The effects of androgens on the aggressive behavior of the male convict cichlid

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Previous studies have shown androgens play an important role in the development of primary sexual characteristics, spermatogenesis, and some secondary sexual characteristics (Oliveira et al, 2001, 2002). However, the relationship between androgens and behavior is less well defined. Some previous experiments show a positive correlation in a variety of species between androgen levels and behavior such as courtship and aggression (Day et al., 2005; Arnold et al., 1975; Salek et al., 2001)

*Amatitlania nigrofasciata*, commonly known as the convict cichlid, is a monogamous bi-parental species. In this species, male androgen levels are highest while courting and may contribute to displays of aggression towards other males while competing for potential mates. This study will explore if manipulating levels of 11-KT, the primary androgen in fish, affects male-male competition during the courtship phase.
Hypothesis

Manipulating the levels of androgens will affect aggression between males during courtship.

Predictions

A. Increasing the level of 11-KT will result in more bites, chases, and displays between the males than a control.
B. Blocking androgen receptors will result in fewer bites, chases, and displays between the males than a control.
Figure 1: Female and male convict cichlids, *Amatitlania nigrofasciata*
284 L tanks set up with a divider (transparent with small holes) placed on one side of the tank, separating off a 15 cm compartment for the stimulus females. A flower pot was positioned on the other side of this divider.

Three size matched males are collected and assigned a treatment group. For each group of males, two stimulus females (10mm shorter than males) were collected and housed in 12 L tanks.
Appropriate capsule (silastic tubing 1.47 mm ID x 1.96 mm OD, Length=10mm, sealed with silicone) inserted into the abdominal cavity of each male behind the pectoral fin. Males were then placed in main compartment of the tank.

Two females were added to the stimulus compartment and the males were taped for 30 minutes at 24 hours, 48 hours, and 72 hours after capsule insertion. Females were removed and returned to their tanks following each taping interval.

Tapes were reviewed using JWWatcher 1.0 to record the number of aggressive behaviors among males.

Male aggressive behavior was quantified in terms of the number of bites, chases, and displays towards other males.
Figure 2: Incision behind male’s pectoral fin to insert silastic capsule.
Description of behaviors of interest

Bite: forceful, direct physical contact between mouth of one fish and another fish; results in retreat of bitten fish

Chase: one fish approaches and pursues another; results in retreat of chased fish

Display: lateral pass, flash, or opening of fins and gills when in close proximity to another fish

Jawlocking: sustained contact between the mouths of two fish
Results

Figure 3: This figure depicts the average number of bites during three 20 minute intervals 24, 48, and 72 hours after the indicated treatment was administered. There are no significant differences between any of the groups.
Figure 4: This figure depicts the average number of chases during three 20 minute intervals 24, 48, and 72 hours after the indicated treatment was administered. There are no significant differences between any of the groups.
Results

Figure 5: This figure depicts the average number of displays during three 20 minute intervals 24, 48, and 72 hours after the indicated treatment was administered. There are no significant differences between any of the groups.
Discussion

It appears 11-ketotestosterone may not directly mediate aggression in the male convict cichlid prior to mating.

• Previous studies have shown that 11-KT may not be necessary or involved in the mediation of sex-specific aggressive behavior in fish (Perry and Grober, 2003 and unpublished data).

• Perhaps metabolites are responsible for mediating aggression. In this situation, raising endogenous levels of 11-KT or blocking androgen receptors will not directly affect aggression levels.

• Natural 11-KT levels could already be maximally elevated so that the 11-KT capsule had no effect on male aggression. However, this does not account for the lack of changes shown in males whose androgen receptors were blocked.
Future Directions

• Males treated with flutamide may court less than males treated with androgens and untreated males.

• We are currently reanalyzing our data and looking for links between androgen levels and changes in courtship behavior.