



# Gene expression during natural and androgen induced sex differentiation in the rainbow trout, *Oncorhynchus mykiss*

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# GENE EXPRESSION DURING GONADAL SEX DIFFERENTIATION IN THE RAINBOW TROUT

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In fish, according to Yamamoto's model, androgens would drive testis differentiation and estrogens ovarian differentiation. Based on this model, steroids have been widely used in aquaculture for sex control. But even if these phenotypic effects on gonadal differentiation are well known and described, the mechanism of action of these molecules still remains poorly understood either during natural differentiation (endogenous steroids) or steroid-induced differentiation (exogenous steroids). This work describes gene expression of putative candidate mediators or targets of steroid action during natural and induced sexual differentiation.

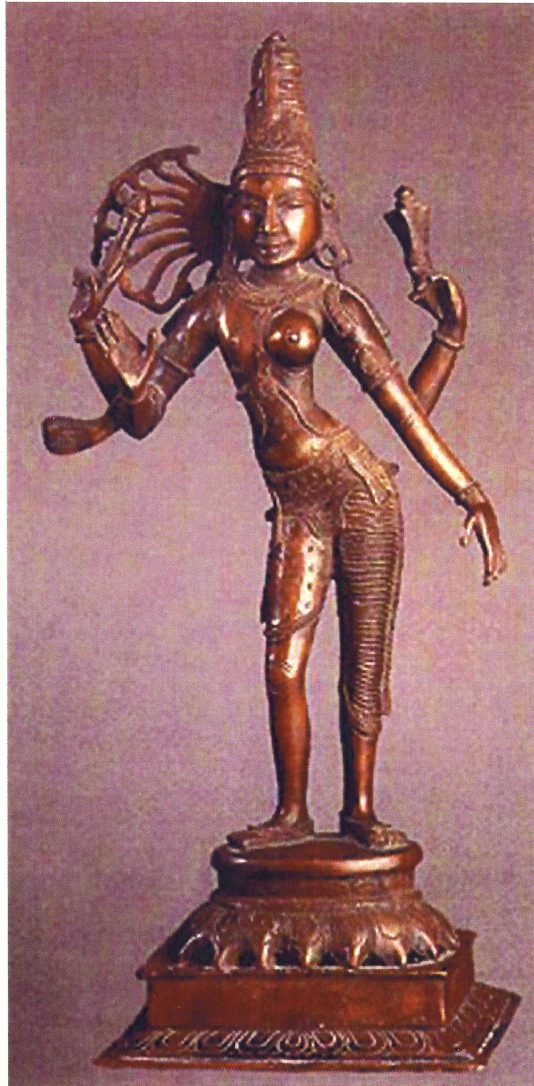
Rainbow trout (*Oncorhynchus mykiss*) is characterized by a male heterogametic (XY) sex determination system, and we produced XX and YY experimental male genotypes using phenotypic sex inversion with steroids. These special males now allow us to work on whole populations of fish in which the genetic and phenotypic sex is known before the first sign of gonadal sex differentiation. All-male and all-female populations (control groups : natural differentiation) were sampled from the onset of the first feeding (D0) and at D7, D12, D27, D60, D90 and D110. At the same time an all-male population was feminized (Ethinyl-estradiol, 20 mg/kg of food) and an all-female population masculinized (11 $\beta$ -hydroxy-androstenedione, 10 mg/kg of food) by classical dietary treatments starting from the first feeding (D0) and applied for 3 months (D90) (treated groups: induced differentiation). They were sampled similarly to the controls groups.

Several genes have been chosen based on bibliographic criteria. They mainly belong to the following families: transcription factors (SF1, WT-1, SOX9, DMRT1...), germ cells (Vasa, ...), steroidogenic enzymes (3 $\beta$ HSD, SCC, Aromatase, ...), growth factors (TGFbs, IGFs, ...), hormones (LH, FSH, AMH, ...) and hormone receptors (LH or FSH receptors, androgens and estrogens receptors, ...). Trout homologues

were searched in public (EMBL, GenBank) and private (AGENAE-INRA trout ESTs) databases and primers were chosen for expression studies using a real-time quantitative PCR approach. These expression data were completed by gonadal histology for each experimental point.

Our results bring interesting new data on gene expressions during the process of sexual gonadal differentiation in rainbow trout. This real-time quantitative PCR approach will be soon completed by a more conventional genomic approach using an array technology.

# THIRD INTERNATIONAL SYMPOSIUM ON THE BIOLOGY OF VERTEBRATE SEX DETERMINATION



MARCH 24-28, 2003 KONA, HAWAII

# **THIRD INTERNATIONAL SYMPOSIUM ON THE BIOLOGY OF VERTEBRATE SEX DETERMINATION**

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Cover: Statue of **Ardhanarishvara**, the hermaphrodite form of **Shiva**,  
India, 11th Century A.D.