O-132.

White spot syndrome virus infection in a crustacean

Hai-peng Liu [1,#], Chuang Meng [1], Dong-li Li [1], Ling-ke Liu [1].

[1] State Key Laboratory of Marine Environmental Science, Xiamen University, Fujian Collaborative Innovation Center for Exploitation and Utilization of Marine Biological Resources, Fujian Engineering Laboratory of Marine Bioproducts and Technology, Xiamen, 361102, Fujian, PR China

Abstract
As a lethal pathogen for crustacean aquaculture, the mechanism of white spot syndrome virus (WSSV) infection remains largely unknown. By using a red claw crayfish *Cherax quadricarinatus* primary haematopoietic tissue (Hpt) stem cell culture suitable for WSSSV propagation, we found that the fusion between WSSV and endosome was pH-dependent which was essential for WSSV infection. The internalized WSSV virion was detained into dysfunctional vacuoles in Hpt cells if pretreated by alkalizers, leading to the pH neutralization of endosome system or autophgosome. Importantly, a valosin-containing protein was found to positively regulate the viral delivery with endosome, whose dysfunction resulted in strong aggregation of the intracellular WSSV. When the valosin-containing protein activity was blocked by inhibitor, the co-localization of Cq-GABARAP puncta, an indicator of autophagy activity, on the aggregated virions was significantly increased, indicating the participation of autophagy in the elimination of WSSV. Furthermore, the autophagic sorting and ultimate degradation of the endocytic WSSV were all clearly enhanced in Hpt cells if pretreated with inhibitor, which demonstrated that the autophagy played a defensive role against WSSV infection. Taken together, our data shed new light on the pathogenesis of WSSV which will benefit the antiviral design and breeding selection against WSSV disease in crustacean aquaculture.
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Keywords: Endosome; γ-aminobutyric acid receptor-associated protein (GABARAP); Autophagy; White spot syndrome virus (WSSV); Crustacean

Corresponding author.
E-mail address: Haipengliu@xmu.edu.cn (H.-peng Liu).

O-133.

Prohibitin 2 is associated with WSSV infection by promoting stat translocation

Cao Xiao-Tong, Zhang Ying-Hao [*], Lan Jiang-Feng [,#].*

Department of Aquatic Animal Medicine, College of Fisheries, Huazhong Agricultural University, Wuhan, Hubei, 430070, China

Abstract
Prohibitinsare mainly locateat the inner membrane of mitochondrion and that are associated with aging, apoptosis, cancer formation and cell proliferation. In the previousstudies, PHBs were found associated with virus infection and replication by interact with virus proteins. Jak/STAT signalingpathway play a key role in anti-virus immune response. The function of PHBs in the regulation of Jak/STAT remains largely unknown.In the present project, we identified that PcPHB2 was widely distributed in several tissues, and it was induced expression by white spot syndrome virus (WSSV).PcPHB2 significantly promote the amount of WSSV in crayfish, and the quantity of WSSV in PcPHB1 RNAi crayfish was decreased compared with thosein the controls.We further confirmed the interaction of PcPHB2 with the STAT using pulldown and CoIP. Finally, we observed that the protein level of STAT in the nuclear was induced after PcPHB2 injected in the crayfish compared with control. Together, thelocation of STATfrom cytoplasm to nuclear was inhibitedby PcPHB2knockdown. STAT was essential inthe expression of early protein of WSSV. Therefore PcPHB2 is associated with the infection of WSSV by promoting the translocation of STAT.

Keywords: Prohibitin; White spot syndrome virus, Signal transducers and activators of transcription; RNA interference; *Procambarus clarkii*

Corresponding author: College of Fisheries, Huazhong Agricultural University, Hubei, Wuhan, 430070, China.
E-mail address: lanjiangfeng@mail.hzau.edu.cn (L. Jiang-Feng).
* These authors have contributed equally to this work.

O-134.

Comparison of gene expression in post-smolt Atlantic salmon challenged by LF-89-like and EM-90-like *Piscirickettsia salmonis* isolates reveals differences in the immune response associated with pathogenicity

M. Rozas-Serri [1,2,#], A. Peña [1], G. Arriagada [1], L. Maldonado [1].

[1] Laboratorio Pathovet Ltda., Puerto Montt, Chile
[2] Newenko Group SpA., Puerto Montt, Chile

Abstract
Piscirickettsiosis is the main bacterial disease affecting the Chilean salmon farming industry and is responsible for high economic losses. The aim of this study was to describe and comparatively quantify the immune response of post-smolt Atlantic salmon infected by cohabitation with fish bearing LF-89-like and EM-90-like Piscir- ickettsia salmonis. The expression of 17 genes related to the immune response was studied in head kidney from cohabitant fish by RT-qPCR. Our results at the transcriptomic level suggest that P. salmonis is able to manipulate the kinetics of cytokine production in a way that might constitute a virulence mechanism that promotes intracellular bacterial replication in cells of Atlantic salmon. This strategy involves the creation of an ideal environment for the microorganism based on induction of the inflammatory and IFN-mediated response, modulation of Th1 polar- ization, reduced antigen processing and presentation, modulation of the evasion of the immune response mediated by CD8+ T cells and promotion of the CD4+ T-cell response during the late stage of infection as a mechanism to escape host defences. This response was significantly exacerbated in fish infected by PS-EM-90 compared with fish infected by PS-LF-89, a finding that is probably associated with the higher pathogenicity of PS-EM-90.
Keywords: Immune response, *Piscirickettsia salmonis*, RT-qPCR

Corresponding author.
E-mail address: marco.rozas@pathovet.cl (M. Rozas-Serri).

O-135.

The microbiome and transcriptome analysis of intestinal microbiota communities in larval and diseased grouper

Joan Tang Xiao Joe [1,2,], Ming-Wei Lu [3,#].*

[1] Doctoral Degree Program in Marine Biotechnology, National Taiwan Ocean University, Taiwan
[2] Doctoral Degree Program in Marine Biotechnology, Academia Sinica, Taiwan
[3] Department of Aquaculture, The College of Life Sciences, National Taiwan Ocean University, Taiwan

Abstract
Grouper, the important economic aquaculture species in Taiwan; however, it is susceptible to infectious diseases such as nervous necrosis virus and Vibrio alginolyticus, and iridovirus during the fry and adult stages. We aimed this researches in aquatic disease control and bioinformatics to investigate the intestinal microbiota community and immunity in grouper by 16S metagenomics and transcriptomic analyses. The results will facilitate establishing database of health-related gut microbial metagenomics in grouper, which can assist in screening for healthy fish fry. Microbiota