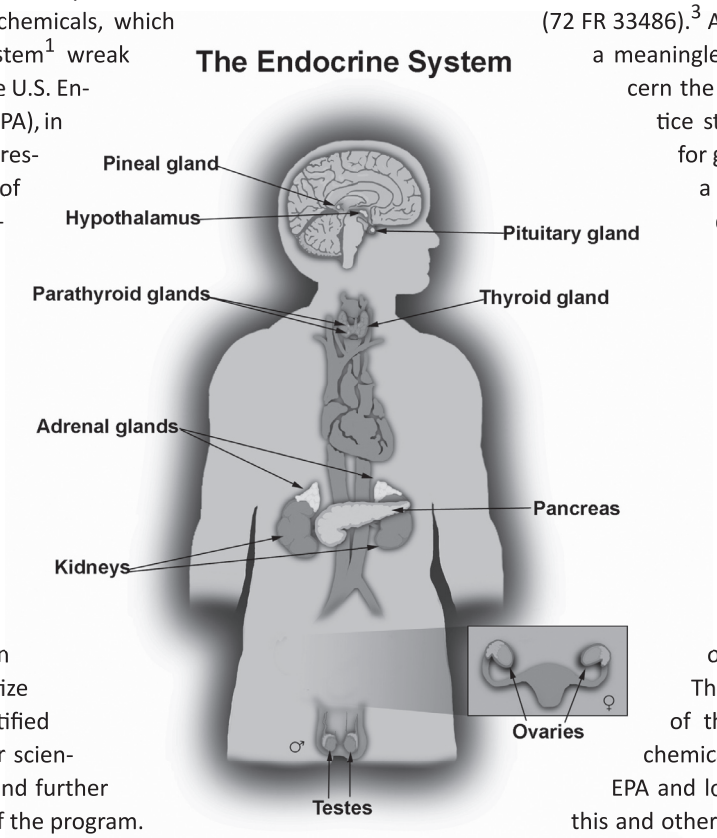
Pesticides That Disrupt Endocrine System Still Unregulated by EPA

EPA proposes regulatory review process for endocrine disrupting pesticides 11 years after mandated by Congress and may be over a decade behind schedule when program gets off the ground and sees results.

By Nichelle Harriott and Jay Feldman

Common household products –detergents, disinfectants, plastics, and pesticides– contain chemical ingredients that enter our bodies, disrupt hormones and cause adverse developmental, disease, and reproductive problems. Known as endocrine disruptors, these chemicals, which interact with the endocrine system[1] wreak havoc in humans and wildlife. The U.S. Environmental Protection Agency (EPA), in response to an 11 year-old Congressional mandate, published a list of 73 pesticides and related chemicals that it intends to review for endocrine disrupting effects, once it finalizes its standards for review. EPA's list of 73 pesticides selected for evaluation includes only 29 of the 56 pesticides that are defined as known or suspected endocrine disruptors by the European Union and *Our Stolen Future* author and The Endocrine Disruptor Exchange (TEDX) president, Theo Colborn, Ph.D. In effect, EPA has chosen to prioritize for review 44 pesticides not identified as endocrine disruptors by other scientific bodies, draining resources and further delaying the regulatory impact of the program.



The scientific evidence of the endocrine disrupting mechanism –which defies classical "dose-makes-the poison" toxicological theory with exquisitely low doses causing effects based on timing of exposure– spurred Congress to act in 1996 as a part of the *Food Quality Protection Act* (FQPA). The law required EPA to, within two years of passage, "develop a screening program, using appropriate validated test systems and other scientifically relevant information, to determine whether certain substances may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or such other endocrine effect as the Administrator may designate."

It is still not clear when EPA will meet its statutory duty under FQPA. EPA published in December 2007 a Federal Register notice (72 FR 70842)[2] announcing its draft policies and procedures for the Endocrine Disruptor Screening Program "that it is considering adopting." Prior to that, in June 2007, it published the list of 73 pesticides and inert (or undisclosed ingredients in pesticide products), entitled *Draft List of Initial Pesticide Active Ingredients and Pesticide Inerts to be Considered* in the Federal Register (72 FR 33486).[3] As if to send a signal that this was a meaningless gesture that should not concern the public, the agency in the FR notice stated, "Nothing in the approach for generating the initial list provides a basis to infer that by simply being on this list these chemicals are suspected to interfere with the endocrine systems of humans or other species."

Endocrine Disruption and Risk Assessment

Risk assessments justify use patterns for widely used pesticides based on assumptions about toxicity and exposure, which are truncated by the lack of data on endocrine disruption. The analyses are skewed in favor of the continued use of hazardous chemicals. Beyond Pesticides has urged EPA and local decision makers, because of this and other regulatory inadequacies, to embrace the precautionary principle, and promote the avoidance of toxic pesticide use in favor of non-chemical practices.

What is the Endocrine System?

The endocrine system consists of a set of glands, such as the thyroid, gonads, adrenal and pituitary glands, and the hormones they produce, such as thyroxine, estrogen, testosterone and adrenaline, which help guide the development, growth, reproduction, and behavior of animals, including human beings. Hormones are signaling molecules, which travel through the bloodstream and elicit responses in other parts of the body. Endocrine systems are found in most animals, including mammals, non-mammalian vertebrates (such as birds, fish, amphibians, and reptiles), and invertebrates (such as snails and insects).[4]

Pesticides and Related Chemicals Recognized by the Scientific Community as Known or Suspected Endocrine Disruptors

Chemical	Type	Listed by	EPA to Review
2,4-D	Herbicide	European Union	Yes
Acephate	Insecticide	European Union	Yes
Acetochlor	Herbicide	Colborn, European Union	No
Alachlor	Herbicide	Colborn, European Union	No
Aldicarb	Insecticide	Colborn, European Union	Yes
Allethrin	Insecticide	Colborn, European Union	Yes
Amitrole	Herbicide	Colborn, European Union	No
Atrazine	Herbicide	European Union	Yes
Bifenthrin	Insecticide	Colborn, European Union	Yes
Butyl benzyl phthalate	Inert	Colborn	Yes
Carbaryl	Insecticide	Colborn, European Union	Yes
Carbofuran	Insecticide	European Union	Yes
Chlorpyrifos	Insecticide	Colborn	Yes
Clofentezine	Insecticide	Colborn	No
Cypermethrin	Insecticide	Colborn	Yes
Diazinon	Insecticide	Colborn, European Union	Yes
Dicofol	Insecticide	Colborn, European Union	Yes
Diethyl phthalate	Inert	Colborn, European Union	Yes
Dimethoate	Insecticide	European Union	Yes
Diuron	Herbicide	European Union	No
Endosulfan	Insecticide	Colborn, European Union	Yes
Fenarimol	Fungicide	Colborn	No
Fenbuconazole	Fungicide	Colborn	No
Fenitrothion	Insecticide	Colborn, European Union	No
Fenvalerate	Insecticide	Colborn	Yes
Fipronil	Insecticide	Colborn	No
Hexachlorobenzene	Insecticide	European Union	No
Iprodione	Fungicide	Colborn, European Union	Yes
Lamda-cyhalothrin	Insecticide	Colborn, European Union	No
Lindane	Insecticide, Rodenticide	Colborn, European Union	No
Linuron	Herbicide	Colborn	Yes
Malathion	Insecticide	Colborn, European Union	Yes
Mancozeb	Fungicide	Colborn, European Union	No
Maneb	Fungicide	Colborn, European Union	No
Methomyl	Insecticide	Colborn, European Union	Yes
Methyl bromide	Insecticide	European Union	No
Methyl parathion	Insecticide	European Union,	Yes
Metribuzin	Herbicide	European Union	Yes
Pendimethalin	Herbicide	Colborn	No
Pentachloronitrobenzene (pcnb)	Fungicide	Colborn	No
Pentachlorophenol (pcp)	Wood Preservative, Microbiocide	Colborn, European Union	No
Permethrin	Insecticide	Colborn, European Union	Yes
Piperonyl butoxide (pbo)	Insecticide (synergist)	European Union	Yes
Prodiamine	Herbicide	Colborn	No
Propanil	Herbicide	European Union	No
Pyrimethanil	Fungicide	Colborn	No
Resmethrin	Insecticide	European Union	Yes
Simazine	Herbicide	European Union,	Yes
Sumithrin	Insecticide	Colborn, European Union	No
Thiazopyr	Herbicide	Colborn	No
Thiram	Fungicide	Colborn, European Union	No
Triadimefon	Fungicide	Colborn, European Union	Yes
Triadimenol	Fungicide	Colborn, European Union	No
Trifluralin	Herbicide	Colborn, European Union	Yes
Vinclozolin	Fungicide	Colborn, European Union	No
Ziram	Fungicide	Colborn, European Union	No

EPA has listed an additional 44 pesticides for review that have not been identified by the scientific community as endocrine disruptors.

Why the concern about endocrine disruptors?

Exposure to endocrine disrupting chemicals may occur within the womb, at the workplace, at schools, home or from the ingestion of chemical residues in food and water. According to Dr. Colborn, endocrine-disrupting chemicals have been reported in semen, the ovarian follicle, the womb environment, and in breast milk at elevated concentrations[5], and have also been implicated in studies of marine mammals, which show increased sterility, growth retardation, perturbation of immunologic function, and reproductive abnormalities.[6]

What are endocrine disruptors?

Endocrine disruptors function by: (i) Mimicking the action of a naturally-produced hormone, such as estrogen or testosterone, and thereby setting off similar chemical reactions in the body; (ii) Blocking the receptors in cells receiving the hormones (hormone receptors) thereby preventing the action of normal hormones; or (iii) Affecting the synthesis, transport, metabolism and excretion of hormones, thus altering the concentrations of natural hormones. [4]

Environmental effects

Growth retardation, sex organ malformation, feminization of males and masculinization of females , and decreased fertility; Hermaphroditic deformities in frogs, pseudo-hermaphrodite polar bears with penis-like stumps, panthers with atrophied testicles, and intersex fish in the Potomac have all been documented; Reproductive abnormalities observed in mammals, birds, reptiles, fish, and molluscs;[6] Amphibians exhibit severe malformations in almost every species; Atrazine, one of the most abundantly applied herbicides in the U.S., chemically castrates and feminizes exposed male amphibian larvae and also affects larval development and growth;[7] S-methoprene, a growth regulator used for mosquito control in ponds, shown to alter early frog embryo development;[8] Distorted sex organ development and function in alligators at Lake Apopka, Florida linked to a DDT-related organochlorine, dicofol. [4,9]

Widespread antimicrobial use. Antibactericals, used in a range of household and personal care products including liquid soaps, detergents and wipes, contain ingredients like triclosan and its chemical cousin triclocarban, which are now found in large quantities in waterways across the U.S. Triclosan has been found to alter thyroid function in frogs,[10] while triclocarban is observed to enhance sex hormones in rats and in human cells.[11]

Health Effects

Reproductive health. Chemical disruption of sex hormones, since connecting DES (diethylstilbestrol) use in mothers in the 1970's to cervico-vaginal cancer in their daughters[12] has since been tenuously associated with adverse reproductive outcomes, including birth defects, neurobehavioral developmental disturbances, leukemia in offspring and testicular cancer.[12] Pesticide families associated with reproductive effects include organochlorines, organophosphates and synthetic pyrethroids, whose effects have also been linked to prenatal exposure.[12-14] Reproductive specialists attribute a worldwide sperm count decline by approximately 50% since the1930s to exposures to high concentrations of estrogens or estrogen-like substances during embryonic, fetal, and early postnatal development.[5] Higher levels of organochlorines, including DDT metabolites, are found in fat samples of males with undescended testes.[15] The onset of puberty in girls, shifting the mean from 11.2 years to 8.87 years for African Americans and 9.96 years for Caucasian girls,[16] is linked to chemical exposure that stimulates sex hormones.[12]

Neurodevelopment. Pesticides affecting estrogenic and androgenic hormones (testosterone) during development can adversely affect neurodevelopment.[12-17] The thyroid hormone system, regulating a number of biological processes in the body and essential for proper neuronal proliferation, cell migration and differentiation in the brain,[18] is impacted by environmental agents.[19] Scientists believe that many neurological disorders observed in children, such as ADHD (Attention Deficit Hyperactivity Disorder) and autism, may be related to the prenatal chemical disruption of the thyroid system.[17-19] Organophosphates and synthetic pyrethroids are believed to alter thyroid function,[12] interfere with brain development and cause deficits in cognitive functions in the developing fetus.[18] Other effects include physical and mental retardation, alterations of the cardiovascular system and musculoskeletal defects, alterations of the menstrual cycle, obesity, and failure to develop secondary sex characteristics.[12]

Inert Ingredients

Inert ingredients pose serious concerns, not only because the identity of these chemicals are withheld from product label information, but also because the effects of these "secret" ingredients on human and environmental health have been underplayed, despite many now being recognized as endocrine disruptors.[9] Phthalates, widely found in pesticide formulations as inert ingredients,[19] are found in 75% of urine samples from normal men in a Centers for Disease Control (CDC) study.[16]Three types of phthalates; diethylhexyl phthalate, di(n-octyl) phthalate, and di(n-hexyl) phthalate, have been found to interfere with the thyroid system, as well as reducing testosterone synthesis[20] which then leads to a host of male developmental and reproductive disorders, such as decreased sperm quality, cryptorchidism (the absence of the scrotum) and hypospadias (defect of the urethra).[16,19]

Conclusion

In her book, *Our Stolen Future*, Dr. Colborn states that the decline of animal species can no longer be simply explained by habitat destruction and human disturbance, but also by reproductive failures within populations[9] brought on by the influence of endocrine disrupting chemicals. These chemicals, many of them used as pesticides in food production and homes, are leaving a devastating legacy.

A fully cited version of this article, as well as other information on endocrine disruptors, is available on the Beyond Pesticides website, www.beyondpesticides.org/infoservices/pesticidesandyou.

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