THE SECRETION OF GONADOTROPIN (GTH) AND GROWTH HORMONE (GH) IN THE BAGRID CATFISH, MYSTUS MACROPTERUS WITH DIFFERENT REPRODUCTIVE STAGES

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Introduction

Bagrid catfish, *Mystus macropterus*, has rapidly been gaining popularity as a cultured fish in China recently. In order to understand the neuroendocrine regulation of the reproduction and growth of this species, we measured the concentrations of gonadotropin (GtH) and growth hormone (GH) in pituitary and serum during different stages of the reproductive cycle.

Male and female bagrid catfish at different reproductive stages were collected from the Jialingjiang River, a branch of the Yangtze River. GtH concentrations in pituitary and serum samples were measured by radioimmunoassay (RIA) using African catfish GtH as standard and antiserum to African catfish GtH as described by Goos et al. (1986) with minor modification. GH concentrations in serum samples were determined by RIA specific for common carp GH (Merchant et al., 1989). Serial dilutions of serum of bagrid catfish resulted in displacement curves parallel to the common carp GH standard curve.

Duncan's multiple range test was used to determine the differences (P 0.05) in the mean GtH and GH levels.

Results

A. Gonadotropin (GTH) levels in the pituitary

The pituitary GtH levels in bagrid catfish showed significant seasonal changes parallel with its

reproductive cycle. Both male (2.62 to 3.26 ug/mg) and female (3.48 to 4.03 ug/mg) pituitary GtH levels peaked during spawning season (from April to July). After breeding, from August to November, pituitary GtH levels decreased gradually, in males, from 1.87 to 1.18 ug/mg, and in females, from 2.11 to 1.76 ug/mg. Upon gonadal recrudescence in the spring of the next year, pituitary GtH concentrations increased in males from 1.07 to 1.49 ug/mg, and in females from 1.53 to 2.25 ug/mg. Pituitary GtH levels were significantly higher in females than in males throughout the reproductive cycle. The average pituitary GtH concentration of the whole reproductive cycle in males was 1.25±0.08 ug/mg and 2.62±0.19 ug/mg in females.

B. Gonadotropin (GtH) levels in serum

Serum GtH levels in male and female bagrid catfish were correlated with their gonadal-somatic index (GSI) during the reproductive cycle.

In males, GtH levels (1.15±0.14 ng/ml) peaked in May at the post-spermatogenic stage (GSI=0.5±0.1%), but slightly decreased in June (0.88±0.09 ng/ml) at the prespawning period. After breeding season, serum GtH still remained at the same levels (0.83 to 1.03 ng/ml) when GSI dropped to 0.22 to 0.34% in July to August. In sexually regressed male fish in November to January, serum GtH decreased to lower levels (0.61 to 0.66 ng/ml).

In females, serum GtH concentrations were elevated gradually (from 0.88 to 1.01 ng/ml) with ovarian development in March to April. In post-vitellogenic fish (GSI=7.61±1.36%) in May, serum GtH levels are the highest (1.23±0.01 ng/ml). At the end of vitellogenesis and during the prespawning period in June, GSI reached its highest level (16.25±1.25%), serum GtH cecreased slightly (1.01±0.05 ng/ml). After spawning in July, GSI declined rapidly to 0.72±0.09%, serum GtH still remained at a higher level (1.11±0.06 ng/ml). During the ovarian regression and resting period, serum GtH level decreased to remain at lower levels (0.59-0.81 ng/ml) until the next spring. Unlike the sexual dimorphism existing in pituitary GtH levels, no difference was found in average serum GtH levels throughout the reproductive cycle between male (0.86+0.05 ng/ml) and female (0.96+0.04 ng/ml) bagrid catfish.

C. Effects of LHRH-A/DOM on serum GtH levels

In a previous study on effects of LHRH-A and domperidone (DOM), a dopamine antagonist on serum GtH level in bagrid catfish, we showed that LHRH-A alone stimulated an increase in serum GtH levels significantly; DOM alone was ineffective in increasing serum GtH levels, but caused a marked potentiation of the GtH release and ovulation response to LHRH-A, indicating that dopamine functions as a gonadotropin release inhibitory factor. The present investigation demonstrated that the responsiveness of serum GtH level to LHRH-A/DOM in bagrid catfish was positively correlated with their GSI and basal serum GtH level at different stages of the reproductive cycle. During sexually regressed and sexual resting periods when the basal GtH level and GSI are low, the stimulating effect of LHRH-A and the potentiating effect of DOM on LHRH-A in response to GtH release are weak; conversely, during the sexually mature and prespawning stages, when the basal GtH level and GSI are high, the stimulating effect of LHRH-A and the potentiating effect of DOM on LHRH-A in response to GtH release are strong. For example, in sexually regressed females, LHRH-A+DOM injection caused a modest stimulation of GtH secretion, serum GtH level at 6 h post-injection is 6.35±1.01 ng/ml, at 12 h post-injection it is 3.33±1.27 ng/ml. However, in sexually

mature females (GSI=18.05±0.84%), LHRH-A+DOM injection stimulated GtH secretion dramatically. The serum GtH level at 6 h post-injection was 12.48±2.65 ng/ml, at 12 h post-injection it was 10.26±2.88 ng/ml, or about a 2-3-fold higher level than in sexually regressed females.

D. Growth hormone (GH) levels in the pituitary

The pituitary GH levels in bagrid catfish showed some seasonal variation, but not parallel with its reproductive cycle precisely. Both male (2.58±O.27 ng/ml) and female (2.40±0.35 ng/ml) pituitary GH levels peaked in March. This may be correlated with the rapid body growth and gonadal development during the spawning season. Pituitary GH levels were not significantly varied in male and female fish at different stages of gonadal maturity (recrudescence, maturing, mature and regressed). The average serum GH levels throughout the reproductive cycle in male (1.76±0.08 ug/mg) and female (1.56±0.09 ug/mg) bagrid catfish were also not different.

E. Growth hormone (GH) levels in the serum

Serum GH levels in male and female bagrid catfish were also correlated with the reproductive cycle. The lowest serum GH levels were found during the sexual resting period in November (39.79±3.52 ng/ml). During the ovarian recrudescence period from January to May, serum GH levels elevated gradually. During the spawning season (June to July), serum GH levels rose rapidly from 60.98±7.43 ng/ml to 227.19±19.32 ng/ml . These high serum GH levels were maintained in autumn during the sexually regressed period.

F. Effects of LHRH-A on serum GH levels

LHRH-A alone or in combination with DOM did not affect serum GH levels in bagrid catfish at any stage of the reproductive cycle. These results indicated that, unlike cyprinids, GnRHs (e.g. LHRH-A) are not involved directly in the regulation of GH release in the bagrid catfish, and consistent with the recent finding that GnRH receptors are restricted to gonadotropes in African catfish (Bosma et al., 1995).

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