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## Evidence for two distinct glucocorticoid receptors in rainbow trout

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**EVIDENCE FOR TWO DISTINCT GLUCOCORTICOID RECEPTORS IN RAINBOW TROUT.** Bury, N.R.<sup>1</sup>, Ducouret, B.<sup>2</sup>, Guiguen, Y.<sup>3</sup>, Colombe, P.<sup>3</sup>, and Prunet, P.<sup>3</sup>. 1. School of Biological Sciences, University of Exeter, UK. 2. CNRS, University of Rennes, France. 3. INRA SCRIBE, Rennes, France.

Cortisol controls a number of physiological processes in teleosts including both mineralocorticoid and glucocorticoid actions. Regulation of these processes involves cortisol binding to its respective receptor, which act as a ligand inducible transcription factor. The present study has identified a novel cortisol receptor in the rainbow trout (*Oncorhynchus mykiss*), which shows high sequence homology with other glucocorticoid receptors (GR). This cDNA clone encodes for a protein of 669 amino acids and is the second GR (rtGR2) to be identified in trout (the first, rtGR1). Both rtGR1 and rtGR2 are widely expressed at a size of approximately 7.4 Kb. More rtGR1 transcript was present in the liver and muscle suggesting that this form of the GR may play a pivotal role in energy metabolism. rtGR1 and rtGR2 induced transcriptional activity in the presence of dexamethasone and cortisol, but not in the presence of other steroids. Based on transcriptional activity, rtGR2 was more sensitive to cortisol than rtGR1. This is the first time that two functionally distinct GR have been identified from the same species.

### CORRELATION BETWEEN ACOUSTIC ACTIVITY AND PHYSIOLOGICAL STATE IN SOME STURGEONS

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Observations on acoustic activity in some sturgeon species showed that their juveniles and adults are among the most "silent" fishes. However once some days before fish mortality suddenly increased by unknown reasons, impulse signals produced by sturgeon juveniles had been registered. Similar biosounds were registered during our studies of behaviour reaction of beluga *Huso huso* juveniles upon changes in water salinity. The juveniles produced sounds only in salt water. But the results of the experiment showed that acoustic activity depended more on the factor "Fish" than the factor "salinity".

We supposed that some fish consumed unsuited feed. For testing this hypothesis we carried out to study on acoustic activity in beluga when fed on different diets including toxic and semitoxic feeds with 25, 40 and 76% infuzoria survived, respectively. The number of signals produced by a juvenile during per minute correlates with state of toxic feed and the amount of these feeds consumed before.

Besides, sturgeons produce impulse and whistle signals during prespawning period. The number of whistle signals produced by a fish correlates with the state of its readiness to spawn.

### DIFFERENTIAL IN VITRO SUPPRESSIVE EFFECTS OF STEROIDS ON THE LEUKOCYTE PHAGOCYTOSIS IN TWO TELEOSTS, TILAPIA AND COMMON CARP

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The objectives were to investigate the roles of cortisol (F) and sexual steroids on the phagocytosis activity of leukocytes in tilapia (*Oreochromis niloticus* x *O. aureus*) and common carp (*Cyprinus carpio*). An *in vitro* microtiter plate assay measuring incorporation of FITC-latex beads into peripheral blood leukocytes was developed. F significantly suppressed leukocyte phagocytosis in a dose- and time-dependent manner in tilapia. Dexamethasone also had a similar suppressive effect as F; while, cortisone and aldosterone only had a weak effect. High doses of estradiol (E<sub>2</sub>) and ethynylestradiol but not of estrone had a suppressive effect on phagocytosis in tilapia. No suppressive effect on phagocytosis was observed with various concentrations of other sexual steroids. Combination of E<sub>2</sub> and F had potentiating suppressive effects. Actinomycin D and cycloheximide blocked the suppressive effects of F and E<sub>2</sub>. F had weaker suppressive effects on phagocytosis in common carp than tilapia. Other steroids did not have suppressive effects in common carp. In conclusion, this study demonstrated the suppressive effects of F (main effect) and E<sub>2</sub> on phagocytosis in tilapia, effects likely mediated via specific glucocorticoid receptors and estrogen receptors, respectively. Sexual steroids, such as E<sub>2</sub>, also could interact with F on further suppressive immune system in tilapia. Differential responsiveness of the immune system to suppressive effects of steroids, among teleosts species, is clearly demonstrated.

### SOCIAL MODULATION OF ANDROGEN RESPONSIVENESS IN VERTEBRATES: A META-ANALYSIS

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The present study focusses on the predictions generated by the 'challenge hypothesis' (Wingfield, *et al.* 1990, Am. Nat. 136: 829-846), according to which androgens mediate the adaptive adjustment of the individual's agonistic motivation to changes in the social environment (such as reproductive state of the mate female, challenges by male competitors or presence of offspring). This androgen responsiveness is, moreover, predicted to vary with mating strategies and with the amount of parental care. For example, in monogamous species with high levels of paternal care, androgen levels should increase above the breeding baseline only when males are challenged by other males or by mating. Conversely, androgen levels in polygynous males should be near physiological maximum throughout the breeding season due to high levels of male-male competition in this type of breeding systems. Here we studied the endocrine responses to social stimuli in males of various vertebrate taxa, such as fish, reptiles, birds and mammals. To accomplish our goal, a literature survey was carried out, and the resulting database was analysed using meta-analysis procedures (Rosenberg, *et al.* 1997, Sinauer Assoc., Sunderland, Massachusetts). Data and results from various studies were translated into a 'common currency', the effect size. We present the general conclusions that may be drawn from the overall effect size and attempt to specify the magnitude of the effect of social modulation on androgens in all taxa. Furthermore, we discuss the observed specific effects of mating system, parenting strategy, levels of aggressiveness and group density on androgen responsiveness.

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