



Columbia Environmental Research Center

Publication Brief

Atrazine Reduces Fish Reproduction

Atrazine is one of the most commonly used herbicides in the world. In the United States this pre- and post-emergent broadleaf herbicide is widely utilized on the majority of corn, sugarcane and sorghum crops.

Our study was designed to evaluate a population endpoint (egg production) in conjunction with histological (e.g., gonad development) and biochemical (e.g., hormone production) observable characteristics associated with atrazine exposure in fathead minnows (*Pimephales promelas*).

Adult virgin breeding groups of one male and two female fathead minnows were exposed to nominal concentrations of 0, 0.5, 5.0, and 50 $\mu\text{g/L}$ of atrazine in a flow-through diluter for 14 or 30 days.

Total egg production was lower (19-39 %) in all atrazine-exposed groups as compared to the controls.

The decreases in cumulative egg production of atrazine treated fish were significant by 17-20 days of exposure. Reductions in egg production in atrazine treatment groups were most attributable to reduced numbers of spawning events with increased atrazine exposure concentrations. Gonad abnormalities were observed in both male and female fish of atrazine exposed fish.

Our results also indicate that atrazine reduces egg production through alteration of final maturation of oocytes. The reproductive effects observed in this study warrant further investigation and evaluation of the potential risks posed by atrazine, particularly feral populations of fish from streams in agricultural areas with high use of this herbicide.

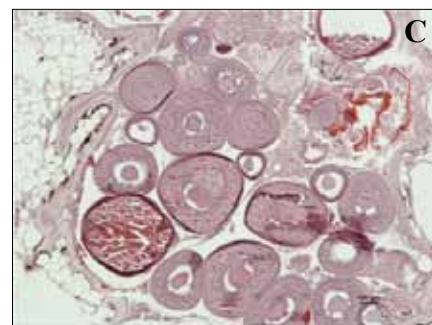
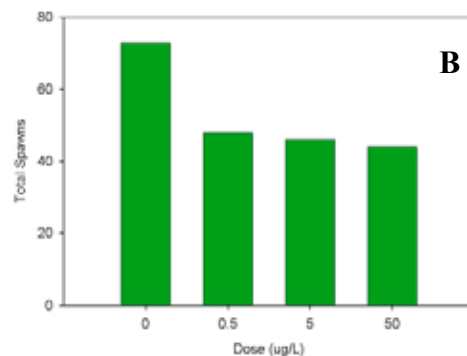
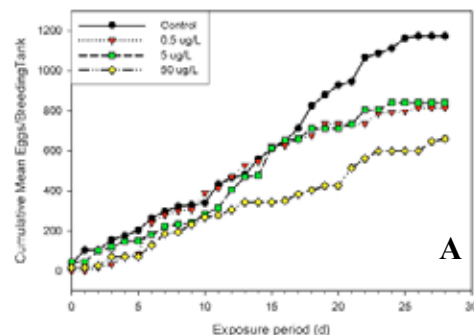
Conclusions:

- Environmentally relevant concentrations of atrazine have significant effects on reproductive output in fathead minnow.
- The atrazine threshold concentration (0.5 $\mu\text{g/L}$) at which reductions were observed is lower than previously defined, yet well within surface water concentrations in agricultural areas.
- The observed reductions in egg production were largely due to reduced numbers of spawning events, which was not predicted by routine physiological measurements of endocrine disruption (steroid hormones, aromatase, or gonad-somatic indices).
- Evidence suggests that atrazine-induced reductions in egg production were attributable to effects on oocyte maturation processes; however, effects on males cannot be discounted.
- The effects on egg production and spawning in fathead minnow suggest the reproductive risks of atrazine exposure to feral fish populations in high-use, agricultural areas may be under estimated by current evaluations.

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Figures:

- (A) Cumulative egg production;
(B) Total number of spawning events;
and
(C) Abnormal ovarian tissue from atrazine exposure.

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