

# Free androgens and progestins and their conjugated forms in serum and urine of stellate sturgeon (*Acipenser stellatus* Pallas) males

by

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**ABSTRACT.** - Stellate sturgeon (*Acipenser stellatus* Pallas) males from Volga River treated with LH-RH-A showed an increase of free, sulfated and glucuronidated sex steroid levels in serum and urine at spermiation. Conjugated forms of sex steroids could act as pheromones in sturgeon.

**Key words.** - Stellate sturgeon male - Steroids - Sulfates - Glucuronides.

## Introduction

Free steroid levels in the blood serum of stellate sturgeon breeders after hormonal treatment were previously investigated (Semenkova *et al.*, 2002; Bayunova *et al.*, 2006). The role of the conjugated forms of sex steroids in sturgeon is still not clear. The aim of this study was to examine the profiles of free, sulfated and glucuronidated sex steroid levels in the serum and urine in males.

## Methods

Stellate sturgeon males ( $n = 6$ ) were captured at Volga River, delivered to the sturgeon hatchery and held in the ponds 1-2 weeks before experiment. Fish were treated by LH-RH-A to induce spermiation. Blood samples were taken at the time of treatment (0 h) and after 4 h (the beginning of spermiation), 8 and 12 h (at spermiation) and 160 h (after spermiation). Urine samples were taken at 0, 4, 8 and 12 h after the treatment.

Concentrations (ng/ml) of free, sulfated and glucuronidated testosterone (T), 11-ketotestosterone (KT), 17,20- $\beta$ -dihydroxy-4-pregnen-3-one (DHP), 17,20- $\beta$ -21-trihydroxy-4-

pregnen-3-one (20 $\beta$ S) and 11-desoxycortisol (S) were measured by radioimmunoassay.

## Results and discussion

Free T serum levels, as well as its sulfate and glucuronidated S levels, increased 8 h after the treatment. Sulfated KT and glucuronidated DHP levels tended to increase at spermiation. Free 20 $\beta$ S and S and glucuronidated S levels increased at the end of experiment and glucuronidated DHP levels significantly decreased at this moment (Tab. I). Free 20 $\beta$ S urine levels rose 12 h, free and sulfated DHP levels elevated 8 h after the treatment (Tab. II).

## Conclusions

Free and conjugated sex steroid levels were elevated in serum and urine at spermiation. It is suggested that these changes may be related to a possible role of these steroids in pheromonal communication in sturgeon.

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Form	Steroid	Time after the treatment (h)				
		0	4	8	12	160
Free	T	46.9 $\pm$ 12.28	50.6 $\pm$ 12.06	96.8 $\pm$ 34.87*	141.6 $\pm$ 54.37	156.7 $\pm$ 27.84
	KT	54.4 $\pm$ 17.81	53.8 $\pm$ 14.36	33.6 $\pm$ 8.78	39.2 $\pm$ 15.61	45.4 $\pm$ 14.97
	20 $\beta$ S	0.9 $\pm$ 0.19	1.2 $\pm$ 0.23	1.0 $\pm$ 0.13	1.3 $\pm$ 0.26	1.5 $\pm$ 0.18**
	DHP	0.3 $\pm$ 0.09	0.4 $\pm$ 0.14	0.3 $\pm$ 0.03	0.3 $\pm$ 0.04	0.3 $\pm$ 0.05
	S	1.1 $\pm$ 0.24	1.1 $\pm$ 0.11	1.3 $\pm$ 0.32	1.9 $\pm$ 0.52	2.3 $\pm$ 0.56*
Sulfate	T	4.0 $\pm$ 0.30	4.3 $\pm$ 0.22	6.2 $\pm$ 0.66*	6.3 $\pm$ 1.41	6.2 $\pm$ 0.87
	KT	0.7 $\pm$ 0.17	0.5 $\pm$ 0.09	1.2 $\pm$ 0.25	0.7 $\pm$ 0.14	1.0 $\pm$ 0.47
	20 $\beta$ S	0.4 $\pm$ 0.18	0.8 $\pm$ 0.40	0.4 $\pm$ 0.13	0.3 $\pm$ 0.03	0.2 $\pm$ 0.07
	DHP	0.1 $\pm$ 0.02	0.3 $\pm$ 0.17	1.0 $\pm$ 0.87	1.1 $\pm$ 0.59	0.1 $\pm$ 0.05
	S	2.2	-	0.5 $\pm$ 0.06	1.0 $\pm$ 0.57	1.2
Glucuronide	T	1.0 $\pm$ 0.06	0.4 $\pm$ 0.06	0.6 $\pm$ 0.17	0.7 $\pm$ 0.34	0.6 $\pm$ 0.19
	KT	4.3 $\pm$ 1.10	2.1 $\pm$ 0.70	2.3 $\pm$ 1.12	2.4 $\pm$ 1.03	3.0 $\pm$ 1.10
	20 $\beta$ S	0.5 $\pm$ 0.12	0.6 $\pm$ 0.09	0.8 $\pm$ 0.29	0.5 $\pm$ 0.09	0.6 $\pm$ 0.21
	DHP	0.7 $\pm$ 0.29	0.9 $\pm$ 0.18	1.4 $\pm$ 0.42	0.8 $\pm$ 0.25	0.5 $\pm$ 0.11 <sup>x</sup>
	S	0.3 $\pm$ 0.01	0.4 $\pm$ 0.07	0.6 $\pm$ 0.15*	0.6 $\pm$ 0.16	1.1 $\pm$ 0.27*

Table I. - Free and conjugated sex steroid levels (ng/ml) in the serum after LH-RH-A treatment. The differences are significant: \*:  $p < 0.05$ ; \*\*:  $p < 0.01$  - in comparison with point "0"; <sup>x</sup>:  $p < 0.05$  - in comparison with point "8" (using T-Student paired test)

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Table II. - Free and conjugated sex steroid levels (ng/ml) in the urine after LH-RH-A treatment. The differences are significant: \*:  $p < 0.05$  - in comparison with point "0"; x:  $p < 0.05$  - in comparison with point "8"

Form	Steroid	Time after the treatment (h)			
		0	4	8	12
Free	T	5.4 ± 2.24	1.5 ± 0.78	0.4 ± 0.15	1.4 ± 0.64
	KT	4.3 ± 1.50	0.9 ± 0.22	0.5 ± 0.11	0.6 ± 0.19
	20βS	0.2 ± 0.07	0.3 ± 0.15	0.4 ± 0.11	0.6 ± 0.13*
	DHP	0.1 ± 0.05	0.1 ± 0.02 <sup>x</sup>	0.2 ± 0.03	0.2 ± 0.12
Sulfate	T	5.6 ± 1.14	9.4 ± 3.19	5.1 ± 1.36	2.7 ± 0.42
	KT	0.5 ± 0.14	1.2 ± 0.46	0.3 ± 0.08	0.1 ± 0.05
	20βS	0.4 ± 0.18	0.2 ± 0.06	0.7 ± 0.37	0.2 ± 0.03
	DHP	0.3 ± 0.12	0.2 ± 0.06 <sup>x</sup>	8.6 ± 2.65*	4.4 ± 0.83
Glucuronide	T	0.5 ± 0.11	0.7 ± 0.35	1.1 ± 1.15	-
	KT	1.1 ± 0.34	2.8 ± 1.90	0.5 ± 0.05	0.4 ± 0.31
	20βS	0.5 ± 0.13	0.4 ± 0.08	0.3 ± 0.05	0.1
	DHP	1.2 ± 0.83	0.3 ± 0.15	0.6 ± 0.27	0.5 ± 0.08

### References

- SEMENKOVA T.B., BARANNIKOVA I.A., KIME D.E., McAL-  
 LISTER B.G., BAYUNOVA L.V., DYUBIN V.P. & N.N. KOL-  
 MAKOV, 2002. - Sex steroids profiles in female and male stel-  
 late sturgeon during final maturation induced by hormonal  
 treatment. *J. Appl. Ichthyol.*, 18: 375-382.
- BAYUNOVA L.V., CANARIO A.V., SEMENKOVA T.B.,  
 DYUBIN V.P., SVERDLOVA O.A., TRENKLER I.V. & I.A.  
 BARANNIKOVA, 2006. - Sex steroids and cortisol levels  
 in the blood of stellate sturgeon (*Acipenser stellatus* Pallas)  
 during final maturation induced by LH-RH-analogue. *J. Appl.*  
*Ichthyol.*, 22: 334-339.