



## TEMPERATURE AND TEMPORAL MODULATED, DOSE DEPENDENT RESPONSE OF ESTRADIOL-17 $\beta$ ON THE INDUCTION OF VITELLOGENIN AND CHORIOGENIN IN *CHANNA PUNCTATUS*

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### Introduction:

Vitellogenin (Vg) and Choriogenin (Chg) are the precursor proteins of egg-yolk and egg-envelope proteins. Vg & Chg are synthesized in liver in primarily in liver under the influence of circulating estrogen hormone and are deposited in and around the egg respectively. Vg & Chg are influenced by various hormones and environmental factors. Present study has been focused to understand the influence of environmental factors like photoperiod, temperature, estrogen hormones and support these findings through experimentation.

### Methods:

The steroid solutions were prepared in 50% alcohol and the fishes were injected intramuscularly using 1-ml tuberculin syringe fitted with 26-gauge needle for all the studies. The control fishes in all the experiments were injected intramuscularly with 50% alcohol. Fishes were collected for 1 year on weekly basis, plasma samples were collected, for estimation of by homologous ELISAs and GSI was calculated. Experiments were carried out to see the dose, time and temperature dependent induced effect of estradiol-17 $\beta$  (E<sub>2</sub>) on Vg and Chg synthesis. All the data were analyzed by student t-test using the Sigma plot software. Control groups were compared with experimental groups for both the proteins, Vg and Chg.

### Results:

Annual studies and *in vivo* experiments revealed that concentration of Chg in the plasma was always higher than Vg at low doses (up to 10  $\mu$ g/ml/100g body wt) and at low temperature (15°C), whereas Vg levels were high

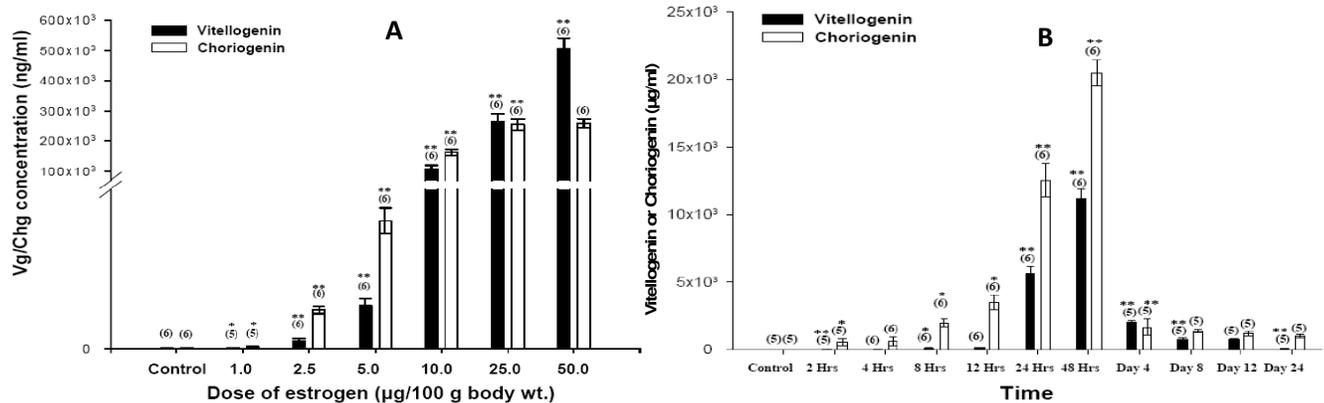
at doses higher than 25  $\mu$ g/ml/100g body wt) and higher temperature (Fig 1A, Fig 2). Temporal study revealed that plasma levels of Chg were higher at low dose of E<sub>2</sub> (Fig1B) and at higher (data not shown).

### Discussion:

An analysis of the annual reproductive cycle of the female murrel, *C. punctatus* in the context of seasonal variations in temperature and photoperiod reveals that ovarian growth is initiated during Feb-Apr when both photoperiod and temperature are showing gradual but perceptible increase. Thereafter, gonads enlarge rapidly due to yolk deposition in response to higher temperature and longer photoperiod in nature. Maximal gonad size is attained in June and maintained till the next set of environmental cues, monsoon rains, which trigger meiotic maturation, ovulation and spawning of the post-vitellogenic oocytes. Following spawning, ovaries remain regressed throughout winter season. The prevailing cool temperature and decreasing photoperiod prevent the further development of the gonads immediately after the completion of the first. The importance of ambient temperature in promoting ovarian recrudescence is evident in the present study. Investigation on the annual reproductive cycle of the murrel reveals that, Chg was detected in the blood earlier in the year than Vg, suggesting that the egg-chorion is formed very early during oogenesis. Lower temperature and shorter photoperiod favour synthesis of Chg. A physiological significance of this observation can be that egg-chorion has to be formed before active incorporation of heterosynthetic Vg during vitellogenesis.



Fig 1: Effect of E<sub>2</sub> on induction of Vg & Chg; A=different doses, B= temporal response



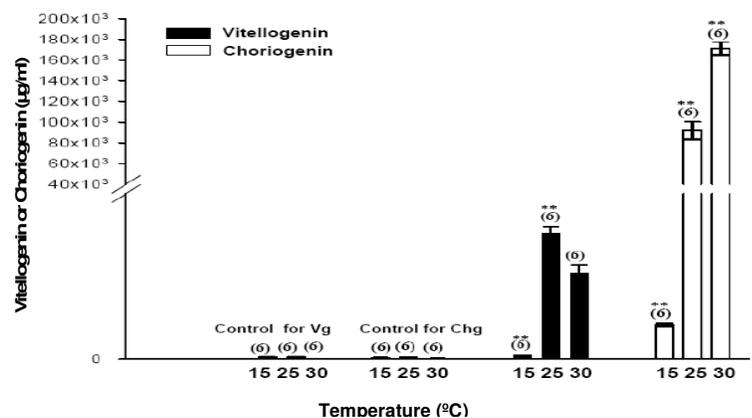
In the present study, a direct relationship was observed between the dose of E<sub>2</sub> administered and plasma levels of these two proteins. This study further reveals that Chg synthesis is more sensitive to E<sub>2</sub> than Vg. At lower dosages of E<sub>2</sub>, levels of Chg in the plasma were higher than those of than Vg. This observation may explain why Chg appears earlier and at higher concentrations than Vg during the annual reproductive cycle of the murrel. The studies suggest that lower temperatures and lower dose of E<sub>2</sub> promote Chg synthesis, whereas higher temperatures and higher dose of E<sub>2</sub> favour Vg production. This assumption is supported by the results of our investigation on the annual reproductive cycle of the murrel.

**References:**

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Fig 2: Effect of E<sub>2</sub> on induction of Vg and Chg at different



vitellogenin and choriogenin, as biomarkers of potential endocrine disruption. Comp. Biochem. Physiol.C. 146(4):540-551.