

# Natural Juvenile Hormones and Some Physiological Functions in Pupal and Adult Stages of *Spodoptera exigua*

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In insects, juvenile hormones (JH) have dual functions of status quo and gonadotropin in immature and mature stages, respectively. At least five different natural JH isoforms (JH<sub>0</sub>, JH<sub>I</sub>, JH<sub>II</sub>, JH<sub>III</sub>, and JHB<sub>3</sub>) are physiologically functional in different insects. In this study, we analyzed the physiological roles of different natural JHs in pupal and adult development in *Spodoptera exigua* to determine the major JH forms with reference of synthetic JH analogs of pyriproxyfen, fenoxycarb, and KS-175. Pupal development, especially at the early stage, was very sensitive to the external JH application. All synthetic JH analogs except KS-175 were very active to block pupal development even at 0.01 $\mu$ g. This inhibitory effect was also found in the pupae applied with natural JH<sub>I</sub> and JH<sub>II</sub>, but not in JH<sub>III</sub>. The JH treated pupae could not develop a normal rectum. Decapitation of adult females blocked oocyte development. Application of synthetic JH analogs could rescue oocyte development in decapitated females. JH<sub>I</sub> and JH<sub>II</sub> could also stimulate oocyte development of the decapitated females at higher doses than those of synthetic JH analogs. JH<sub>III</sub> seemed to have little effect at normal physiological level. This JH could induce vitellogenin (Vg) synthesis at in vitro fat body culture. The size of Vg was 180kDa on a gradient SDS-PAGE. Vitellins (Vn) were smaller than Vg and degraded with oocyte development. All Vg and Vn of *S. exigua* could bind antibody raised against Vg of *S. litura* in Western blot analysis. Addition of tunicamycin blocked the release of Vg and resulted in a form of pre-Vg at in vitro fat body assay. These results indicate that JH had inhibitory effect of pupal development, but stimulated oocyte development in *S. exigua*, and suggest that the possible JH of *S. exigua* is a mixture of JH<sub>I</sub> and JH<sub>II</sub>.