# Preliminary study of aromatase expression and sexual steroids level in different sexual phenotype/genotype combinations of Nile tilapia (*Oreochromis niloticus*)


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## Introduction

Peculiar sexual phenotype/genotype combinations of *O. niloticus* are largely used to investigate the sex determinism mechanisms, and to produce male monosex populations in fish farming. Preliminary results showed that tilapias with atypical phenotype/genotype combinations have different reproductive performances (e.g. spawning frequency, hatching rate). These differences could be linked with aggressiveness level and/or physiological particularities.
This study tried to highlight differences in plasma level of sexual steroids and in the expression of brain and gonad aromatase between fish characterized by different sexual phenotype/genotype combinations.

Fig.1: *Oreochromis niloticus* (photo: WorldFish Center).

## Materials and methods

Fish were held in 4m²/1.6 m³ tanks (4 males, 14 females) with different crosses:
♂**XY** × ♀ **XX**
♂**XY** × ♀ **YY**
♂**XX** × ♀ **XX**
♂**YY** × ♀ **XX**
After 10 days, blood, brain and gonads were sampled on 60 individuals (BW = 447 ± 105 g). Plasma level of **17β-estradiol (E2), testosterone (T) and 11-ketotestosterone (11KT)** were measured by RIA and RT-QPCR was used to assess the expression level of **gonad (AromA)** and **brain (AromB) aromatase** in the brain and the gonads.

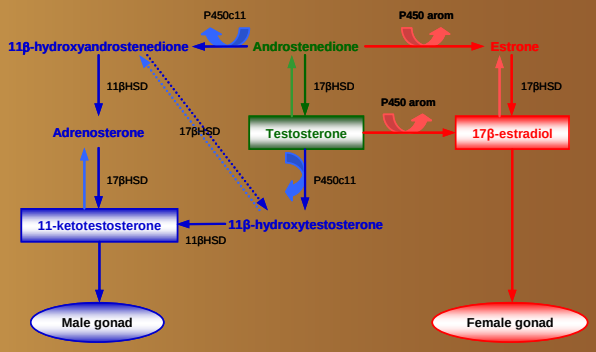


Fig.2: Steroidogenesis in fish. P450arom: aromatase; P450c11: 11β-hydroxylase; HSD: hydroxysteroid dehydrogenase.

## Results

Mean relative expression of AromA was about 50 times higher in female (between 43.3 ± 32.2 and 72.8 ± 54.0) than in male (between 0.6 ± 0.5 and 2.3 ± 2.3) gonads but was not significantly different between genotypes of the same phenotypic sex. AromA was not expressed in the brain. Expression of AromB was lower but was found in the brain (from 11.7 ± 19.8 to 13.1 ± 14.4 in females; from 1.0 ± 1.0 to 10.9 ± 13.7 in males) and gonads (from 1.9 ± 1.6 to 3.9 ± 2.0 in females; from 0.5 ± 0.2 to 1.0 ± 1.1 in males) of both sexes. Plasma concentrations of T and 11KT were higher in males (3.3 ± 5.6 ng/mL, 10.9 ± 10.6 ng/mL respectively) than in females (0.7 ± 1.6 ng/mL, 1.3 ± 1.1 ng/mL respectively) and E2 concentration was higher in females (4.0 ± 4.1 ng/mL) than in males (2.0 ± 3.1 ng/mL). Within a same phenotype, no statistical difference could be highlighted between the different genotypes.

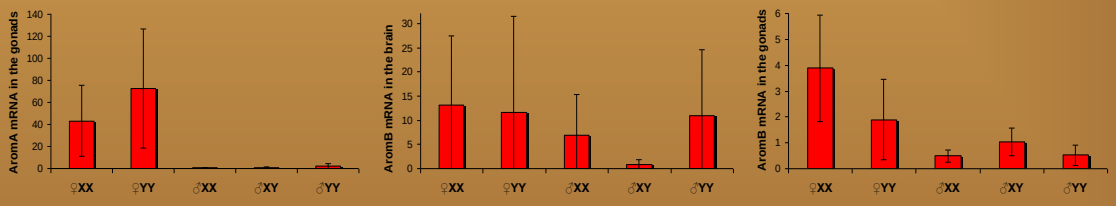


Fig.3: Expression of brain (AromA) and gonad (AromB) aromatase in the brain and gonads of *O. niloticus* according to sexual phenotype/genotype combinations. Results are expressed as relative values with regard to expression level in XY males. XY male is considered as the control condition and its expression level is set to 1 (mean±SD, n=6).

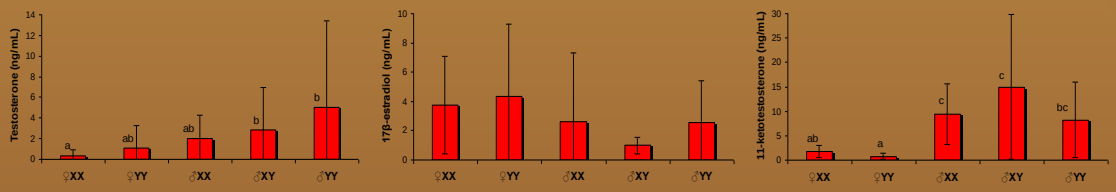


Fig.4: Plasma concentration of testosterone, 17β-estradiol and 11-ketotestosterone in different sexual phenotype/genotype combinations of *O. niloticus* (mean±SD, n=12). Values with different letters are statistically different.

## Conclusions

In this study, endocrinological differences between groups seem to be related only with phenotype but not with genotype. However, genotypic differences could be hidden by the great interindividual variability. Therefore, these preliminary results need to be refined by using larger number of fish and better synchronizing fish maturation.


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