

Rachel's Environment & Health News

#750 - The Latest Hormone Science -- Part 1

August 21, 2002

Last week the NEW YORK TIMES took a slap at one of my favorite organizations, the Science and Environmental Health Network or SEHN (<http://www.sehn.org>). The TIMES accused SEHN of harboring beliefs far outside the mainstream of science: "[SEHN] gives much more weight than do most industry scientists and government regulators to theories that chemicals in the environment are disrupting the human endocrine system and contributing to a wide range of ailments." (NY TIMES Aug. 19, pg. C5.)

As president of the board of SEHN, I thought I should take this accusation seriously. It is true that SEHN supports the view that industrial chemicals in the environment can disrupt hormones and by this means are probably contributing to a wide range of human ailments. Is this view not generally held by the mainstream scientific community?

SEHN's position has been stated best by science director, Ted Schettler, a physician. Before he joined SEHN, Schettler, along with several co-authors published *GENERATIONS AT RISK: REPRODUCTIVE HEALTH AND THE ENVIRONMENT* (MIT Press, 1999) -- a 230-page review of medical and scientific data showing that some industrial chemicals in the environment (such as lead, mercury, cadmium, arsenic, manganese, chlorinated solvents, some pesticides, PCBs and dioxins) can and probably do interfere with the hormone systems of humans (and non-human animals), causing or exacerbating disease in some who are exposed.[1]

In 2000, Schettler and SEHN board member David Wallinga (also a physician) and other co-authors published a shorter book titled, *IN HARM'S WAY: TOXIC THREATS TO CHILD DEVELOPMENT*. That book concluded that "Neurodevelopmental disabilities are widespread, and chemical exposures are important and preventable contributors to these conditions." [2, pg. 117; and see RACHEL'S #712.] Is this conclusion warranted by the facts? It certainly seems so. Scientific studies of a single toxic element, lead, spanning the last 100 years provide ample justification for such a statement. (Notably, the hormone-disrupting characteristics of lead and about 75 other environmental chemicals are described in three recent technical books.[3])

Do "most industry scientists and government regulators" disagree with Ted Schettler and SEHN? Neither we nor the NEW YORK TIMES has any reliable information about what "most" scientists and regulators think about hormone-disruptors. I suspect the TIMES simply manufactured its conclusion out of thin air. (Unfortunately, it wouldn't be the first time the TIMES had done such a thing to belittle health dangers from industrial chemicals. See, for example, RACHEL'S #346 and #486.)

Still, the accusation against SEHN warrants a fresh look. I decided to investigate the current scientific status of the idea that chemicals can interfere with hormones. To do so, I chose one hefty scientific journal that often carries articles about the effects of environmental chemicals on wildlife and humans. Then I spent a grueling week reading every chemicals-and-health study in the last 24 monthly issues. The journal I chose is *ENVIRONMENTAL HEALTH PERSPECTIVES* (EHP), which is published by the federal government's National Institute of Environmental Health Sciences, a division of the National Institutes of Health. The editorial board of EHP is composed mainly of academic scientists but it also includes representatives from Dow Chemical Company, the Schering Plough pharmaceutical company, and the Chemical Industry Institute of Toxicology (CIIT). You can think of CIIT as the research arm of the American chemical industry.

Of course I didn't start off completely ignorant. I had been reporting on environmental hormone disruptors since 1991 (see RACHEL'S #263). But I have to tell you, I wasn't prepared for what I found. I'm going to summarize recent studies of hormone-disrupters published in EHP, but first some background on this problem:

In 1991, about two dozen scientists from half a dozen countries published a consensus document that became known as The Wingspread Statement. (See RACHEL'S #263.) It said in part,

"We are certain of the following:

"A large number of man-made chemicals that have been released into the environment, as well as a few natural ones, have the potential to disrupt the endocrine [hormone] system of animals, including humans. Among these are the persistent, bioaccumulative, organohalogen compounds that include some pesticides (fungicides, herbicides, and insecticides) and industrial chemicals, other synthetic products, and some metals.

"Many wildlife populations are already affected by these compounds. The impacts include thyroid dysfunction [impaired or abnormal functioning] in birds and fish; decreased fertility in birds, fish, shellfish, and mammals; decreased hatching success in birds, fish and turtles; gross birth deformities in birds, fish and turtles; metabolic abnormalities [impaired or abnormal use of energy, manufacture of tissue, or handling of resulting wastes] in birds, fish, and mammals; behavioral abnormalities in birds; demasculinization and feminization in male fish, birds, and mammals; defeminization and masculinization of female fish and birds; and compromised [impaired] immune systems in birds and mammals.

"The patterns of effects vary among species and among compounds. Four general points can nonetheless be made: (1) the chemicals of concern may have entirely different effects on the embryo, fetus, or perinatal [meaning "near the time of birth," from the 28th week of pregnancy through the first week of life, in humans] organism than on the adult; (2) the effects are most often manifested in offspring, not in the exposed parent; (3) the timing of exposure in the developing organism is crucial in determining its character and future potential; and (4) although critical exposure occurs during embryonic development [from conception through the end of the second month of pregnancy], obvious manifestations [effects] may not occur until maturity.

"Laboratory studies corroborate the abnormal sexual development observed in the field and provide biological mechanisms to explain the observations in wildlife.

"Humans have been affected by compounds of this nature, too. The effects of DES (diethylstilbesterol), a synthetic therapeutic agent, like many of the compounds mentioned are estrogenic [meaning they act like estrogen, female sex hormone]. Daughters born to mothers who took DES now suffer increased rates of clear cell adenocarcinoma [cancer], various genital tract abnormalities, abnormal pregnancies, and some changes in immune responses. Both sons and daughters exposed in utero [while in the uterus] experience congenital anomalies of their reproductive system and reduced fertility. The effects seen in in utero DES-exposed humans parallel those found in contaminated wildlife and laboratory animals, suggesting that humans may be at risk to those same environmental hazards as wildlife." The Wingspread Statement continued on, but those were the key points.

The main message of the Wingspread Statement -- that industrial chemicals can interfere with hormones and thus harm animals and humans -- wasn't totally new in 1991. Researchers in 1950 had demonstrated that the pesticide DDT could dramatically shrink the testicles of roosters, obviously interfering with their normal testosterone (male sex hormone).[4] In the early 1970s, researchers discovered to their horror that "occupational exposures to pesticides could diminish or destroy the fertility of workers." [EHP Vol. 108, No. 9 (September, 2000), pgs. 803-813.] In 1980, the term "environmental estrogens" was invented to describe industrial chemicals found in the environment that behaved like the female sex hormone, estrogen.[5]

What the 1991 Wingspread Statement did was shine a spotlight on

an unrecognized world-wide pattern of harm from endocrine-disrupting chemicals, mainly in wildlife, but also plausibly in humans. The following year Theo Colborn, who had convened the original Wingspread meeting, published a volume of scientific evidence supporting the Wingspread conclusions.[6] As time passed, these findings electrified the scientific community, persuading thousands of researchers to look for similar effects in wildlife, laboratory animals, and humans all over the world.

In 1995 Theo Colborn, J.P Myers and Dianne Dumanoski published *OUR STOLEN FUTURE*, a scientific treatise on hormones written like a mystery story to reach a wide audience. *OUR STOLEN FUTURE* awoke the environmental community and focused enormous media attention on this emerging problem. The web site <http://www.ourstolenfuture.org> is still the best single place to learn about the latest hormone-disruptor studies. Because it was scientifically solid yet easily readable by the general public, *OUR STOLEN FUTURE* drove the chemical industry into a frenzy of denial and retribution. They hired PR attack dogs aiming to destroy the reputations of Colborn, Myers and Dumanoski, and NY TIMES science writer Gina Kolata began barking and snarling with the best of them (see RACHEL'S #486).

Now, 11 years after the Wingspread Statement, are these ideas ridiculed, held in disrepute, or simply ignored by the scientists who publish in EHP? Has the scientific community moved beyond "endocrine disruptors" or is this problem still being taken seriously? By way of answers to these questions, here are a few general statements from EHP:

"Endocrine-disrupting chemicals are among the most complex environmental health threats known today. By mimicking natural hormones such as estrogen and testosterone, these chemicals can interact with the body's endocrine system and exert toxic effects that may lead to reproductive and developmental abnormalities or cancer." [EHP Vol. 109, No. 9 (September 2001), pg. A420.]

"The developing organism is exquisitely sensitive to alterations in hormone function. In the early embryonic state, the gonads of human males and females are morphologically [physically] identical. Sexual differentiation [turning a fetus into a boy or a girl] begins under hormonal influence during the fifth and sixth weeks of fetal development, and thus alteration of hormone function during this highly sensitive period can have profound, often debilitating, consequences. The balance of estrogens and androgens [male hormones] is critical for normal development, growth, and functioning of the reproductive system. Although it is especially important during development, this balance is important throughout life for preservation of normal feminine or masculine traits.

"A number of environmental chemicals have actions that mimic or alter the normal sex steroid hormones. The fetus is especially vulnerable because this is the period of time when organs develop. If the normal balance between estrogens and androgens is disrupted, the result may be feminization of males, masculinization of females, birth defects of the reproductive organs, reduced fertility, and alteration of the expression of normal feminine or masculine personality traits, probably including sexual preference." [7]

To be continued.

=====

[1] Ted Schettler, Gina Solomon, Maria Valenti, and Annette Huddle, *GENERATIONS AT RISK: REPRODUCTIVE HEALTH AND THE ENVIRONMENT* (Cambridge, Mass.: MIT Press, 1999). ISBN 0-262-19413-9.

[2] Ted Schettler, Jill Stein, Fay Reich, Maria Valenti, and David Wallinga, *IN HARM'S WAY: TOXIC THREATS TO CHILD*

DEVELOPMENT (Cambridge, Mass.: Greater Boston Physicians for Social Responsibility [GBPSR], May 2000). Available on the web at <http://www.igc.org/psr/ihwrept/ihwcomplete.pdf> or as a paper copy from GBPSR in Cambridge, Mass.; telephone 617-497-7440.

[3] See, for example, Lawrence H. Keith, editor, *ENVIRONMENTAL ENDOCRINE DISRUPTORS: A HANDBOOK OF PROPERTY DATA* (New York: Wiley, 1997; ISBN 0471191264). See also M. Metzler, editor, *ENDOCRINE DISRUPTORS; THE HANDBOOK OF ENVIRONMENTAL CHEMISTRY VOL. 3* (New York: Springer-Verlag, 2002; ISBN 3540422803); and Louis Guillette, Jr. and D. Andrew Crain, *ENVIRONMENTAL ENDOCRINE DISRUPTERS; AN EVOLUTIONARY PERSPECTIVE* (New York: Taylor & Francis, 2000; ISBN 1560325712).

[4] H. Burlington and V.F. Lindeman, "Effect of DDT on testes and secondary sex characteristics of white leghorn cockerels," *PROCEEDINGS OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE* Vol. 74 (1950), pgs. 48-51.

[5] Sheldon Krinsky, "An Epistemological Inquiry into the Endocrine Disruptor Thesis," *ANNALS OF THE NEW YORK ACADEMY OF SCIENCES* Vol. 948 (Dec., 2001), pgs. 130-142.

[6] Theo Colborn and Coralie Clement, editors, *CHEMICALLY-INDUCED ALTERATIONS IN SEXUAL AND FUNCTIONAL DEVELOPMENT: THE WILDLIFE/HUMAN CONNECTION* [Advances in Modern Environmental Toxicology Vol. XXI] (Princeton, N.J.: Princeton Scientific Publishing Co., 1992).

[7] EHP Vol. 110 Supplement 1 (February, 2002), pgs. 27