Influence of sexual genotype on agonistic behaviors and sex steroid levels of phenotypic males and females in the Nile tilapia (*Oreochromis niloticus*)

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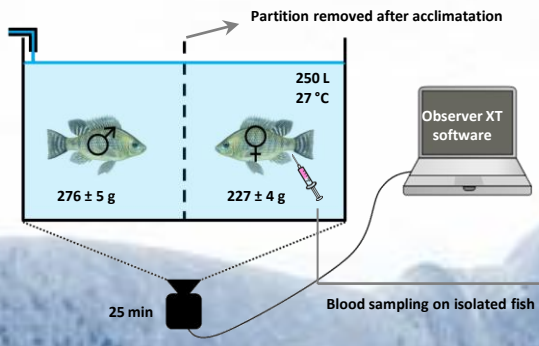
INTRODUCTION

Mechanisms of sex determination and differentiation are extremely labile in fish, as demonstrated by the numerous sex reversal experiments performed on teleosts. In Nile tilapia, sex reversal processes using exogenous sex steroids (e.g. 17 α-ethynylestradiol, 17α-methyltestosterone) allow to produce individuals with sexual phenotype opposite to their genotype that constitute major tools to investigate the mechanisms of sex determination and differentiation, from gonad differentiation to sexual differentiation of brain and behavior. The aim of this study was to assess the **influence of sexual genotype and the role of circulating sex steroids on the expression of agonistic behaviors** in Nile tilapia breeders. These data would provide insights on the influence of sex chromosomes in the process of **brain sexual differentiation** and on the possible role of sex steroids in translating genotypic differences to the behavioral level.

MATERIALS & METHODS

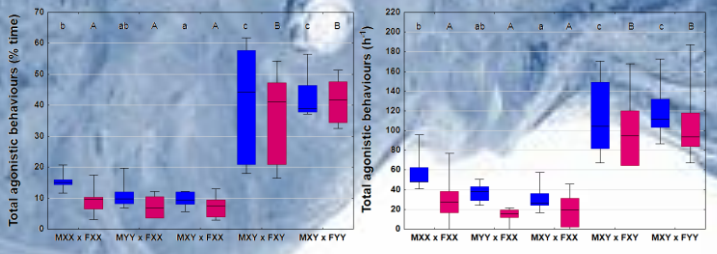


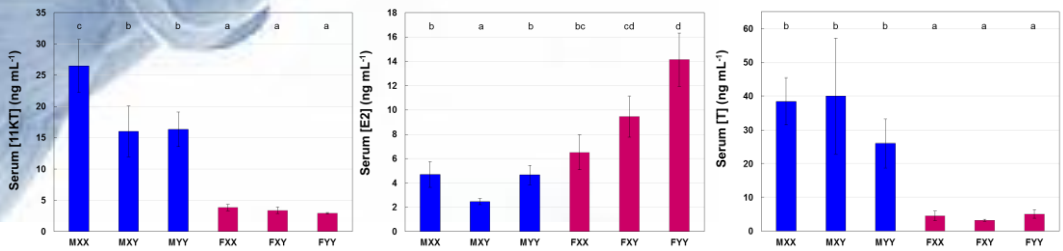
Confrontations (n = 6):
MXY×FXX (control)
MXY×FXY
MXY×FYY
MXX×FXX
MYY×FXX

Steroid assay (RIA) (n = 16 ♂, 16 ♀):
11-ketotestosterone (11KT)
17β-estradiol (E2)
Testosterone (T)

Quantified behaviors:
fin raising
throat swelling
chasing
lateral attack
frontal display
tail beating
mouth fighting
biting

Example of agonistic behaviors. (a): threats: fin raising and throat swelling; (b): attack: mouth fighting.



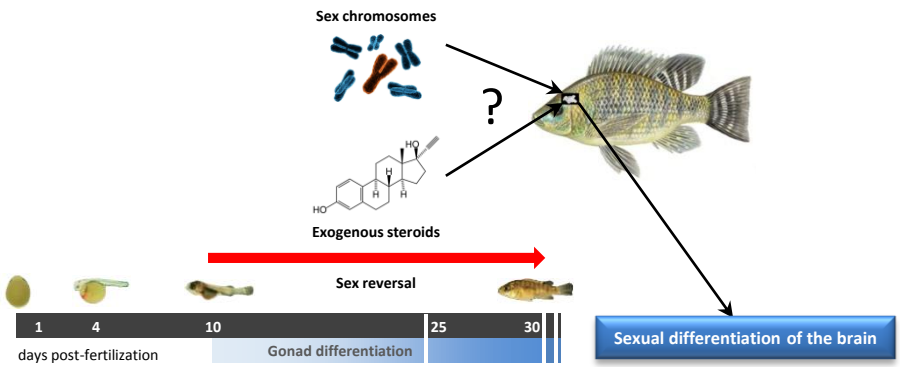


RESULTS AND DISCUSSION

- Expression of aggressive behaviors was significantly higher in couples with a XY or YY female than in couples with a XX female.
- Expression level of agonistic behaviors in MXY staged with FXY or FYY seems to be adjusted to the aggressiveness level of females.
- Aggressiveness level was low and similar in MXY×FXX, MXX×FXX and MYY×FXX.
- When comparing males together, only MXX showed a slightly but significantly higher expression of aggressive behaviors that could be related to their higher level of 11KT.
- E2 concentrations were similar between males and increased in females with the presence of Y chromosome(s). This result raised the question of an involvement of E2 in the control of agonistic behaviors in females.
- No influence of the genotype on T levels.

CONCLUSION

Our results suggest that the presence of a Y chromosome increases aggressiveness in females. However, since the same relationship between aggressiveness and the Y chromosome is not observed in males, in which the level of aggressiveness is paradoxically higher in XX, we can hypothesize that the differences in aggressiveness are not directly dependant on the genotype but on the sex reversal procedures which young fry were exposed to during their sexual differentiation. These hormonal treatments could have permanently modified the development of the brain and consequently influenced the behavior of adults independently to their genotype.



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