After 30 years of scientific detective work, a picture has emerged strongly suggesting that American-style industrialization is in fundamental conflict with living systems. Many common chemicals, used in bulk quantities are now known to interfere with the reproductive systems of wildlife and humans, causing reproductive failure, birth defects, immune system deficiencies, and cancers.[1] About 40 widely-used chemicals (pesticides, detergents, plasticizers and other important industrial building blocks) have now been identified with these characteristics.[2] However, scientists say the only way to discover all such chemicals is to test each of the 70,000 chemicals now in commercial use.[3] Such a broad-scale testing program would be unprecedented and seems politically, economically, and logistically impossible, given today's corporate milieu and mood. Without such a testing program, the withdrawal of these chemicals from commercial use cannot even reach the discussion stage. Thus the conflict between our industrial institutions and the health of living things seems irreconcilable without a fundamental shift in world view and in political relations.

It was 1972 when the federal National Institute of Environmental Health Sciences (NIEHS) formally began studying chemicals that interfere with the endocrine system of wildlife and humans. The endocrine system is a complex set of bodily organs and tissues whose actions are coordinated by chemical messengers called hormones, which control sexual reproduction, growth, development and behavior. Bears hibernate because of chemical signals from the endocrine system, and women menstruate under control of their endocrine systems. In the egg or the womb, males are made into males, and females into females, by endocrine hormone signals.

In the late 1960s, scientists began reporting disruptions of the endocrine system in birds --for example, the pesticide DDT was causing eggshell thinning, leading to reproductive failure.[4] The same year DDT was banned in the U.S. (1972), Dr. John A. McLachlan began a research program at NIEHS, examining chemicals that mimic hormones (chiefly estrogen, the main female sex hormone). McLachlan says even he didn't realize how many endocrine-disrupting chemicals were "out there" until 1979, when NIEHS sponsored the first scientific conference on the subject.[5] Even after that conference, the general public (including the environmental community) knew nothing of these problems.

In 1988, two government researchers in Canada --Tom Muir and Anne Sudar --packaged much of the available information on chemicals and health into a concise and alarming report on the Great Lakes. Their employer, Environment Canada --the Canadian equivalent of the U.S. Environmental Protection Agency (EPA) --refused to publish their report.[6] Subsequently, the Conservation Foundation in Washington, D.C. --a private organization with close ties to the U.S. government[7] --was asked to examine the Muir/Sudar report. In 1990, the Conservation Foundation published an expanded and toned-down version of the facts in GREAT LAKE'S GREAT LEGACY?, authored by Theodora E. Colborn[8] with an extensive bibliography of studies from the 1980s showing endocrine damage to wildlife, and, to a much lesser extent, humans.

In July of the following year Theo Colborn convened a conference attended by 21 scientists at the Wingspread Center in Racine, Wisconsin; that conference issued a consensus statement by the 21 scientists, saying, 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 system of animals, including humans... 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; feminization and masculinization of female fish and birds; and compromised [impaired] immune systems in birds and mammals."[9] (See REHW #263, #264.)

In 1992, Theo Colborn went on to summarize what is known about endocrine-disrupting chemicals in a technical book aimed at a scientific audience.[9] In 1993, she presented a summary in the prestigious journal, ENVIRONMENTAL HEALTH PERSPECTIVES, the official voice of the National Institute of Environmental Health Sciences (NIEHS).[13] That put the issue "on the map" in the U.S.

In 1992 and 1993, researchers in Denmark, England, the U.S. and elsewhere began connecting the dots among a wide range of studies that had shown various kinds of damage to the reproductive systems of men, including:

** increases in cancer of the testicles in many industrialized countries;[10]
** increased incidence of undescended testicles (cryptorchidism) in humans and in wildlife;[10]
** reduction in sperm count by 50% among men in many industrialized countries;[11]
** increased incidence of hypospadias -- a birth defect of the male genitalia.[10]

Furthermore, several studies in 1993 suggested that certain important problems of the female reproductive system --breast cancer and endometriosis --may also be linked to endocrine-disrupting chemicals.[12]

Endocrine-disrupting chemicals of industrial origin are now measurable in rain water, well water, rivers, lakes, and oceans, as well as in freshwater, oceanic and terrestrial food products. Effects of exposure to endocrine disrupters early in life are permanent and irreversible. Exposure of a woman at any time in her life prior to pregnancy can affect her offspring because these chemicals persist in the body.[13]

There seems to be no doubt that estrogen-mimicking chemicals are damaging wildlife worldwide. In certain cases, the damage is so severe that extinction is occurring; for example, pallid sturgeon in the Mississippi and Missouri rivers have not reproduced for at least 10 years; any members of the species seen today are 30 to 40 years old. For 15 years, scientists have been reporting that the gonads of the pallid sturgeon "aren't distinctly male or female any more."[14] Likewise, the Florida panther most likely will go extinct this decade or next, victim of undescended testicles and diminished sperm count. How different is the prospect for humans? The handwriting on the wall couldn't be more plain, yet the most knowledgeable among us are largely confined to talking to themselves.

The International Joint Commission (IJC) has outlined a regulatory program adequate to the task before us, but President Clinton has rejected it.[15] What is to be done? We can only ask questions. How can we modify the framework that prevents scientists from speaking out? How can we get private money out of politics, so we can elect public officials who are not beholden to corporate interests? How can we liberate the decision-makers within corporations from today's legal constraints, freeing them to consider the public health consequences of their business decisions? How can we induce the mass media -- particularly those that use the publicly-owned airwaves --to inform the public about the nature and importance of these chemical and political problems?

--Peter Montague

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Here is an incomplete list of chemicals known to disrupt the endocrine system:
2,4-D; 2,4,5-T; alachlor; amitrole; atrazine; metribuzin; nitrofen; trifluralin; benomyl; hexachlorobenzene; mancozeb; maneb; metiram-complex; tributyl tin; zinc; ziram; beta-HCH; carbaryl; chloridane; dicofol; dieldrin; DDT and metabolites; endosulfan; heptachlor and heptachlor epoxide; lindane (gamma-HCH); methyloxochlor; mirex; oxychlordane; parathion; synthetic pyrethroids; toxaphene; transnachlor; aldicarb; DBCP; cadmium; dioxin (2,3,7,8-TCDD); lead; mercury; PBBS; PCBs; pentachlorophenol (PCP); penta-to nonylphenols; phthalates; styrenes.

[3] For example, Ana M. Soto and others, "The Pesticides Endosulfan, Toxaphene, and Dieldrin Have Estrogenic Effects on Human Estrogen-Sensitive Cells," ENVIRONMENTAL HEALTH PERSPECTIVES Vol. 102, No. 4 (April 1994), pg. 380, says, "It should be noted that the estrogenic activity of chemicals cannot be deduced solely from their molecular structure..."


[7] For example, William Reilly was president of the Conservation Foundation before President Bush selected him to head U.S. EPA.

