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Comparative Evaluation of the Influence of Some Hormonal Preparations on Male Silver Carp (Hyphothalmichthys Molitrix) (Val.)

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At the present time in connection with the increase in the volume of artificial fish farming, the question of the possibility of replacing fish hypophyses with different preparations which have the same gonadotropic effect, is becoming even more urgent.
In this work we have studied the possibility of using luteinizing (LH) and follicle-stimulating (FSH) hormones and a chorion gonadotropin (CG) in male silver carp according to the effect on the spermiation process and the effect of individual preparations on some aspects of metabolism in different tissues. The males were examined before the injection and 8-10 hours after the hormonal effect.

Injections with acetonic hypophyses of carp and CG cause spermiation 8-10 hours after the injection. The volumes of ejaculates after introducing the hypophysis in a dose of 1-1.5 mg/kg and CG in a dose of 500 molar units/kg are close and comprise on the average 7.8 and 7.4 cm³ respectively. After injections of FSH of a sheep and LH of a bull, the silver carp males discharged sperm similar to the control, that is, in very small amounts.

Each gonadotropic hormone causes certain changes in the isoenzyme spectrum of MDG* and non-specific esters; these changes relate not only to the quantity of isoforms and their relative electrophoretic mobility but also to the redistribution of enzymatic activity between individual isoforms.

The general picture of the distribution of MDG isoforms in different tissues of males after injections with the carp hypophysis and CG is quite similar. It is expressed most clearly in the muscles, liver and spermal fluid. Injections of LH and FSH cause, in the isoenzyme spectrum, changes which differ significantly. 

*Revisor's note: "Molar units" is a proposed expansion of the original Russian abbreviation m.e. Another expansion is "mass unit".

**Revisor's note: No suitable full expansion is available for the original Russian abbreviation MDG, which may properly transliterate as "MDH". The final "H" in the latter abbreviation may expand to "hormone".
from the effect of the carp hypophysis and CG. Under the influence of these hormones, a significant decrease in the quantity of isoforms in the spermal fluid and blood plasma is observed; there are no significant changes in the rest of the tissues, but definite changes take place in the isoenzyme spectrum.

In the spectrum of non-specific esterases a similar picture is observed. In the majority of the examined tissues carp hypophyses and CG cause similar changes in the composition of esterases, while injections of LH and FSH cause somewhat different changes.

The similarity observed in the changes of the isoenzyme spectra of MDG and non-specific esterases in the majority of the examined tissues of male silver carp, is apparently caused by a certain similarity in the effect mechanism of the hormones of the carp hypophysis and CG, which is confirmed by data on the periods of the onset of spermiation under the influence of these preparations.
SOME PROPERTIES OF GONADOTROPIC HORMONES
OF CARP - CYPRINUS CARPIO L.

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One of the ways of improving the methods of artificial fish farming is by checking the possibility of using purified gonadotropic preparations to obtain more rapidly mature reproductive products in fish. Gonadotropins were separated from carp hypophyses using analytical disc-electrophoresis and polyacrylamide gel, followed by biological testing of eluates of individual areas of the gel in loaches Misgurnus Rossilis L. in the fourth stage of maturity. Two protein fractions which cause ovulation in loaches after 24±2 hours were isolated. These fractions were doubly cleaned by gel filtration in a Sefadex. A check of the purified gonadotropins for homogeneity by analytical disc-electrophoresis, followed by biological testing on loaches of the eluates of the narrow gel zones, showed uniformity in protein and in the hormonal activity of each tested hormone. One gonadotropin
had a relative electrophoretic mobility (REM) of 0.57±0.02, the other 0.51±0.02. The isolated hormones had a molecular weight of about 38000 and a Stock radius of -26.4 Å. When analysing the absorption spectra, it was established that both hormones had a maximum absorption at 276 nm and minimum at 253 nm.

The isolated hormones differed in the emission spectra which were obtained when stimulated by a wave length of 278 nm, in REM, and in the relative content of each hormone in the hypophysis at equal stages of maturity of the fish. In addition, when introduced in the same quantities, double the threshold quantities, the hormones caused, by the moment of the onset of ovulation in loaches different changes in the isoenzyme spectra of LH, MDG, KoDG*and non-specific esterases in the eggs, skin, liver, muscles and spleen.

Similar differences reflect the different effect of each hormone on the metabolic processes in the corresponding tissues, and the obtained differences in the relative content of hormones in the hypophysis at different stages of maturity apparently indicate their different functional purpose. Further study of the physico-chemical properties, functional role and effect mechanism of each gonadotropic hormone will in the near future bring about a transition from hypophysial injections, which introduce a whole series of other hormones and proteins, to the use of individual purified fish gonadotropins, with allowance for the nature of their functional effect.

*Revisor's note. No suitable full expansion is available for the original Russian abbreviation KoDG, which may properly transliterate as "KoDH". The final "h" in the latter abbreviation may expand to "hormone".
SPECIES SPECIFICITY OF GONADOTROPIC HORMONES
OF THE HYPOPHYSIS OF FISH.

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In solving the problem of which fish species can serve as donors when producing the gonadotropic preparation necessary for work with different fish-cultural items, the question of the existence of species specificity in the reaction of the reproductive system to foreign gonadotropins is very important.

Comparisons of some physico-chemical properties (relative electrophoretic mobility - REM) and of the biological effect of gonadotropic hormones of the hypophysis of fish of different taxonomic groups on one type of receptor system were conducted (Korean sawbelly - *Hemiculter eigenmanni* - were used). In the hypophyses of the examined fish there were two different protein fractions which had gonadotropic activity. In carp, silver carp and big-head, the gonadotropins had a similar REM: 0.51 ± 0.02 and 0.57 ± 0.02; sockeye salmon - 0.43 ± 0.02 and 0.57 ± 0.02; sturgeon - 0.30 ± 0.02 and 0.45 ± 0.02; stellate sturgeon - 0.36 ± 0.02 and 0.49 ± 0.02; snakehead - 0.24 ± 0.02 and 0.47 ± 0.02.
The gonadotropins differed also in the time of their stimulating effect. With the administration to the female saw-belly of doses of gonadotropins equal in quantity and 1.5-2 times greater than the threshold quantity, the following times of the onset of ovulation were obtained: with hormone injections of carp, silver carp and bighead - after 10-12 hours; sockeye salmon sturgeon and starred sturgeon - after 25-32 hours and snakehead - after 23-26 hours. The doses of the gonadotropins administered were increased 2-3 times, compared with the threshold doses, but did not cause a significant change in the time of the onset of ovulation (not more than 1-3 hours). This difference in the time of the onset of ovulation in the sawbelly is apparently connected with the species specificity of the gonadotropic hormones of fish of different taxonomic groups and with the different effect of these hormones on the receptor systems of the tissues and muscles of the recipient.