



HAL
open science

Fatty acid sensing, regulation of food intake, and cellular signaling pathways are modified in rainbow trout fed with a lipid-enriched diet

Jose L. Soengas, Marta Libran-Perez, Inge Geurden, Karine Dias, Geneviève Corraze, Stéphane Panserat

► To cite this version:

Jose L. Soengas, Marta Libran-Perez, Inge Geurden, Karine Dias, Geneviève Corraze, et al.. Fatty acid sensing, regulation of food intake, and cellular signaling pathways are modified in rainbow trout fed with a lipid-enriched diet. Society for Experimental Biology (SEB) Annual Meeting, Jun 2015, Prague, Czech Republic. 118 p., 2015, Animal abstracts. hal-01901440

HAL Id: hal-01901440

<https://hal.science/hal-01901440>

Submitted on 2 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

A10.53**Behavioral Responses of Striped Shore Crab (*Pachygrapsus crassipes*) to the Antidepressant Fluoxetine**

Garfield T Kwan (Scripps Institution of Oceanography University of California San Diego, United States), Trevor Hamilton (MacEwan University, Canada), Martin Tresguerres (Scripps Institution of Oceanography University of California San Diego, United States)

We adapted three behavioral tests commonly used on mammals and studied the effect of the antidepressant drug fluoxetine (commonly known as Prozac) in the striped shore crab *P. crassipes*. The open field test consists of four white walls in a rectangular arena and measures locomotion (velocity and immobility). The light/dark preference test is a rectangular arena with half black and half white walls. Time spent in each zone is quantified and increased time spent in the dark zone is indicative of anxiety. The mirror-approach test consists of three white walls and a mirror on the long axis of the fourth wall. Aggression is measured by the time spent close to the mirror. Motion tracking software was used to record the position of the crab in each test and parameters such as velocity, immobility, and time in zones were quantified. Shore crabs were exposed to 5 mg/L fluoxetine (n=34), or to control seawater (n=36). We found significant differences in velocity and time spent in the dark zone in the light/dark test between the control and fluoxetine treated crabs. However, no significantly different results were detected in the open field or mirror-approach tests. These results indicate involvement of the serotonin pathway on some but not all the behavioral parameters analyzed, as well as common serotonin uptake pathways between humans and crustaceans. These results provide novel approaches and ideas to study neurobiology and behavior of crustaceans, as well as characterizing non-lethal effects of environmental stress, such as wastewater effluents and ocean acidification.

Email Address for correspondence: gkwan@ucsd.edu

Poster Session - Thursday 2nd July 2015

A10.54**Comparison of H₂S effect on aortas and resistance mesenteric arteries in normal and endotoxaemic rats**

Cheng-Ming Tsao (Department of Anesthesiology Taipei Veterans General Hospital National Yang-Ming University, Taiwan), Chen-Tzu Chiu (Department of Pharmacology National Defense Medical Center, Taiwan), Mei-Hui Liao (Department of Pharmacology National Defense Medical Center, Taiwan), Shiu-Jen Chen (Kang-Ning Junior College of Medical Care and Management, Taiwan), Chin-Chen Wu (Department of Pharmacology National Defense Medical Center, Taiwan)

Vascular hyporeactivity to vasoconstrictor agents plays an important role in sepsis. By acting on K_{ATP}, Hydrogen sulfide (H₂S) can hyperpolarize cell membranes and relax smooth muscle cells, and hence, regulate blood pressure. However, the vascular responses to H₂S are various in different tissues and species. Thus, we examine different effects of H₂S on vascular responses of thoracic aortas and mesenteric arteries in endotoxaemic rats induced by lipopolysaccharide (LPS). The thoracic aortas and mesenteric arteries of rats were isolated at 6 h after LPS administration to perform the ex vivo study of isometric tension recording. The vascular hyporeactivity to noradrenaline (NA) (1nM – 10 μM) was observed in aortas and mesenteric arteries from the LPS group, however, it was more severe in mesenteric arteries. The NA-induced contraction was reduced by DL-propargylglycine (PPG, decreasing H₂S synthesis) in aortas from the control group, but further enhanced by N^ω-nitro-L-arginine methyl ester (L-NAME) in aortas from both groups. In addition, these inhibitors had no effect on the NA-induced contraction in mesenteric arteries from both groups. Interestingly, 100 μM of NaHS (a donor of H₂S) caused a vasoconstriction, whereas higher concentration caused a vasodilatation in aortas and mesenteric arteries from both groups. L-NAME potentiated a NaHS-induced relaxation in aortas from both groups, whereas it attenuated the relaxation in mesenteric arteries from the control group only. In conclusion, our results suggest that H₂S plays a different role in vascular responses of thoracic aortas and mesenteric arteries in normal and LPS rats.

Email Address for correspondence: cm.cmtsao@gmail.com

Poster Session - Thursday 2nd July 2015

A10.55**Fatty acid sensing, regulation of food intake, and cellular signaling pathways are modified in rainbow trout fed with a lipid-enriched diet**

Jose L Soengas (Universidad de Vigo, Spain), Marta Libran-Perez (Universidad de Vigo, Spain), Inge Geurden (INRA St-Pée-sur-Nivelle, France), Karine Dias (INRA St-Pée-sur-Nivelle, France), Genevieve Corraze (INRA St-Pée-sur-Nivelle, France), Stephane Panserat (INRA St-Pée-sur-Nivelle, France)

In rainbow trout fed with low fat (LF) or high-fat (HF) diets, we aimed to determine 1) if the response of food intake, mRNA abundance of hypothalamic neuropeptides involved in the metabolic regulation of food intake, and fatty acid (FA) sensing systems in hypothalamus and liver is similar to that previously observed when levels of specific FA were raised by injection, and 2) if the phosphorylation state of intracellular energy sensors 5'-AMP-activated protein kinase (AMPK), and proteins involved in cellular signalling protein kinase B (Akt) and target of rapamycin (mTOR) display changes that could be related to FA-sensing and the control of food intake. The increased levels of FA in hypothalamus and liver of rainbow trout fed the HF diet only partially activated FA-sensing systems with no changes in food intake, suggesting that FA-sensing response in fish to increased levels of FA is more dependent on the presence of specific FA such as oleate or octanoate rather than to the global increase in FA. On the other hand, we also obtained, for the first time in fish, evidence for the presence and functioning in hypothalamus of energy sensors like AMPK and proteins involved in cellular signaling like mTOR and Akt. These proteins in hypothalamus and liver were generally activated in fish fed the HF vs LF diet suggesting the activation of the cellular signaling pathways in response to the increased availability of FA.

Email Address for correspondence: jsoengas@uvigo.es

Poster Session - Thursday 2nd July 2015

A10.56**Andrographolide Induced HO-1 Expression via p38 MAPK/Nrf2 Pathway Protect Cerebral Endothelial Cell Against Focal Ischemic Injury In Vitro and In Vivo**

TING-LIN YEN (Taipei Medical University, Taiwan), Ray-Jade Chen (Taipei Medical University Hospital, Taiwan), Wan-Jung Lu (Taipei Medical University, Taiwan), Cheng-Ying Hsieh (Taipei Medical University, Taiwan), Chih-Hao Yang (Taipei Medical University, Taiwan), Chun A Changou (Taipei Medical University, Taiwan), George Hsiao (Taipei Medical University, Taiwan), Kuan-Hung Lin (Shin-Kong Wu Ho-Su Memorial Hospital, Taiwan), Joen-Rong Sheu (Taipei Medical University, Taiwan)

Heme oxygenase-1 (HO-1) functions as an endogenous defense against oxidative stress. Andrographolide, extracted from *Andrographis paniculata*, was reported to possess multiple biological activities. Moreover, our preliminary results showed that andrographolide up-regulated HO-1 expression in cerebral endothelial cells (CECs). However, whether andrographolide-mediated HO-1 expression protects against ROS-triggered ischemic damage remains unclear. Therefore, we investigated the role of HO-1 in andrographolide-mediated neuroprotective effects in middle cerebral artery occlusion (MCAO) animal model. Primary CECs and Wistar rats were used in this study. CECs were treated with andrographolide (10 mmol/L) for the indicated time and Wistar rats underwent 90 min transient MCAO upon andrographolide (0.1 mg/kg) treatment with or without the HO-1 inhibitor ZnPP, followed by 24 h reperfusion. Andrographolide significantly increased HO-1 expression, Nrf2 phosphorylation and translocation, and MAPKs phosphorylation in CECs. Andrographolide-mediated HO-1 expression was reversed by the p38 MAPK inhibitor SB203580 and Nrf2 siRNA. Moreover, SB203580 inhibited Nrf2 phosphorylation and translocation. These findings indicate that andrographolide induces HO-1 expression possibly through p38 MAPK/Nrf2 pathway. In an animal study, intraperitoneal injection of andrographolide augmented HO-1 expression in brain homogenates and cerebral capillaries. Moreover, andrographolide improved MCAO/reperfusion-induced brain edema and infarct size, which were reversed by ZnPP, indicating that HO-1 induction may play a critical role in andrographolide-mediated neuroprotective effects. This study demonstrated that andrographolide up-regulated HO-1 expression in CECs and cerebral capillary possibly via p38 MAPK/Nrf2 pathway, thereby preventing ischemia/reperfusion-induced brain injury. Our findings also support that andrographolide may offer benefits for patients with ischemic stroke.

Email Address for correspondence: d102092002@tmu.edu.tw

Poster Session - Thursday 2nd July 2015