

Studies on hormonal regulation of oocyte maturation, steroidogenesis and mercury-induced reproductive impairments in banded gourami, *Trichogaster fasciata*

Abstract:

The endocrine regulation of gonadal development and annual variation of key sex steroids is the basic knowledge to understand the reproductive cycle of teleost fish. Present study was aimed to investigate the levels of gonadotropins in relation to the follicular development and plasma steroids during the reproductive cycle of female *Trichogaster fasciata*. Furthermore, Mercury is one of the key pollutants responsible for the degradation of natural aquatic ecosystems. Pollutant may exert their action on organisms or populations by affecting their normal endocrine function as well as reproduction. Thus, the present study also tried to understand the effect of mercuric chloride (HgCl_2) on reproductive function and to decipher the molecular mechanism of Hg-induced reproductive impairments of female *T. fasciata*. In female fish, relatively higher level of FSH was observed till the ovary reaches in late vitellogenic stage confirms that FSH regulates the early folliculogenesis of the ovary, whereas LH peak was observed in the postvitellogenic stage, which indicates that maturation and ovulation were controlled by LH. Seasonal steroid profiles show that both T and E_2 reach its maximum level prior to the $17,20\beta\text{-P}$ which attain its peak value in the month of August. Moreover, this study analyzes the other key factors of ovarian function such as *cyp19a1a* gene expression, aromatase activity and SF-1 localization throughout the year. *cyp19a1a* gene expression and the aromatase activity were highest in vitellogenic stages indicate that relatively higher E_2 production in this stage is regulated by FSH. Immunohistochemical localizations of aromatase and SF-1 in the cellular layer of oocytes demonstrated that aromatase is FSH-dependent and SF-1 could be regulated by both FSH and LH. Both *in vivo* and *in vitro* experiments were performed by using ecologically relevant doses of HgCl_2 and the resulting effects on follicular development, steroidogenic potentiality, aromatase activity, aromatase gene expression and steroidogenic factor-1 (SF-1) expression pattern were analyzed. *In vivo* experiments confirm the inhibitory role of HgCl_2 on follicular development, steroid biosynthesis and SF-1 activity. *In vitro* experiments revealed that aromatase activity, steroidogenesis, aromatase and SF-1 expression were blocked by HgCl_2 . The results obtained from this study contribute to understand the molecular mechanism of HgCl_2 - induced reproductive impairment of *T. fasciata*.

Keywords: Steroidogenesis, Maturation, Oocytes, Mercury, and *Trichogaster fasciata*