

ENDOCRINE DISRUPTORS



Credit: Colin Brown

Caylor Romines
University of Tennessee, Knoxville
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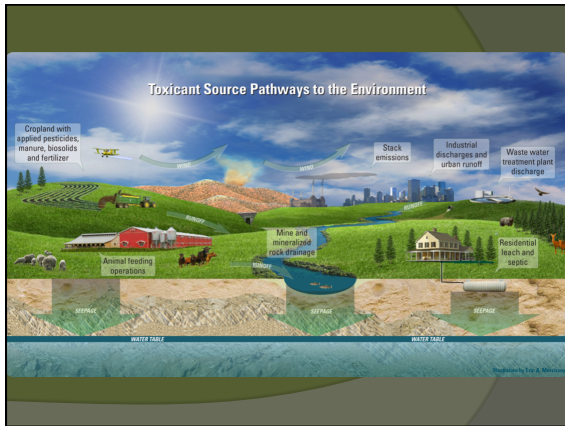


What is endocrine disruption?

Endocrine disruptors (ED) are endocrine active compounds causing specific effects on endocrine systems at several levels without relevant toxic actions.
(Matthiessen and Johnson, 2007)

Certain environmental compounds can interfere with the endocrine systems of wildlife and humans.

The source of these substances are surface waters. The substances are called ED, mainly originating from anthropogenic factors.
(Kloas and Lutz, 2006)



Endocrine Disruption's Association with Amphibian Declines

Endocrine Disrupters can have several effects on amphibians and their development.

One way is the ability to reverse the sex of a male to a female when the adult stage is reached. This scenario is not going to have as much of an impact on the individual, yet the population will slowly die-off from lack of suitable recruitment. (Hayes, T.B., 2002)

Another factor to consider with endocrine disruption is the disease coming from areas with high pesticide, herbicide and fungicide usage in close relation to streams. (Hayes, et. al. 2006.)

Both conditions are equally fatal to populations of multiple species of amphibians.

Where is the evidence?

Atrazine is the most commonly used herbicide in the world!

The Study(I):

N. Leopard Frog larvae (30 larvae/treatment; n=3) immersed in .1 ppb concentration of atrazine just after hatching until tail resorption was complete.

Retarded gonadal development in 36% and only 1 control.

(Hayes, T.B., 2002)



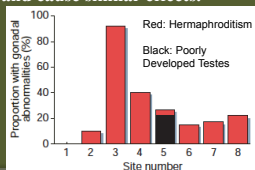
The Study (II):

Lithobates pipiens from 8 sites in a transect from Utah to Iowa.

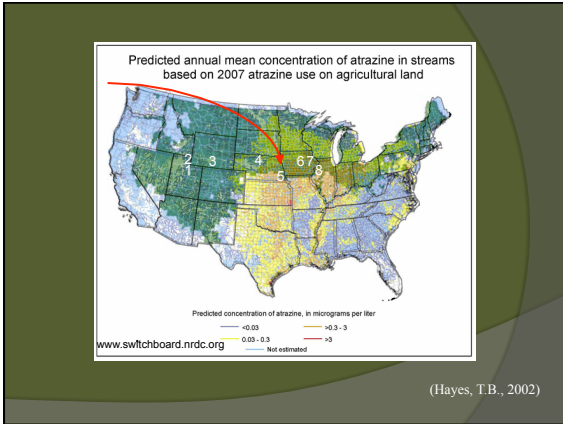
Results:

All sites with water-borne atrazine contamination >.2 ppb contained males with testicular oocytes.

Atrazine is responsible for effects of feminizing males in wild populations, even though other contaminants may be present and cause similar effects.



(Hayes, T.B., 2002)



Study of a Nine-Pesticide Mixture tested on *Lithobates pipiens*: York County, Nebraska
 (Hayes, et. al. 2006.)

Most studies are done using single pesticides and at low concentrations which are not used in the real applications as herbicides, pesticides, insecticides and fungicides are typically used together.

What was used?

<u>4 Herbicides</u>	<u>3 Insecticides</u>	<u>2 Fungicides</u>
Atrazine	Cyfluthrin	Metalaxyl
Metolachlor	Cyhalothrin	Propiconazole
Alachlor	Tebupirimphos	
Nicosulfuron		

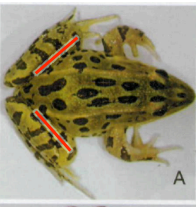
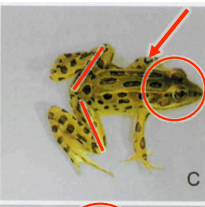


Amphibians typically reproduce and pass through critical hormone-regulated developmental stages. When performing these in habitats containing endocrine-disrupting chemicals, it may have significant effects on individuals and populations.

Generalized Gram-Negative Bacterial Infection

Pathogen was identified in both the control and exposed animal.

Only the pesticide-exposed frog showed signs of disease:

- * Head Tilt
- * Unilateral extensor muscle rigidity
- * Anisocoria
- * Intermittent recumbency due to a severe otitis interna and meningitis

Northern Leopard Frog: Gosner 46	
Control	Exposed
	
	

How does this affect overall survival?



L. pipiens = 3.3 cm SVL
Cricket = 2.1 cm long

L. pipiens = 3.2 cm SVL
Garter Snake = 67 cm long

Average Length of *L. pipiens* is 6.8 cm SVL

Both are gape limited predators.
Smaller animals are preferred for both.

(Hayes, et. al. 2006.)

Why this hypothesis is the most important...

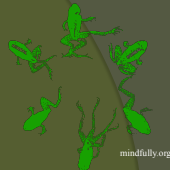
Atrazine contamination in water sources peaks with spring rains.

Spring rains also coincide with the breeding activity of most amphibians.

This pattern of application will soon lead to an increased impact on amphibian populations if something is not changed.



National Geographic

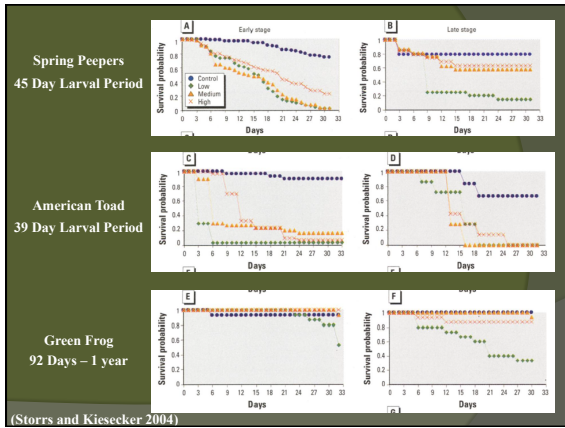


mindfully.org

**ATRAZINE:
LET'S GET IT
BANNED!**

savethefrogs.com

(Hayes, T.B., 2002)



References

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Questions?

http://www.youtube.com/watch?v=n1hZwLT_970

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