THE EFFECT OF TEMPERATURE ON OOGENESIS AND BRAIN GENE EXPRESSION OF HORMONES INVOLVED IN REPRODUCTION AND GROWTH IN THE FEMALE BLUE GOURAMI (TRICHOGASTER TRICHOPTERUS)

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Introduction:
The blue gourami (Trichogaster trichopterus) female has an asynchronic ovary development and the FOM will occur only in the presence of the male. Thus, each stage of its gonadal development can be controlled and examined separately in the laboratory [4]. Previous studies in our laboratory have shown variations in hypothalamic and pituitary hormonal gene expression during reproduction stages. Gonadotropin releasing hormone 3 (GnRH3), and pituitary adenylate cyclase activating polypeptide (PACAP - long and short form [PRP]) gene expression increased in reproductively active females [5,6], and beta-follicle stimulating hormone (beta FSH) and beta-luteinizing hormone (beta LH) gene expression were increased in females in the vitellogenic stage [4]. Accumulated data indicate an involvement of growth factors in the regulation of reproduction, e.g., growth hormone (GH) and prolactin (PRL) [2, 3]. The present study examined the effect of temperature on reproduction and growth-related factors in blue gourami (Trichogaster trichopterus) females under non-reproductive (NRC) and reproductive conditions.

Methods:
The females, maintained in three different containers at the temperatures as described in prevue study [1], gonads were sampled and mRNA levels of GnRH3, PACAP, PRP, IGF1, GH, beta-LH, beta-FSH and PRL were measured[1].

Results:
A higher percentage of oocytes in the advanced vitellogenic stage was found in FNRC kept at 27 °C than in those kept at 23 °C or 31 °C (P<0.05, Fig. 1a). In contrast, in FRM and FNRM, a higher percentage of oocytes at the FOM stage were observed at 23 °C, than at 27 °C (Fig. 1b). In FNRC kept at 23 °C and 27 °C, as compared to the group at 31 °C, significantly higher mRNA levels of brain GnRH3 were detected, whereas no significant differences in the mRNA levels of brain IGF-1, PACAP and PRP were observed in these females at 23 °C, 27 °C or 31 °C. In FRM, mRNA levels of brain GnRH3, IGF1, PACAP and PRP were higher when kept at 27 °C than at 23 °C (Figs. 2A-D). PRP mRNA levels were also higher at 27 °C than at 31 °C in these fish. On the other hand, mRNA levels of PACAP were greater in FNRM kept at 27 °C than in those fish maintained at 23 °C and 31°C (Fig. 2B); and mRNA levels of IGF-1 were higher in the brains of FNRM kept at 23 °C than in those kept at 31 °C (Fig. 2C).

Fig 1. (A) Percentage of oocytes at the advanced vitellogenic stage in adult FNRC ovaries. (B). Females at the vitellogenic stage were separated after an acclimation period of four days and held at 23 °C, 27 °C or 31 °C in the presence of a mature male for one day (mean±SEM; n=15). Different letters above each bar of the histogram denote a significant difference among the temperatures (P<0.01, Student's t-test).
Conclusion:

We propose that in the blue gourami female, vitellogenesis and FOM may be affected by changes in the environmental temperature, through modifications in GnRH3, IGF1, PACAP and PRP gene expression.

References:


