

Endocrine disruptors start a medical revolution: From alligators to humans

January 7 2014, by Kara Feilich

Dr. Lou Guillette Jr. began studying the evolution of lizard reproduction more than 40 years ago. He never expected that reptiles would point him in the direction of a worldwide environmental challenge: endocrine disruption. Speaking at the Society for Integrative and Comparative Biology's annual meeting in Austin, Dr. Guillette explained how his basic research on animals has brought him and others to recognize the environmental challenges to human health.

Early studies of alligators led Dr. Guillette to realize that something in the environment was affecting their reproduction. Juvenile female alligators had malformed ovaries, while males had lower than average testosterone levels and a small penis. He and his colleagues discovered that the changes were caused by environmental contaminants, which were acting as endocrine disruptors.

The endocrine system is one of the body's most important internal [communication systems](#). It is how cells tell each other what to do to keep everything working correctly. Hormones are the messengers of the [endocrine system](#), running back and forth among cells carrying their instructions. Disrupting normal endocrine function can have serious repercussions for health.

According to Dr. Guillette, the way hormones create different effects in the body is like music. "Think about all of the ways you could play 'Twinkle Twinkle Little Star' and you could still understand that it is 'Twinkle Twinkle Little Star'. You could make the notes loud, or play

them softer. You could play them slower or faster...Each one of us is a little bit different. We each play 'Twinkle Twinkle Little Star' a little bit differently." As long as the body recognizes the message, the "music" played by its chemical messengers, it works correctly.

The idea of endocrine messages as music also describes the effect of [environmental contaminants](#) that act as endocrine disruptors. "If 'Twinkle Twinkle Little Star' is so loud that it no longer is music, it's noise, or if it's so soft that you can't hear it, now all of the sudden, that's not good." Contaminants can cause either of these situations, breaking down the harmony of the body's communication systems. If the body is overwhelmed with false messengers, or blocked from receiving its own messengers, it won't be able to function properly. If other chemicals interact with the body's own chemicals in unexpected ways, they confuse cells, and provide them with incorrect instructions.

How did researchers find these endocrine effects in alligators and other wildlife before humans? The alligators are what Dr. Guillette calls a "sentinel" species. At the top of the food chain, alligators accumulate contaminants faster than other animals. And the effects of those contaminants on alligators point researchers, like Guillette, to how they may affect people.

The National Institutes of Environmental Health Science lists over a thousand chemicals that appear to be endocrine disruptors, and Dr. Guillette and researchers around the world are only beginning to uncover the extent to which these endocrine disruptors affect human health. Pesticides, flame retardants, metals, even the nitrates in fertilizer can be endocrine disruptors. "Our bodies are actually being bombarded with thousands of chemicals every day. Some of those are natural products but many of them are compounds that we've introduced into the environment, and many of them are biologically active. It's not just one or two chemicals, but whole classes of compounds." Some like DDT are

restricted, but researchers are only starting to realize how other chemicals, like phthalates found in everything from nutritional supplements to children's toys, may be affecting [human health](#).

Dr. Guillette believes this new appreciation of how the environment—and not just genetics or germs—affects health is ushering in a revolution in medicine. "There's still a perception that somehow we're going to find a gene that cures cancer, or there's a gene for Alzheimer's; the reality is that what we're doing is we're messing with the language or music of genes. Environmental contaminants, or even other kinds of environmental factors—if you don't eat the right food, you have too much stress—all of those change the music. That alteration, of course, can lead to health or disease."

Provided by Society for Integrative & Comparative Biology

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