Gonadotropins affect the steroidogenesis and in vitro expression of pituitary adenylate cyclase-acti

莫閔翔、黃尉東

E-mail: 345436@mail.dyu.edu.tw

ABSTRACT

In vertebrate, hypothalamus-pituitary-gonads (HPG) axis regulats reproduction system, the hypothalamus produces gonadotropin-releasing hormone (GnRH) ragulating anterior portion of the pituitary produces follicle-stimulating hormone (FSH) and luteinizing hormone (LH), and regulats gonads development, gametogenesis, maturation, and to promote gonadal steroidogenesis. Tilapia is an important protein source in Taiwan, however, studies on the regulation of PACAP in reproduction in tilapia are still scant. Our previous studies indicated that tilapia (Oreochromis mossambicus) pituitary adenylate cyclase-activating polypeptide (tpacap38) and its type I receptor (tpac1-r) transcripts were detected in the brain, gallbladder, gill, heart, intestine, kidney, muscles, pancreas, spleen, stomach, testes, and ovaries, but not in the liver. Addition of cAMP analog dibutyryl-cAMP, exogenous ovine PACAP38 or forskolin (adenylate cyclase activator) signi?cantly upregulated the expression of tpacap38 in the follicles and testis via a dose- and time-dependent fashion and its function could be suppressed with the addition of protein kinase A (PKA) inhibitor, H89, indicating involvement of the cAMP-PKA signaling pathway in the regulation of tpacap38. In the present study, semi-quantitative RT-PCR and enzyme immunoassay (EIA) were performed to detect the effect of gonadotropin on the expression of tpacap38 and tpac1-r and steroidogenesis in tilapia gonads. The expression of tpacap38 and tpac1-r increased significantly in a dose-dependent experiment by addition of different concentrations of human chorionic gonadotropin (hCG; 5, 15, and 50 IU) to gonads cultured for 2 hours. The mRNA expression levels of tpacap38 and tpac1-r in both sexes were higher than those in the control group at a dose of 15 IU hCG. However, the expression level of tpac1-r increased significantly at a dose of 50 IU pregnant mare's serum gonadotropin (PMSG) but not others (0, 5, 50, and 100 IU), and this was observed only in female. The gonadal steroids secretions of estradiol, testosterone and progesterone increased at a dose of 15 IU hCG for the 2 hour-culture, and similar result was observed at a dose of 50 IU PMSG (estradiol, testosterone and progesterone). Besides, the mRNA expression levels of tpacap38 and tpac1-r were higher than those in the control group at a dose by hCG and PMSG co-induction for the 2 hour-culture, and the gonadal steroids secretions of estradiol, testosterone and progesterone increased at 50 IU hCG/50 IU PMSG co-induction for the 2 hour-culture. In the time course experiment, the mRNA expression levels of tpacap38 and tpac1-r were significantly higher at a dose of 15 IU hCG at 4 h. and similar result was observed at a dose of 50 IU PMSG tpacap38 and tpac1-r at 2 h. In addition, the mRNA expression levels of tpacap38 and tpac1-r were significantly higher at 6 h with 15 IU hCG+50 IU PMSG co-induction. The gonadal steroids secretions were low at 0 h (after preculture for 8 h) and increased significantly at 2 h at a dose of 15 IU hCG, 50 IU PMSG or co-induction (15 IU hCG + 50 IU PMSG), and then decreased with prolonged cultured periods (4, 6, and 8 h) in both genders. However, the results of the inductive function of hCG and PMSG could be suppressed by the addition of protein kinase A inhibitor H89 (10 M). These results suggested that tpacap38 and tpac1-r may be regulated by gonadotropins in reproduction system in a paracrine/autocrine manner, and further involved in the gonadal steroidogenesis in the bony fish.

Keywords : tilapia、pituitary adenylate cyclase-activating polypeptide (PACAP)、PACAP type I receptor (PAC1-R)、gonads、gonadotropin、steroidogenesis

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