The Effects of Steroid Hormones on the Protein Expressions in the In Vitro Cultured Gonadal Tissues of Tilapia (Oreochro

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ABSTRACT

The endocrine system involved in many physiological processes such as growth, development, tissue function, immunity and metabolism, as well as reproduction. In most vertebrates, many reproductive functions including gametogenesis, sex characteristics and sex reversion were regulated through hypothalamus-pituitary-gonadal axis (HPG axis). To date, numbers of studies have demonstrated that gonadal steroids act as regulators not only in HPG axis in teleost but also probably in other reproductive endocrine axes. However, literature about hormone-regulated genes and related proteins in bony fish gonads is still scant. To investigate the relationship between proteins/genes and steroid hormones in tilapia gonads, testes and ovarian follicles with or without deyolking process cultured in DMEM with or without 10 nM steroid hormones (-estradiol, hydrocortisone, progesterone and testosterone, respectively) in vitro were analyzed by proteomic approaches. There were 175~305 spots at a range of pH 4~7, more than 130~230 spots at a range of pH 3~10 in testes. There were 40~90 and 35~60 spots, were detected at the range of pH 3~10 and pH 4~7 in ovarian follicles, respectively. No significant difference was found between these two ranges, but 6 significant protein spots consistently appeared in each analysis. After deyolking, the protein spot numbers increased from 40~90 spots to 110~250 spots. MALDI-TOF/TOF-MS results showed that seven spots were confirmed as marker proteins in male (actin, tropomyosin, cathepsin D, 14-3-3 protein, myosin, unnamed protein product and Cu/Zn-superoxide dismutase), but only four in female (actin, vitellogenins, tropomyosin and quinone reductase). Furthermore, eight protein spots with different expression patterns were also identified and functions as stress (heat shock protein 70, heat shock 60 kDa protein 1 and glutathione S-transferase), metabolism (enoyl coenzyme A hydratase and enolase 1 alpha-like), immunity (78 kDa glucose-regulated protein), structure (keratin) and development or reproduction (cofilin-2) regulators. The present results showed that the expression of gonadal proteins in tilapia was concentrated at a range of pH 4~7 and the expression could be affected by steroid hormones in vitro and enhanced by yolk removal, which suggested that these proteins may act as regulators in reproduction system.

Keywords : hypothalamus-pituitary-gonadal axis、steroids、proteomics、two-dimensional gel electrophoresis、gonads、tilapia

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