



In vivo* and *in vitro* inhibitory action of 17 β -estradiol and environmental estrogen 4-nonylphenol on gonad-inhibiting hormone (GIH) expression in the eyestalks of *Litopenaeus vannamei

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ABSTRACT. The gonad-inhibiting hormone (GIH) belongs to a neuropeptide family synthesized and released in an X-organ sinus gland complex of crustacean eyestalks. GIH inhibits crustacean ovarian maturation by suppressing vitellogenin (Vtg) synthesis, whereas estrogen is responsible for the stimulation of vitellogenesis (not established). In this study, the effects of 17 β -estradiol (E₂, 10⁻⁶ M), estrogen receptor antagonist tamoxifen (TAM, 10⁻⁶, 10⁻⁷, and 10⁻⁸ M), and the environmental estrogen nonylphenol (NP, 1 μ g/L and 100 μ g/L) on *LvGIH* expression in the eyestalks of shrimp were determined by quantitative real-time PCR. Results showed that *LvGIH* expression decreased significantly during the *L. vannamei* ovarian maturation cycle. E₂ and NP significantly reduced *LvGIH* transcripts *in*

vivo, but TAM neutralized the inhibitory action of E₂ in a dose-dependent manner ($P < 0.05$). In addition, the *LvGIH* expression levels decreased significantly in a time-dependent manner ($P < 0.05$) when ovary fragments were cultured *in vitro* with E₂. The results of this study suggested that estrogen regulates GIH expression in *L. vannamei* eyestalks. E₂ promoted ovarian development not only by directly upregulating vitellogenesis in the hepatopancreas, but it was also capable of downregulating *LvGIH* expression, which indirectly resulted in the stimulation of *L. vannamei* vitellogenesis.

Key words: *Litopenaeus vannamei*; Gonad-inhibiting hormone; 17 β -estradiol; Nonylphenol; Estrogen receptor antagonist