass spectrometry.
The antioxidant properties will be evaluated by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging effect.

REFERÊNCIAS/REFERENCES:

H. Cidade, V. Rocha, A. Palmeira, C. Marques, M. E. Tiritan, H. Ferreira, J. S. Lobo, I. F. Almeida, M. E. Sousa, M. Pinto. *In silico* and *in vitro* antioxidant and cytotoxicity evaluation of oxygenated xanthone derivatives, Arabian Journal of Chemistry 2017, doi: 10.1016/j.arabjc.2017.01.006.

ÁREA CIENTÍFICA/SCIENTIFIC AREA:

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES:

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 – 2019

ORIENTADOR(A)/SUPERVISOR: Maria Natividade Vieira

GRUPO/GROUP: Soil/Water Interactions

CO-ORIENTADOR(A)/CO-SUPERVISOR: Diogo Peixoto

GRUPO/GROUP: Soil/Water Interactions

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR/FCUP - Soil/Water Interactions

TEMA/THEME: Microplastics pollution in Portuguese saltwork ponds

RESUMO/SUMMARY

Microplastics(MPs) are plastic particles with linear dimension <5mm commonly polluting aquatic environments, as principal marine debris [1]. MPs are, undoubtedly, leading to contamination of biotic and abiotic sea products with possible adverse effects on human health through consumption [2,3].

Sodium chloride(NaCl) is typically produced in solar saltwork ponds by crystallization and has various uses for industry, cosmetic products and mostly for daily human food preparation and conservation [2,4]. Portuguese saltworks are generally located along anthropized coastal environments. In these areas, prior to NaCl crystallisation, seawater circulates along successive ponds, providing a gradient of environments with different salinity levels (35-300g/L) [4]. Besides salt production, saltworks provide ecological functions, by the presence of several native organisms. Recently, Portuguese NaCl was found to be contaminated by various MPs polymers [3,5]. This internship will focus on the identification of MPs polymers present in water, sediment and ingested by zooplankton organisms of various saltwork ponds at different areas (Aveiro, Figueira da Foz, Alcochete, Alcáçer do Sal and Tavira), before NaCl crystallization, through classical and cutting-edge approaches.

OBJECTIVOS/OBJECTIVES:

- Evaluation of seasonal variation of water, sediment and zooplankton communities' compositions at selected areas;

- Evaluate the seasonal variation of MPs concentrations and polymers types in water at the selected areas;

- Identification of MPs polymers types found in water, sediment and ingested by zooplankton organisms at the selected areas.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

- Participation in the samples collections;

- Laboratory analysis of chemical and biological parameters of water and sediment [6-9];

- Taxonomical identification of zooplankton communities [6];

- Identification of MPs polymers in in water, sediment and ingested by zooplankton organisms using microRaman spectroscopy and chemical imaging [10].

REFERÊNCIAS/REFERENCES:

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ÁREA CIENTÍFICA/SCIENTIFIC AREA: Biological Sciences – Toxicology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology, Aquatic Sciences

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Puri Veiga Sánchez

GRUPO/GROUP: Coastal Biodiversity

CO-ORIENTADOR(A)/CO-SUPERVISOR: Marcos Rubal García

GRUPO/GROUP: Coastal Biodiversity

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: LBC (CIIMAR) and Lab 2.54 (Biology Department of Faculty of Sciences, UP)

TEMA/THEME: Molluscs associated with invasive and native canopy-forming macroalgae along the Atlantic coast of the Iberian Peninsula.

RESUMO/SUMMARY

Biological invasions are broadly considered as one of the largest component of global change and macroalgae are the most notorious invasive species in marine systems (1). Moreover, macroalgae provide important services in nearshore ecosystems such as habitat, food or nutrient regulation (2). This importance is particularly evident in canopy forming-species (e.g. fucoids or kelps) because they generate three-dimensional habitat and can enhance the biodiversity of their associated fauna. Although some invasive macroalgae are also canopy forming-species, (e.g. *Sargassum muticum*, *Undaria pinnatifida*), the function of these invasive canopy-forming macroalgae usually does not correspond to that of the native macroalgae (3; 4).

Atlantic coast of the Iberian Peninsula is in one of the areas (NE Atlantic) that is suffering the most rapid environmental changes (5; 6). Moreover, sea surface temperature shows a latitudinal gradient from north to south and significant seasonal changes with a maximum latitudinal variation of 8 °C in autumn and a minimum of 4 °C in winter (5).

This proposal will explore patterns of abundance and diversity of molluscs associated with invasive and native canopy-forming macroalgae along the latitudinal gradient in the Atlantic coast of the Iberian Peninsula.

OBJECTIVOS/OBJECTIVES

The aims of this proposal are:

i) To study biodiversity associatted with invasive and native canopy- forming macroalgae.
ii) To elucidate if the invasive macroalgae harbour a similar biodiversity to native macroalgae.
iii) To analyse if fauna associatted with invasive and native canopy-forming macroalgae differs between latitudinal regions.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

The Atlantic coast of the Iberian Peninsula, from Algarve (South Portugal) to Marinha de Lugo (North of Galiza), was divided in 5 main regions with different temperature and environmental conditions. At each region, two different shores were considered. The most common invasive and native canopy macroalgae were selected. At each rocky shore, 6 replicates of each macroalgal species were collected. In this proposal molluscs associated with each macroalga will be determined at species level. With this information both specific diversity and functional diversity (i.e. trophic groups) associated with each macroalga will be calculated.

Molluscs were considered as model because they live commonly associated with macroalgae since they provide them refuge from predation, shelter from hydrodynamism or serving as nursery area (7; 8). This proposal allow us obtain a model about effects of invasive macroalgae on biodiversity and trophic structure of their associatted fauna.

REFERÊNCIAS/REFERENCES:

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ÁREA CIENTÍFICA/SCIENTIFIC AREA: Ecology, Zoology, Marine Biology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia, Ciências do Meio aquático

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Maria João Santos

GRUPO/GROUP: Laboratório de Patologia Animal

CO-ORIENTADOR(A)/CO-SUPERVISOR: -

GRUPO/GROUP:

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: Laboratório de Patologia Animal do CIIMAR, que fica na FCUP (na Rua do Campo Alegre)

TEMA/THEME: Parasitas de Animais Aquáticos

RESUMO/SUMMARY

Os parasitas de animais aquáticos são organismos ainda pouco conhecidos, não é invulgar encontrarmos espécies novas a cada passo da pesquisa parasitológica. Para fazer uma boa descrição das espécies novas há que respeitar algumas metodologias de observação, e descrever cuidadosamente cada um dos passos dessa análise.
O grupo de Patologia Animal no decurso das suas pesquisas parasitológicas encontrou algumas espécies novas que necessitam ser detalhadamente descritas e analisadas. Pretende-se fazer análises de Microscopia de Varrimento, além de análises morfológicas detalhadas com microscopia ótpica, e análises moleculares, algumas já efetuadas para complementar a descrição detalhada das espécies. Todas estas etapas serão respeitadas na descrição das espécies novas. O aluno interessado neste trabalho verá o seu nome ligado à descrição da espécie que descrever, e assim ligado à Ciência e à Parasitologia em geral.

OBJECTIVOS/OBJECTIVES:

Organizar a informação já compilada para a descrição da espécie. Rever a literatura para outras espécies do mesmo género. Publicar o trabalho da descrição da espécie nova.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Fazer análises de microscopia de varrimento e de microscopia ótica do parasita a descrever.

Conhecer como se publica um artigo científico.

Organizar o artigo compilando toda a informação existente e completando com nova informação.

REFERÊNCIAS/REFERENCES:

– Cavaleiro, F., Rangel, L. F., Duarte, F., **Santos, M.J.** 2017. *Syndesmis aethopharynx Westervelt & Kozloff, 1990 (Rhabdocoela: Umagillidae): a revisitation supported by scanning electron microscopy and molecular analyses. Systematic Parasitology*. 94: 1007-1017. DOI: 10.1007/s11230-017-9754-0.

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ÁREA CIENTÍFICA/SCIENTIFIC AREA: Parasitologia

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia & Licenciaturas ICBAS

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Marcos Rubal García

GRUPO/GROUP: LBC

CO-ORIENTADOR(A)/CO-SUPERVISOR: MSc Cristiano Fortuna Soares

GRUPO/GROUP: Soil/Water Interactions

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK:FCUP laboratories (2.54 and 2.62)

TEMA/THEME: Physiological and biochemical responses of macroalgae to adverse environmental conditions – a field-based study.

RESUMO/SUMMARY

Being organisms of the intertidal, several species of macroalgae are periodically exposed to different environment constraints, including extreme temperatures, high UV radiation and desiccation (Maharana et al., 2015; Guajardo et al., 2016). As a consequence of these fluctuations, the normal metabolism of the cells can be disrupted, favouring the occurrence of oxidative stress, by an overproduction of reactive oxygen species (ROS) (Gill and Tuteja, 2010). However, up to date, little is acknowledged regarding the physiological responses of macroalgae to environmental factors and their contribution to the vertical distribution of the species (Salavarría et al., 2018). In this way, the present study intents to understand the effects of environmental factors (UV radiation, desiccation and high temperatures) on the physiological performance of macroalgal species found in the North coast of Portugal. Since oxidative stress is a common response to diverse types of adverse growth conditions, particular relevance will be given to the induction of pro-oxidative conditions and the activation of the macroalga antioxidant system.

OBJECTIVOS/OBJECTIVES:

- Understand the impacts of environmental fluctuations on the physiological status of several macroalgal species.
- Evaluate the response of the antioxidant system and the induction of oxidative stress.
- Identify species-specific mechanisms to cope with several adverse conditions.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

- Identification and field sampling of macroalgae.
- Determination of different physiological indicators, e.g. total chlorophylls and carotenoids, soluble protein (Soares et al., 2016).
- Quantification of biochemical parameters related to oxidative stress, such as lipid peroxidation, hydrogen peroxide and superoxide anion (Soares et al., 2018).
- Quantification of non-enzymatic (proline and ascorbate) and enzymatic antioxidants (superoxide dismutase, catalase and ascorbate peroxidase) (Soares et al., 2018).
- Determination of total antioxidant capacity and reducing power (Zafar et al., 2016).

REFERÊNCIAS/REFERENCES:

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ÁREA CIENTÍFICA/SCIENTIFIC AREA: Marine Biology and Plant physiology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology, Biochemistry and Aquatic Sciences

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Marcos Rubal García

GRUPO/GROUP: LBC

CO-ORIENTADOR(A)/CO-SUPERVISOR: Puri Veiga Sánchez

GRUPO/GROUP: LBC

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: FCUP (laboratory 2.54)

TEMA/THEME: The effect of seawalls on the diversity and structure of intertidal sandy beach meiobenthic assemblages.

RESUMO/SUMMARY

Sandy shore ecosystems dominate the world coastlines but, despite their broad extension and social importance as recreational places, the apparent absence of life made that their study lagged behind rocky shores for years. However, they play an important role in nutrient remineralisation, processing organic materials through their interstices and loading nutrients to the sea (McLachlan and Turner 1994). The presence of breakwaters and seawalls can influence the structure of meiobenthic assemblages by modifying the sedimentary environment and the hydrodynamics. In North Portugal the macrobenthic assemblages of intertidal sandy beaches have been studied (Veiga et al., 2014). In contrast, there is a lack of quantitative information about sandy beach meiobenthos. The objective of this proposal is to fill this gap on the study of intertidal sandy beach ecology and the impact of artificial structures on natural habitats.

OBJECTIVOS/OBJECTIVES:

- To explore the effect of seawalls on meiobenthic assemblages.
- To explore changes on diverse groups such as tardigrades or polychaetes.
- To explore changes in the sedimentary environment in relation to the distance to the seawall.
- To explore the relationship between changes in sediment and the structure of meiobenthic assemblages.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

- Processing meiobenthic sediment samples
- Sorting meiobenthic samples under dissection microscope.
- Identification of meiobenthic major taxa.
- Data analyses.

REFERÊNCIAS/REFERENCES:

McLachlan A, Turner I. 1994. The interstitial environment of sandy beaches. Marine Ecology 15:177-211.

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ÁREA CIENTÍFICA/SCIENTIFIC AREA: Marine Biology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology and Aquatic Sciences

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Patricia Cardoso

GRUPO/GROUP: EDEC

CO-ORIENTADOR(A)/CO-SUPERVISOR: Francisco Arenas

GRUPO/GROUP: EEA

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR

TEMA/THEME: The effects of binary mixtures of mercury and synthetic progestins on the fitness and reproduction of *Gammarus locusta*, under global warming conditions

RESUMO/SUMMARY

The emergence of climate change and endocrine disruptor chemicals (EDCs) as crucial societal challenges became priority topics. Besides climate change, over the last 2 decades, considerable concern has been given to the environmental health risks posed by endocrine disruptor chemicals (EDCs) that possibly upset animal hormonal systems. Despite EDCs have been widely studied worldwide, little attention has been paid to the environmental health effects of environmentally realistic EDCs mixtures (e.g. xenoestrogens and metals) and the risks they pose to aquatic organisms are largely unknown. There is good evidence that common EDCs, like xenoestrogens and mercury, which act at interconnecting endocrine axes can work together to produce combined effects (1,2). These contaminants associated to climate related factors (e.g. temperature) may produce a stronger and unpredictable effect on the aquatic habitat (3).

OBJECTIVOS/OBJECTIVES:

The main goal of this work is to assess the effects of combined mixtures of EDCs (progestins and Hg) under a global warming scenario on the fitness and reproduction of the amphipod *Gammarus locusta* in which is possible to follow its life cycle. Different outputs will be evaluated:

- Survival
- Consumption rates
- Growth
- Reproductive traits (fecundity and embryonic development)

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Mesocosm experiments will be performed, exposing young individuals of *G. locusta* to contaminated diet (*Ulva lactuca* previously exposed to Hg and progestins) under the combined effects of temperature and pCO_2.
Organisms will be assessed in terms of growth rate, survival, bioaccumulation rates, consumption rates and reproduction (newborns production and embryonic development).

Relative Consumption Rates will be evaluated using the method of (4) in which amphipod consumption (C)will be calculated as C = Wi * (Cf/Ci) e Wf; where, Wi and Wf are the initial and the final WW of the Ulva sp. pieces, respectively, and Ci and Cf are the equivalent WW of the control pieces (biogenic controls). Relative consumption rates (RCRs, g Ulva ww g-1 individual ww day-1) were calculated as C/(WMf x t), where C is the Ulva sp. consumed for each time interval (1d) and WMf is the final wet mass of individuals for each time interval.

REFERÊNCIAS/REFERENCES:

- (1) Tan SW, Meiller JC, Mahaffey KR. 2009. The endocrine effects of mercury in humans and wildlife. Crit Rev Toxicol 39:228–269.
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- (4) Gutow L, Rahman MM, Bartl K, Saborowski R, Bartsch I, Wiencke C 2014. Ocean acidification affects growth but not nutritional quality of the seaweed *Fucus vesiculosus* (Phaeophyceae, Fucales). Journal of Experimental Marine Biology and Ecology 453: 84-90.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Ecotoxicologia/Ecologia

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biologia/Ciências do Meio Aquático

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Dr. Leonardo J. Magnoni

GRUPO/GROUP: LANUCE

CO-ORIENTADOR(A)/CO-SUPERVISOR: MSc. Francisca Silva-Brito

GRUPO/GROUP: LANUCE

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR

TEMA/THEME: THE IMPACT OF SWIMMING ACTIVITY ON THE WELFARE OF CULTURED FINFISH

RESUMO/SUMMARY

Intensifying aquaculture production and an increasing concern for fish welfare means that improved knowledge of the swimming physiology of fish and its application to rearing conditions is required. Exercise at optimal speeds enhance muscle growth and flesh quality, improving the immune response and welfare of some teleost fish (Palstra et al. 2013). Swimming affects fish physiology through adaptive mechanisms, but further research efforts should weigh the potential benefits and/or drawbacks of different swimming regimes, which are key applicable issues in the aquaculture sector. Locomotion in fish, from sustained to burst swimming activity, is associated with increased oxygen use, involving the recruitment of a variable proportion of red and white muscle fibers (Palstra and Planas, 2011). In addition, swimming activity, utilizing red and/or white muscle contractions, is fueled by aerobic and anaerobic metabolic pathways, depending on exercise conditions, oxygen, and energy available.

Two swimming speeds are particularly relevant in terms of the behavioral and physiological adaptations of fish: optimal swimming speed (U_{opt}) and critical swimming speed (U_{crit}). U_{opt} is defined as the speed at which the active metabolic rate (AMR) reaches a minimum per distance swum (Tudorache et al. 2011; Tudorache et al. 2013). On the other hand, U_{crit} is the swimming speed at which maximum sustained oxygen uptake occurs and when fatigue occurs (Tudorache et al. 2011). Swimming speeds above the U_{opt} and below the U_{crit} may involve the complete recruitment of all red muscular mass (aerobic energy production) as well as a significant proportion of white muscular mass (anaerobic energy production) for locomotion. In mammals at least, an increase in metabolic demand during exercise has been linked to elevated reactive oxygen species (ROS) formation in muscle mitochondria, which may result in oxidative stress (Steinbacher and Eckl, 2015). This burst in ROS results in free radical production, highly reactive molecules that damage lipids, proteins, DNA and RNA, resulting in subsequent oxidative stress in animal tissues (Fisher-Wellman and Bloomer 2009). As a consequence, protective mechanisms at cellular/tissue levels may be displayed to decrease potential oxidative damage that might be produced by an excess of ROS formation in animals. These kinds of mechanisms may include increasing levels of antioxidant enzyme activities (e.g. catalase, superoxide dismutase and glutathione peroxidase).

OBJECTIVOS/OBJECTIVES:

The aim is to test if swimming activity may induce oxidative stress in fish and to assess their welfare by evaluating changes in several stress/ metabolic markers.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

The experimental setup will consist of four identical Brett-type swimming tunnels. The tunnels, cylindrical acrylic flumes (7.5 x 50 cm) will be equipped with water pumps and potentiometers, thus allowing changes in water flow speeds. Temperature, light regime, pH and oxygen concentration (>98% air saturation) will be maintained at similar levels in all the tunnels.

Three experimental groups will be established:

1. Resting group (R) - fish are not forced to swim (under low speed water current) (4-24 hs)
2. Swimming group (SW) - fish swimming above the U_{opt} (below U_{crit}) for several hours (4-24 hs);
3. Swimming-resting group (SR) - fish swim the same speed as in 2, but alternated with resting periods. This alteration will be repeated several times (4-24hs).

Water velocity in the swimming chamber will be calibrated by video-taping the repeated release of a dye suspension through the chamber and by counting film frames. Fish will be individually placed inside each swimming tunnel and allowed to acclimatize 24 hs before the trial. After the trial fish will be anesthetized. Blood will be sampled fro hematocrit and hemoglobin determination. Also plasma will be separated to measure glucose, lactate and cortisol using commercial kits. Fish will be euthanized to collect tissues (liver, muscles, and heart). The activity levels of key enzymes involved in protective mechanisms against oxidative stress will be analyzed in several fish tissues (e.g. catalase, superoxide dismutase and glutathione peroxidase). Oxidative damage of lipids and DNA will be evaluted as well.

REFERÊNCIAS/REFERENCES:

Palstra A.P., Planas J.V. (2011): Fish under exercise. Fish Physiology and Biochemistry, 37:259-272.

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Steinbacher P., Eckl P. (2015): Impact of Oxidative Stress on Exercising Skeletal Muscle. Biomolecules, 5: 356-377.

Tudorache C., O'Keefe R.A., Benfey T.J. (2011): Optimal swimming speeds reflect preferred swimming speeds of brook charr (*Salvelinus fontinalis* Mitchill, 1874). Fish Physiology and Biochemistry, 37: 307-315.

Tudorache C., de Boeck G., Claireaux G. (2013): Forced and preferred swimming speeds of fish: a methodological approach. In: Palstra A., Planas J.V. and Magnoni L.J. (Eds) Swimming physiology of fish. Springer-Verlag Berlin, Germany, 81-108.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Animal physiology. Animal welfare. Aquaculture.

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biochemistry, Biology, Aquatic sciences, Veterinary sciences.

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Olga Maria Lage

GRUPO/GROUP: LEMUP/BBE

CO-ORIENTADOR(A)/CO-SUPERVISOR:

GRUPO/GROUP:

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: Faculdade de Ciências

TEMA/THEME: Evaluation of bioactivities by Flow Cytometry

RESUMO/SUMMARY

In this project, Flow Cytometry (FCM) will be used to evaluate the production of bioactive compounds/extracts in different cell targets like *Escherichia coli*, *Bacillus subtilis* and *Candida albicans*. Parameters that will be analyzed include cell viability, death and membrane integrity.

The student will cultivate the potentially bioactive bacteria, will obtain extracts that then will be tested in in vivo assays with the target strains.

The obtained results will compared with the ones from conventional antimicrobial screenings.

OBJECTIVOS/OBJECTIVES:

The main objective is to assess the applicability for the screening of bioactivities.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

Bacteria cultivation.

Flow Cytometry analyses.

Antimicrobial screenings.

REFERÊNCIAS/REFERENCES:

O'Brien-Simpson NM, Pantarat N, Attard TJ, Walsh KA, Reynolds EC. 2016. A Rapid and Quantitative Flow Cytometry Method for the Analysis of Membrane Disruptive Antimicrobial Activity. PLoS One. 2016 Mar 17;11(3):e0151694. doi: 10.1371/journal.pone.0151694. eCollection 2016.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Microbiology

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology, Biochemistry

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Filipe Castro

GRUPO/GROUP: AGE

CO-ORIENTADOR(A)/CO-SUPERVISOR: Miguel Santos

GRUPO/GROUP: EDEC

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR and FCUP

TEMA/THEME: ***The Neglected: evolution of endocrine systems in Lophotrocozoans***

RESUMO/SUMMARY

Evolutionary biology seeks to unravel the link between the physiological diversity and the genetic makeup of different lineages. These can include for example variable gene complements, *or* subtle/drastic substitutions in the coding region of genes. Nuclear Receptors (NRs) are a group of Metazoan-specific transcription factors triggered by specific ligands, including hormones, morphogens and dietary compounds, thus modulating the transcription of downstream target genes. The coordinated action of NRs and their ligands controls many aspects of physiological homeostasis, including development and reproduction. Over the years, a significant inroad into the evolutionary origin of NRs and their diversification in Metazoans has been made. From the basal metazoan phylum, the Porifera, an original set of two ancestral NRs expanded through large events of duplication, at the base of the Bilateria and later in the Vertebrate branch. However, a variable NR gene repertoire has been appointed to different animal lineages, denoting a profoundly dynamic evolutionary path. A string of recent findings, including works by this research team, lends support to the hypothesis that NR evolution has been punctuated by episodes of functional plasticity associated with subtle or more dramatic amino acid changes in the ligand pocket of NRs with likely impacts in endocrine system evolution. This proposal puts into an evolutionary context the structural and functional aspects of NR biology and their role in endocrine systems, validated by millions of years of evolution.

OBJECTIVOS/OBJECTIVES: Here we propose to investigate the NR gene repertoire and function in Lophotrocozoan phyla, which have been largely overlooked such as Rotifers, Annelids, Bryozoa and Priapulida.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES: The work plan will entail a strong component of Bioinformatics (e.g. gene mining, gene annotation, phylogenetics, selection) in combination with Molecular and Cell Biology techniques (e.g. next generation sequencing technologies, Cell culture, PCR).

REFERÊNCIAS/REFERENCES:

Castro LF, Santos MM. (2014). To bind or not to bind: the taxonomic scope of nuclear receptor mediated endocrine disruption in invertebrate phyla. Environ Sci Technol. 48(10):5361-3.

Fonseca E, Ruivo R, Lopes-Marques M, Zhang H, Santos MM, Venkatesh B, **Castro LF**. LXRα and LXRβ Nuclear Receptors Evolved in the Common Ancestor of Gnathostomes. Genome Biol Evol. 2017 Jan 1;9(1):222-230.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Environmental Sciences, Comparative Genomics and Evolution

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology and Biochemistry

BLUE YOUNG TALENT - BYT

CENTRO INTERDISCIPLINAR DE INVESTIGAÇÃO MARINHA E AMBIENTAL - CIIMAR

PROPOSTA DE PLANO DE ESTÁGIO 2018 - 2019

ORIENTADOR(A)/SUPERVISOR: Filipe Castro

GRUPO/GROUP: AGE

CO-ORIENTADOR(A)/CO-SUPERVISOR: Raquel Ruivo

GRUPO/GROUP: -

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: CIIMAR and FCUP

TEMA/THEME: *When less is more*: the role of gene loss in phenotypic diversification

RESUMO/SUMMARY

The Vertebrate sub-phylum comprises a considerable number species with tantalizing morphological and physiological adaptations to particular environments. In many cases, the evolution of novel traits (e.g. teeth, hair, taste, digestion) has been clearly linked to Gene Duplication. The retention of descendent gene copies leads to the emergence of novel roles. Much less explored is the role of gene pseudogenization and the ensuing phenotypic consequences - adaptation.

Here, we will investigate the gene composition of various genetic pathways (e.g. lipid and sugar metabolism) in the whole of the vertebrate clade (mammals, birds and reptiles, amphibians, teleosts and sharks). We will combine comparative genomics with functional assays to determine when and how have key adaptations emerged in vertebrate ancestry and whether gene loss has been an effective way of adaptation.

OBJECTIVOS/OBJECTIVES:

To investigate and identify evolutionary processes of gene loss in Vertebrate genomes and their role in phenotypic diversification.

PRINCIPAIS METODOLOGIAS/MAIN METHODOLOGIES:

The work plan will be entail a strong component of Bioinformatics (e.g. gene mining, gene annotation, phylogenetics, selection) in combination with Molecular and Cell Biology techniques (e.g. next generation sequencing technologies).

REFERÊNCIAS/REFERENCES:

Recurrent gene loss correlates with the evolution of stomach phenotypes in gnathostome history. **Castro** LF, Gonçalves O, Mazan S, Tay BH, Venkatesh B, Wilson JM. Proc Biol Sci. 2013 Dec 4;281(1775):20132669.

Genes for de novo biosynthesis of omega-3 polyunsaturated fatty acids are widespread in animals. Kabeya N, Fonseca MM, Ferrier DEK, Navarro JC, Bay LK, Francis DS, Tocher DR, **Castro LFC**, Monroig Ó. Sci Adv. 2018 May 2;4(5):eaar6849. doi: 10.1126/sciadv.aar6849.

ÁREA CIENTÍFICA/SCIENTIFIC AREA: Comparative Genomics and Evolution

LICENCIATURAS ADMITIDAS /ADMITABLE DEGREES: Biology and Biochemistry