

'Estrogen' pairings can increase potency

Toxicologist John A. McLachlan and his coworkers made a startling observation 2 years ago: A pair of polychlorinated biphenyls (PCBs) delivered together had up to 20 times the ability to switch the sex of incubating turtles as either of these weak estrogen mimics had when delivered alone (SN: 10/8/94, p. 239).

Now, McLachlan and his coworkers at the Center for Bioenvironmental Research at Tulane and Xavier Universities in New Orleans note even more dramatic synergies among several ubiquitous pesticides. For instance, they had to use 160 times as much endosulfan or 1,600 times as much dieldrin alone to match the estrogenicity of the two combined, they report in the June 7 SCIENCE.

Chlordane offered the biggest surprise. While it exhibits no estrogenic activity on its own, this termite killer proved almost as potent as dieldrin or toxaphene in boosting the estrogenicity of endosulfan. Toxaphene is another weak mimic of estrogen, the primary female sex hormone.

Though dieldrin, toxaphene, and chlordane have long been banned in the United States, traces of all three persist in the environment. Endosulfan remains in widespread use. Steven F. Arnold, a coauthor of the study, says his team focused on these pesticides because of their presence in the eggs of a population of reproductively impaired alligators at Florida's Lake Apopka (SN: 1/8/94, p. 24).

Hormones regulate critical activities in the body by unlocking receptors on and in cells. Estrogen triggers various activities, depending on its timing and the receptor's location, thus making it difficult to evaluate the hormone's effects within a whole animal.

The Tulane-Xavier team therefore inserted a human estrogen receptor into yeast cells, which normally lack hormone receptors. Then they added a chemical response system that turns yellow when the receptor is activated, enabling them to quantify estrogenicity.

Describing the new findings as "quite interesting" and solid, Stephen H. Safe of Texas A&M University in College Station cautions that one should not conclude that all weak environmental estrogens will exhibit similar synergy or prove toxic in animals. However, he adds, "it's certainly worth looking at."

The new data also suggest it may be time "to resurrect" the idea of multiple hormone-binding sites on each estrogen receptor, says S. Stoney Simons Jr. of the National Institute of Diabetes and Digestive and Kidney Diseases in Bethesda, Md., in an accompanying commentary.

Indeed, McLachlan points out, the data suggest that two binding sites exist and that both "would have to be occupied for the synergy to occur." While it's unclear how the pairs of pollutants operate, he says they may act as partial keys that can unlock only one of the sites and only after the pollutants have merged.

— J. Raloff