

Premarinal Effect (Estrogen) on Pituitary Gonadal Axis in the Fish, *Clarias Batrachus* (L.)

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Abstract: *Reproduction is primarily controlled by hypothalamo pituitary gonadal axis. Gonadotropin stimulates growth and development via the synthesis of sex steroids. Estrogen is important for the growth and development of female reproductive system. Premarin was injected 2.5ml/kg body weight at every alternate day for two week intramuscularly in the fish, Clarias batrachus. It has been observed that due to estrogen, oogenesis stimulated in the ovary which was mediated through the gonadotrophic hormone in female and in male testicular development was arrested. These findings indicate that premarin is an inducer of spawning reflexes in the fish, Clarius batrachas that induces gonadal maturity and used to achieve early breeding in female whereas in male testicular development is arrested.*

Keywords: Estrogen, gonadotrophin, inducer, sex steroids and spawning reflexes

I. INTRODUCTION

The steadily growing importance of fish farming has completed improvements in the technologies necessary for securing the initial basic requirements for productive aquaculture. The recent interest in the commercial farming of the more valuable species of fish in the industrialized countries necessitates the search for new culture techniques by giving more emphasis on modern breeding techniques by using sex steroid hormones to bring production of fish seed on large scale to an economically profitable level. It is well established practice in meat producing industry is that of the use of steroid hormones. An indication, however of the potential benefit of this technique has been provided by report of growth promoting effect of steroid hormones on fish. Estrogen treatment facilitates the activation of paraventricular secretory cell units and the reflex release of oxytocin by genital tract stimulation. Therefore, ovarian hormone may not only promote the expression of sexual receptivity but may also increase level of neurohypophysial hormones and facilitate release of these hormones during mating, because these hormones have potent stimulating effect on uterine and oviduct smooth muscles, they might also enhance the likelihood of fertilization by promoting sperm transport. The brain–Pituitary–gonadal axis has been studied by several worker,^{7,1,2,16,17,3,5,8,11,12,14,51,23}. Age, composition, growth and reproduction of *Cyprinus carpio* has been studied^{4,18}. Despite of many investigations on this subject, studies on the structure of the ovary are confined to a few teleost fishes only. The information on the integration of endocrine system controlling number of other biological phenomenon is still fragmentary. The hormone used in this project estrogen which is associated with a variety of autocrine and paracrine functions in the vertebrate body. Estrogenic compound has great stimulating effect on gonads. Thus, study on the effect of estrogen (premarin) on pituitary gonadal axis in the fish. *Clarias batrachus* are meager and are limited to foreign species. Hence, the study is undertaken on *Clarias batrachus* as it is a very hardy and sturdy fish. The present investigation are undertaken with a view to assess stimulatory effect of premarin on pituitary and gonads in the fish, *Clarias batrachus*.

II. MATERIALS AND METHODS

Clarias batrachus were collected, reared in a fibre glass tanks and acclimatized to the laboratory conditions. The experiment was carried out for two week. Control and experimental groups were formed. Fishes from control groups were injected with 2.5ml of distilled water and experimental groups were injected with 2.5ml of premarin intramuscularly at every alternate day for two week. At the end of the experiment, fishes from control and experimental groups were sacrificed to study the histomorphological changes in the pituitary and gonads.

III. OBSERVATIONS AND RESULTS

Control Group: At the end of the experiment, the survival rate of control fish was 100%. The average weight length and girth of female was 590gm, 26cm and 25cm. The pituitary gland consisted of cyanophil, chromophobes and acidophils. The cyanophil cells were angular or spindle in shape. The ovary was in the maturing form and histologically, reorganized into young oocytes, early maturing oocytes, and few mature oocytes (pre spawning oocyte). Testis were opaque and in the maturing phase. In a section, a number of primary, secondary spermatocytes were visible.

Experimental Group: At the end of the experiment, the survival rate of the fish was 100%. The average weight, length and girth of female were 610gm, 27cm and 26cm. At the end of the experiment, in the pituitary gland the cyanophill cells were spindle shaped, granular and partially distributed through the proximal pars distalis. The entire body cavity was occupied by the ovaries which were turgid and deep yellow in colour. The ova were opaque as well as translucent. On pressing, eggs oozed out. At the end of the experiment, histologically, a large number of oocytes with fused yolk vesicles, yolk globules and migrating nucleus along with ripe eggs were seen in a section. In the testes, the testicular tissue was transformed in to fibrous tissue and testicular development was completely arrested or inhibited.

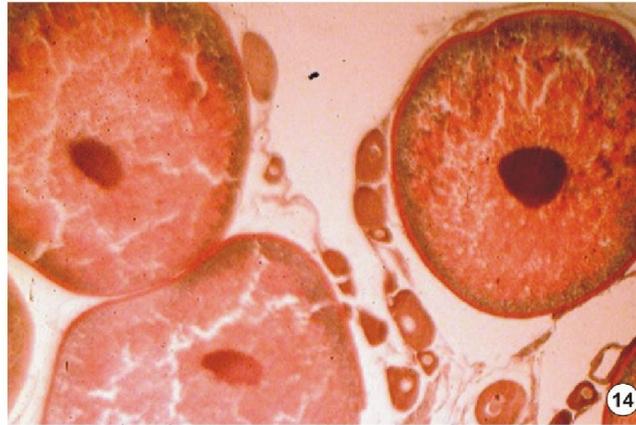


Fig. 14 :Section of ovary showing maturing follicles with nucleus. Mallory's triple.

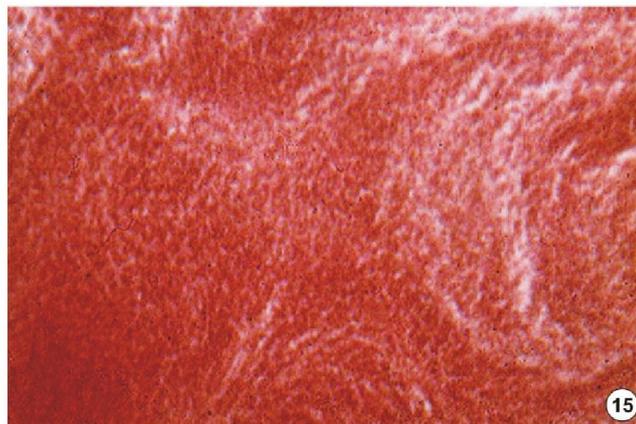


Fig. 15 :Section of testes showing spermatocyte and spermatid Iron haematoxylin. X45.

Discussion

Many differences are observed in teleost species in the histological features of pituitary and gonads and hence, in the present study, an attempt has been made to study the detailed histomorphological structure of the endocrine glands

which have definite role in reproduction. Synchronisation of reproductive behavior pattern has also observed^{19,20}. Very little information is available on ovarian maturation in fishes⁹. It is indicated that corticosteroids derived from the ovary may act as a local hormone mediating pituitary gonadotropins induce ovulation in *Orizias latipus*,⁹ The present results reveal that estrogen plays an important role in maturation and ovulation of fish *Clarias batrachus* rather than male. Present study investigated the possibility of estrogen as a stimulant may in the female fish *Clarias batrachus* as it stimulates female. In the presence study, estrogen also stimulates oocyte maturation. Present studies also indicate that estrogen inhibits the growth of testicular tissue. The exposure to water borne $PGF_2\alpha$ increased neurogenesis and GnRH concentration in male goldfish brain and modulate brain plasticity associated with behavioral changes during spawning season via the neuroendocrine (GnRH) and motor components of the pheromone-reproductive system⁶. This finding confirms the above view in *Clarias batrachus* in relation with increased number of gonadotrops, increased secretary activity in ovary. Hence, in the present study, it is used as a stimulant. This finding confirms the above view in *Clarias batrachus* in relation with increased number of gonadotrops. Estrogen is known to play an important role in almost all aspects of reproduction¹⁰. Higher proportion of gonadotrops (GTH) has been observed during the breeding season¹³. In *Clarias batrachus* many nucleoli of various sizes are seen at the early perinucleolus and yolk vesicles stages. The size of the nucleoli gradually diminishes with advancement stages of the oocytes. In testis spermatogonial number is very much reduced and they are than seen along the lobule wall only. Results of the present study support the earlier views in the *Clarias batrachus* as it act as a stimulant in female and in male act as a growth promoter.

IV. CONCLUSION

The objective of the present study was to evaluate the effect of premarin on pituitary gonadal axis in the fish *Clarias batrachus*. The estrogen in the form of premarin stimulate the oogenesis in the ovary of *Clarias batrachus* which was mediated through gonadotrophic hormone (GTH) and essential for sexual behavior in fish resulting into early maturity. Gonadotrophs and Gonadotrophins were also stimulated. Thus, the results obtained from the present study, it can be concluded that the premarin acts as a stimulants as it stimulates oogenesis in the ovary of female fish mediated through gonadotrophic hormone with the help of pituitary gland. In male *Clarias batrachus*, an energy required for the development of testis was diverted into muscular growth. Thus, premarin acts as a promoter in male fish.

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