Rachel's Environment & Health News
#372 - PCBs Diminish Penis Size
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Boys in Taiwan exposed to PCBs while in their mothers' womb develop smaller penises as they mature, compared to normal boys in Taiwan, according to a brief article this month in SCIENTIFIC AMERICAN.[1] PCBs (polychlorinated biphenyls) are a group of industrial chemicals manufactured and released into the environment in megaton quantities by Monsanto and its licensees between 1929 and 1976.[2]

The finding of small penises among PCB-exposed human males tends to confirm that humans and wildlife are affected similarly by exposure to "endocrine-disrupting chemicals" such as PCBs, dioxin, DDT, and dozens of others. (See RHWN #249, #263, #264, #323, #327, #334, #337, #364, #365.) The endocrine system, in wildlife and humans, is a complex set of bodily organs and tissues whose activities are coordinated by chemical messengers, called hormones, that control growth, development and behavior. In recent years, evidence has accumulated that several dozen pesticides and other industrial chemicals mimic, or interfere with, hormones and thus disrupt the endrocine system. In both wildlife and humans, it is the reproductive system that seems most prone to disruption by hormone-like industrial pollutants.

SCIENCE NEWS reported this month that male alligators exposed to pesticides in Florida are having difficulty reproducing, partly because their penises are not developing to normal size.[3] SCIENCE NEWS presented evidence from several sources that males of many wildlife species (birds, fish, amphibians, and mammals) are being "feminized" by exposure to low levels of pesticides and other industrial chemicals that have been released into the environment in huge quantities since World War II.

The boys in Taiwan were born to mothers who unwittingly consumed PCB- contaminated rice oil during a 10-month period in 1979. As many as 2000 people consumed the contaminated oil. The children consumed no contaminated oil themselves; they were exposed before birth to PCBs that were carried by their mothers' blood and crossed the placenta; they may have also been exposed shortly after birth by drinking their mothers' milk. The rice oil contained 100 parts per million (ppm) PCBs and 0.1 ppm PCDFs [polychlorinated dibenzofurans, a potent dioxin-like poison].[4] A new mother in the U.S. today has an average of one ppm PCBs in her breast milk.

The children in Taiwan have been observed medically for many years. They are known as the "yucheng" (or "oil disease") children. A similar PCB contamination event ("yusho") occurred in Japan in 1968.

When 115 yucheng children were examined in 1985 they were less developed than a control group of children on 32 of 33 different measures. They were delayed, compared to controls, in the age at which they performed tasks such as saying phrases and sentences, turning pages, carrying out requests, pointing to body parts, holding pencils, and catching a ball.

The yucheng children also had a variety of physical defects at birth, including dark colored heads, faces and genitals, and abnormal nails that were often dark and ridged, split, or folded.[5]

These children provided the first direct evidence that PCBs are teratogenic [birth-defect-producing] in humans. Since then, other studies have shown that American children with "normal" levels of PCBs in their blood show slight physical, mental and emotional retardation.

In North Carolina, 912 infants have been followed from birth. Their mothers had no unusual PCB exposures but, like all Americans, they carry PCBs in their body tissues. Among 866 North Carolina infants tested, higher PCBs in mother's milk was correlated with hypotonicity [loss of muscle tone] and abnormally weak reflexes. Subsequent studies of 802 of the North Carolina children at ages 6 months and 12 months revealed those with higher levels of PCBs had poorer performance on tests requiring fine motor coordination.

Researchers reviewing the history of these children conclude, "There is thus consistent evidence that prenatal exposure to levels of PCBs commonly encountered in the U.S. produces detectable effects on motor maturation and some evidence of impaired infant learning."[6] In North Carolina, about 5% of the children have so far shown measurable effects related to PCB exposure, and in a Michigan study of children whose mothers ate fish from Lake Michigan (almost all of which are contaminated with PCBs), somewhat more than 5% of the children are showing effects.

At age 4, children in the Michigan group with higher PCBs levels weighed 10% (4 pounds) less than children with lower PCB levels. The effect was particularly significant in girls. In addition, the Michigan children were ranked according to an "activity" index, and higher PCB levels were correlated with children who were unusually "quiet and inactive." These effects on growth and behavior were specifically correlated with exposure to PCBs before birth and not with exposure after birth. This leads researchers to conclude that PCBs attack the central nervous system more successfully during its earlier developmental stages.[7]

The information from Taiwan about male genital development tends to confirm that PCB exposure in the womb has effects different from, and more powerful than, those caused by PCB exposure in later life.

The same seems to be true in wildlife as well. Alligator eggs exposed to DDT or a related pesticide, dicofol, produce male alligators with abnormal sex hormones (estrogen and testosterone) in their blood, leading to growth of penises one-third to one- half normal size, and subsequent reproductive failure.

The Florida panther, an endangered species, is also failing to reproduce itself. There are only 30 to 50 panthers remaining, and the reason for the decline has been a mystery. Now researchers have reported that between 1985 and 1990, 67 percent of male panthers were born with one or more undescended testicles, a condition known as cryptorchidism. In England and the U.S., cryptorchidism has more than doubled in men during the last four decades.[8] Furthermore, some Florida panthers are sterile and others produce abnormal or deformed sperm. It was reported last year that sperm count in men in industrialized countries has dropped 50% during the past 50 years.[9]

Two years ago, researchers at University of Wisconsin reported that low prenatal [before birth] exposures to dioxin feminized the behavior of male rats during adulthood, and sharply reduced their production of sperm.[10] "Indeed," says Janet Raloff in SCIENCE NEWS, "the researchers concluded, the developing male reproductive system appears to be more sensitive to the effects of this hormone-like toxicant [dioxin] than any other organ or organ-system studied."[3]

The ability of industrial chemicals to damage the reproductive systems of wildlife has been observed since the 1950s when DDT was linked to eggshell thinning in many bird species,[11] but humans have been slow to get the message. Petrochemical corporations and agricultural giants continually dump billions of pounds of endocrine-disrupting toxins into the environment each year. Government goes along.

Scientists continue to study birds, uncovering new evidence of reproductive damage. Dr. Michael Fry at University of California, Davis, has been studying Western gulls on Santa Barbara Island, where in recent years he has begun to observe "lesbian gulls," meaning female-female pairing. He attributes this behavior partly to male gulls' growing indifference to sex. Examination reveals that the male gulls have feminized sex organs and have been "chemically castrated" by DDT and other environmental pollutants, Fry says.

Perhaps the new information about small penises in alligators and humans will finally get the attention of someone high up in Washington.

--Peter Montague

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[1] Marguerite Holloway, "Dioxin Indictment," SCIENTIFIC AMERICAN Vol. 270 (January 1994), pg. 25.

[2] Kristin Bryan Thomas and Theo Colborn, "Organo-chlorine Endocrine Disruptors in Human Tissue," in 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). pgs. 342-343.

[3] Janet Raloff, "The Gender Benders," SCIENCE NEWS Vol. 145 (January 8, 1994), pgs. 24-27. And see J. Raloff, "Perinatal dioxin feminizes male rats," SCIENCE NEWS Vol. 141 (May 30, 1992), pg. 359, and Janet Raloff, "EcoCancers," SCIENCE NEWS Vol. 144 (July 3, 1993), pgs. 10-13. See also: Bette Hileman, "The Great Lakes Cleanup Effort," C&EN [CHEMICAL & ENGINEERING NEWS] February 8, 1988, pgs. 22-39; and: Bette Hileman, "Concerns Broaden over Chlorine and Chlorinated Hydrocarbons," C&EN [CHEMICAL & ENGINEERING NEWS] April 19, 1993, pgs. 11-20.

[4] Walter J. Rogan and others, "Congenital Poisoning by Polychlorinated Biphenyls and Their Contaminants in Taiwan," SCIENCE Vol. 241 (July 15, 1988), pgs. 334-336.

[5] Gina Kolata, "PCB Exposure Linked to Birth Defects in Taiwan," NEW YORK TIMES August 2, 1988, pg. C3.

[6] Hugh A. Tilson and others, "Polychlorinated Biphenyls and the Developing Nervous System: Cross-Species Comparisons," NEUROTOXICOLOGY AND TERATOLOGY Vol. 12 (1990), pgs. 239-248.

[7] Joseph L. Jacobson and others, "Effects of Exposure to PCBs and Related Compounds on Growth and Activity in Children," NEUROTOXICOLOGY AND TERATOLOGY Vol. 12 (1990), pgs. 319-326.

[8] A. Giwercman and N.E. Skakkebaek, "The human testis--an organ at risk?" INTERNATIONAL JOURNAL OF ANDROLOGY Vol. 15 (1992), pgs. 373-375.

[9] Elisabeth Carlsen and others, "Evidence for decreasing quality of semen during past 50 years," BRITISH MEDICAL JOURNAL Vol. 305 (1992), pgs. 609-613.

[10] Thomas A. Mably and others, "IN UTERO and Lactational Exposure of Male Rats to 2,3,7,8-Tetrachlorodibenzo-P-dioxin. 1. Effects on Androgenic Status." TOXICOLOGY AND APPLIED PHARMACOLOGY Vol. 114 (May, 1992), pgs. 97-107. And: Thomas A. Mably and others, "IN UTERO and Lactational Exposure of Male Rats to 2,3,7,8-Tetrachlorodibenzo-P- dioxin. 2. Effects on Sexual Behavior and the Regulation of Luteinizing Hormone Secretion in Adulthood." TOXICOLOGY AND APPLIED PHARMACOLOGY Vol. 114 (May, 1992), pgs. 108-117. And: Thomas A. Mably and others, "IN UTERO and Lactational Exposure of Male Rats to 2,3,7,8- Tetrachlorodibenzo-P-dioxin. 3. Effects on Spermatogenesis and Reproductive Capability." TOXICOLOGY AND APPLIED PHARMACOLOGY Vol. 114 (May, 1992), pgs. 118-126.

[11] For example, see Robert Risebrough and Virginia Brodine, "More Letters in the Wind," in Sheldon Novick and Dorothy Cottrell, editors, OUR WORLD IN PERIL: AN ENVIRONMENT REVIEW (Greenwich, Conn.: Fawcett, 1971), pgs. 243-255.

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