

Accepted Manuscript

Impairment of the intestine barrier function in *Litopenaeus vannamei* exposed to ammonia and nitrite stress

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PII: S1050-4648(18)30235-3

DOI: [10.1016/j.fsi.2018.04.050](https://doi.org/10.1016/j.fsi.2018.04.050)

Reference: YFSIM 5266

To appear in: *Fish and Shellfish Immunology*

Received Date: 28 December 2017

Revised Date: 21 April 2018

Accepted Date: 23 April 2018

Please cite this article as: Duan Y, Liu Q, Wang Y, Zhang J, Xiong D, Impairment of the intestine barrier function in *Litopenaeus vannamei* exposed to ammonia and nitrite stress, *Fish and Shellfish Immunology* (2018), doi: 10.1016/j.fsi.2018.04.050.

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1 **Impairment of the intestine barrier function in *Litopenaeus vannamei* exposed to** 2 **ammonia and nitrite stress**

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 8 **ABSTRACT** Intestine barrier serves as the front-line of shrimp defense, which rely on its structural
 9 integrity, microbial composition, and mucus immune compounds. Mucins are the major organic
 10 components of the intestine mucus layer that contribute to the immunity of intestine mucus. In this
 11 study, we examined the histological structure, microbial composition, and mucin genes expression in
 12 the intestines of *Litopenaeus vanmei* under three different conditions: control, ammonia stress, and
 13 nitrite stress for 72 h. H&E stain showed that ammonia and nitrite stress exposure both damaged the
 14 intestine mucosal tissue. High-throughput 16S rDNA sequencing revealed that two stresses exposure
 15 decreased the bacterial diversity, and altered the composition of intestine microbial. Specifically, the
 16 dominant bacterial phyla Bacteroidetes abundance was increased, while Proteobacteria and
 17 Planctomycetes were decreased; at the genus level, *Formosa* abundance was increased and
 18 *Photobacterium* was decreased, opportunistic pathogens including *Nautella* and *Pseudoalteromonas*
 19 was also increased. Intestine mucus immune genes including *mucin-2* and *mucin-19* were up-regulated,
 20 while *mucin-1*, *mucin-5AC*, and *mucin-5B* were down-regulated in two stress exposure groups. These
 21 results revealed that ammonia and nitrite stress harmed the intestine barrier function of *L. vannamei* by

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