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Cloning, characterization, and expression of the macrophage migration inhibitory factor gene from the Pacific white shrimp *Litopenaeus vannamei* (Penaeidae)

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ABSTRACT. The macrophage migration inhibitory factor (MIF) is an important proinflammatory cytokine that mediates both innate and adaptive immune responses. In this study, we identified a homolog of MIF in the Pacific white shrimp *Litopenaeus vannamei*. The MIF cDNA contained a 363-bp open reading frame encoding a 120-amino acid protein with a calculated molecular mass of 13.442 kDa and a theoretical isoelectric point of 6.57. The *L. vannamei* MIF shared high amino acid identity with MIFs of other invertebrates. Tissue distribution analysis by quantitative real-time polymerase chain reaction (qRT-PCR) revealed that the *L. vannamei* MIF was abundantly expressed in the blood, heart, and hepatopancreas, was moderately expressed in the gill, and was weakly expressed in the muscle and intestine. Furthermore, in order to gain a basic understanding of the role of MIF in the shrimp immune response against viral infection, its mRNA expression was determined in the hepatopancreas of *L. vannamei* at different stages after white

spot syndrome virus (WSSV) challenge using qRT-PCR. The result indicated that the expression of MIF was significantly upregulated after WSSV injection, suggesting that MIF may be involved in the response to viral infection in shrimp.

Key words: Macrophage migration inhibitory factor; Cloning; *Litopenaeus vannamei*

