



Tefluthrin Causes Morphological Defects in *Xenopus Laevis* Tail Development

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Abstract

Tefluthrin is the most common agricultural insecticide in Indiana, treating approximately 14% of Indiana farming acreage yearly. The overall impact of pesticides likely plays a role in a decline of global amphibian populations. This study examines the mutagenic and toxic effects of tefluthrin on an amphibian model system, *Xenopus laevis*. When compared to negative control groups through use of Student's T-test, tefluthrin was found to have a significant impact on notochord development and *X. laevis*'s ability to swim. This research may be used for regulatory changes concerning frog conservation. Almost a third of all Indiana amphibians are either considered special concern or endangered- tefluthrin may negatively affect these populations.

Methods

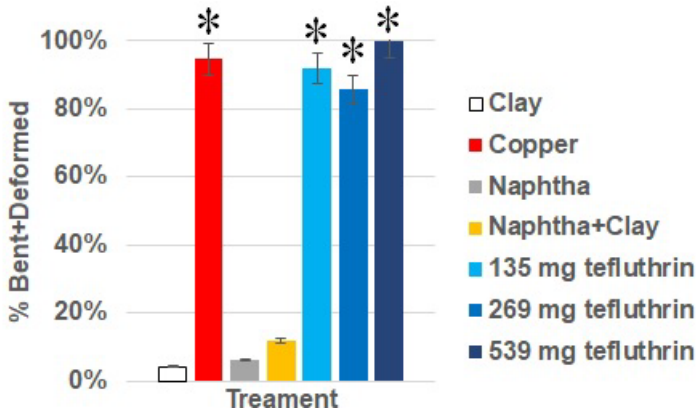
- Create the following solutions: 3 experimental tefluthrin, 1 positive control copper, 3 negative controls.
- Allow embryos to develop in solutions after in vitro fertilization to stage 40, about 4 days.
- Wash and fix specimens.

Tefluthrin is marketed as Force® 6.5G, which contains tefluthrin, naphtha, and clay. Negative control groups were composed of clay and naphtha. Experimental groups contained 3 concentrations of tefluthrin, clay, and naphtha.

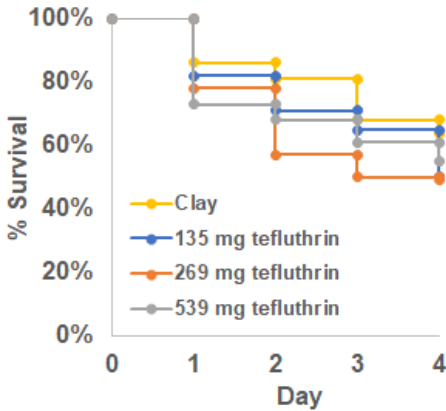
Hypothesis

It was predicted that tefluthrin causes neuromuscular defects based on previous pesticide studies. A significant amount of death caused by tefluthrin was also expected.

Results



Percent of Living Specimens Bent or Abnormal: Most subjects displayed axial bending. Those with defects other than a bent tail were considered deformed or abnormal. Error bars represent \pm %SD. * $t < 0.05$ vs clay.



Kaplan-Meier Curve of Experimental vs Negative Control:

Survivorship decreased the most in tefluthrin groups but was not statistically significant. Death was not clearly dose-dependent.



Discussion

- Bending was a statistically significant effect in groups treated with tefluthrin or copper.
- No notable malformation was seen until stage 38.
- Subjects in tefluthrin almost completely lost the ability to swim. Those that could not swim either twitched, with or without stimulus, or did not move at all.

Future Research

- Study neuromuscular changes between stages 38 and 40 and how tefluthrin interferes with development.
- Allow subjects to develop further into adulthood under the same conditions.
- Replicate experiment with doses found in waterways, perhaps using water directly from polluted areas.

References

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