

**NATURAL AND SYNTHETIC ESTROGENS AT ENVIRONMENTALLY RELEVANT CONCENTRATIONS
DISRUPT REPRODUCTIVE COMPETENCE IN MALE FATHEAD MINNOWS**

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ABSTRACT: Natural and synthetic estrogens found in treated wastewater effluents may impair the reproductive ability of male fathead minnows. In this study, we exposed male fathead minnows to three environmentally relevant concentrations of natural (E1, E2) and synthetic estrogens (EE2) for 21 days before allowing treated males to directly compete with control males for reproductive opportunities (competitive spawning). Secondary sexual characteristics were graded before and after the competitive spawning assay to determine how male fish responded to the competitive challenge through up-regulation of androgen driven secondary sexual characters. Plasma samples were obtained for the detection of the female precursor egg yolk protein vitellogenin. Livers and testes were dissected, gonadosomatic and hepatosomatic indices were measured, and histopathology was conducted to detect changes in organ morphology. Exposed male fathead minnows were unable at the highest exposure concentrations to compete with control males for access to females and spawning sites, a pre-requisite for successful reproduction in the fathead minnow. Secondary sexual characters diminished at higher exposure concentrations and a dose-dependent degradation in testis structure was observed with seminiferous tubules becoming obliterated at the highest exposure concentrations. These preliminary results indicate that natural and synthetic estrogens in treated wastewater effluents can have disruptive effects at the structural and behavioral level and suggest that environmental concentrations of these compounds may disrupt reproduction in male fishes.

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