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Intestine oxidative stress and immune response to sulfide stress in Pacific white shrimp *Litopenaeus vannamei*

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2 **shrimp *Litopenaeus vannamei***

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7 **ABSTRACT** The effects of sulfide stress on oxidative stress and immune response in intestine of
8 Pacific white shrimp *Litopenaeus vannamei* were evaluated in the present study. Oxidative stress
9 parameters, immune enzymes activity and immune gene mRNA expression level were detected in
10 intestine of *L. vannamei* after the exposure of 5.0 mg/L sulfide stress 72 h. The duration of sulfide
11 stress influenced the shrimp survival, and the cumulative mortality rate was 30.0% and 33.3% at 48 h
12 and 72 h respectively. HE staining showed that sulfide stress caused the intestine tissue damage
13 symptoms. Compared with the control group, after exposed to sulfide stress, the content of lipid
14 peroxidation (LPO), malondialdehyde (MDA) and ROS production ($\cdot\text{O}_2^-$ generation capacity)
15 increased. Total antioxidant capacity (T-AOC) activity increased at 6 h and decreased at 48 h.
16 Superoxide dismutase (SOD) activity increased in the entire experiment. Inducible nitric oxide
17 synthase (iNOS) activity and nitric oxide (NO) content increased to the highest at 6 h and 12 h
18 respectively, and both decreased at 48 h. The relative mRNA expression level of heat shock protein 70
19 (HSP70) gene decreased at 6 h and increased to the highest at 48 h. The relative mRNA expression
20 level of hypoxia inducible factor 1 α (HIF-1 α) gene increased at 12 h and decreased to a lower level at
21 72 h. The relative mRNA expression level of Toll and immune deficiency (Imd) gene increased to the

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