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TESTOSTERONE: EFFECTS ON THE MAINTENANCE OF SPERMATOGENESIS IN INTACT AND HYPOPHYSECTOMIZED GOLDFISH (CARASSIUS AURATUS)

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Testosterone propionate (TP) can restore or stimulate spermatogenesis in hypophysectomized catfish (*Heteropneustes fossilis*) (1) and in goldfish testis *in vitro* (2). In the hypophysectomized guppy it has no effect (Billard, R., unpublished data). Methyltestosterone (MT) has only a slight potency on spermatogenesis of *Fundulus heteroclitus* (3) and no effect in *Cymatogaster aggregatus* (4). This work investigates the effects of TP and MT on spermatogenesis in the goldfish.

Sexually mature males, weighing 30-40 g, were kept under constant photoperiod (12 L - 12 D) at 17 °C in tanks filled with brackish water (sea-salts, 8 parts per 1000) for hypophysectomized animals, and fresh water for the intact ones. TP and MT were injected intraperitoneally in oil solution or suspension, 3 times a week during 4 weeks. Doses were from 1 to 200 µg/g body weight/injection. At the end of the experiment (in September) animals were killed, gonadosomatic index (GSI) was established and quantitative studies of spermatogenesis (5) were performed.

Results, expressed in mm³/testes/g body weight with the S.E.M., are summarized in the table. In hypophysectomized males (H⁻), GSI dropped drastically in comparison with the intact ones (H⁺). Total volume of Sertoli cells decreased.

Treatment	Dose µg	No. d	GSI	Sertoli cells	G _A	G _B	Spermatocytes	Spermatids	Spermatozoa
H ⁻		7	0.27 ± 0.02	0.42 ± 0.11	0.20 ± 0.07	0.02	0	0	0.08 ± 0.07
H ⁻ + TP	1	4	0.80 ± 0.14	1.25 ± 0.37	0.22 ± 0.04	0.30 ± 0.1	0	0	3.59 ± 1.48
	10	4	0.92 ± 0.25	0.79 ± 0.13	0.20 ± 0.01	0.62 ± 0.11	0	0	3.59 ± 1.68
	100	4	0.94 ± 0.27	1.56 ± 0.33	0.33 ± 0.02	0.39 ± 0.15	0.05	0.01	0.03
	200	4	1.10 ± 0.14	3.53 ± 0.13	0.19 ± 0.07	0.18 ± 0.04	0.44 ± 0.11	0.11 ± 0.05	1.5 ± 0.19
H ⁻ + MT	100	5	1.01 ± 0.12	1.34 ± 0.56	0.38 ± 0.12	0.10 ± 0.02	0	0	3.55 ± 2.10
H ⁺ + TP	1	4	1.03 ± 0.19	1.00 ± 0.21	0.13 ± 0.05	0.51 ± 0.26	0	0	7.22 ± 3.7
	10	4	1.09 ± 0.12	1.18 ± 0.19	0.26 ± 0.08	0.53 ± 0.19	0.36 ± 0.11	0.29 ± 0.19	5.62 ± 1.88
	100	4	1.62 ± 0.18	1.16 ± 0.33	0.23 ± 0.02	0.85 ± 0.18	0.84 ± 0.54	0.27 ± 0.11	1.04 ± 2.03
H ⁺		7	1.25 ± 0.15	1.28 ± 0.16	0.35 ± 0.07	0.50 ± 0.1	0.25 ± 0.09	1.05 ± 0.12	2.35 ± 0.27

Except for type A spermatogonia (G_A) which remained unchanged, almost all the germ cells disappeared from the testis. Low doses of TP injected immediately after hypophysectomy and during 4 weeks maintained only type B spermatogonia (G_B). Spermatocytes and spermatids were present in the testis only when high doses of TP (100 to 200 µg) were injected. Release of sperm (spermiation) was significant only in males treated with 100 or 200 µg of TP; this might explain the reduction of the total volume of spermatozoa found in their testis at the end of the experiment. MT was less effective than TP on the maintenance of spermatogenesis: spermatocytes and spermatids disappeared but Sertoli cells and spermatozoa were maintained.

In intact males on a low dose of TP (1 µg) there were no spermatocytes and spermatids in the testis, and the number of spermatozoa were higher than in controls. As there was no spontaneous spermiation in these males, total volume of spermatozoa in the testis might have been increased.

Conclusions: Testosterone can maintain spermatogenesis *in vivo* in hypophysectomized goldfish only when large doses are injected; this might be due to a blood-testis barrier in fish, as in mammals. It can also be suggested that in intact males, low levels of testosterone act only at the hypothalamo-pituitary system level in reducing the secretion of gonadotropin, thus inhibiting spermatogenesis. At high levels the direct effect on the testis is sufficient to maintain a normal spermatogenic activity as occurs in the rat.

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