An international group of scientists and physicians— including U.S. government scientists—issued a consensus statement May 30, 1996, expressing great concern about the effects of hormone-disrupting chemicals on the brain and central nervous system. The new statement, resulting from a workshop Nov. 5-10, 1995 at Erice, Italy. Therefore, we will refer to this as the Erice Statement.[1]

Hormones are chemical messengers that travel in the blood stream, turning on and off critical bodily functions to maintain health and well being. Hormones control growth, development, and behavior in birds, fish, reptiles, amphibians, and mammals, including humans. In humans, 100 different hormones have been identified. Taken together, the tissues and organs that produce, and respond to, hormones are called the endocrine system. In 1991, an international group of 23 scientists issued a consensus statement, expressing great concern that many synthetic (human-created) industrial chemicals can interfere with hormones in wildlife and humans. (See REHW #263, #264). The 1991 statement focused on the ability of industrial chemicals to interfere with sexual development and behavior in wildlife and humans. The Erice Statement issued last month focuses attention on industrial chemicals that can interfere with the development of the brain and other parts of the central nervous system. The statement is not easy reading, but it is important, so we present it verbatim.

The Erice Statement begins with a paragraph labeled "background," which says, in part:

Research since 1991 has reinforced concerns over the scope of the problems posed to human health and ecological systems by endocrine- disrupting [hormone-disrupting] chemicals. New evidence is especially worrisome because it underscores the exquisite sensitivity of the developing nervous system to chemical perturbations [disturbances] that result in functional abnormalities. Moreover, the consequences of these perturbations depend upon the stage of development during which exposure occurs and are expressed in different ways at different times in life, from birth through to advanced age. This work session was convened because of the growing concern that failure to confront the problem could have major economic and societal implications.

CONSENSUS STATEMENT

The following consensus was reached by participants at the [Erice] workshop.

1. We are certain of the following:

** Endocrine-disrupting chemicals can undermine neurological and behavioral development and subsequent potential of individuals exposed in the womb or, in fish, amphibians, reptiles, and birds, the egg. This loss of potential in humans and wildlife is expressed as behavioral and physical abnormalities. It may be expressed as reduced intellectual capacity and social adaptability, as impaired responsiveness to environmental demands, or in a variety of other functional guises. Widespread loss of this in nature can change the character of human societies or destabilize wildlife populations. Because profound economic and social consequences emerge from small shifts in functional potential at the population level, it is imperative to monitor levels of contaminants in humans, animals, and the environment that are associated with hormone-disrupting chemicals and reduce their production and release.

** Because the endocrine system is sensitive to perturbation, it is a likely target for disturbance. In contrast to natural hormones found in animals and plants, some of the components and by-products of many manufactured organic compounds that interfere with the endocrine system are persistent and undergo biomagnification in the food web, which makes them of greater concern as endocrine disruptors.

** Man-made endocrine-disrupting chemicals range across all continents and oceans. They are found in native populations from the Arctic to the tropics, and, because of their persistence in the body, can be passed from generation to generation. The seriousness of the problems is exacerbated by the extremely low levels of hormones produced naturally by the endocrine system which are needed to modulate [change] and induce [cause] appropriate responses. In contrast, many endocrine disrupting contaminants, even if less potent than the natural products, are presented in living tissue at concentrations millions of times higher than the natural hormones. Wildlife, laboratory animals, and humans exhibit adverse health effects at contemporary environmental concentrations of man-made chemicals that act as endocrine disruptors. New technology has revealed that some man-made chemicals are present in tissue at concentrations previously not possible to measure with conventional analytical methods, but at concentrations which are biologically active.

** Gestational exposure to persistent man-made chemicals reflects the lifetime of exposure of females before they become pregnant. [Gestation is the period of development, from conception through birth; in the case of eggs, it is the incubation period.] Hence, the transfer of contaminants to the developing embryo and fetus during pregnancy and to the newborn during lactation is not simply a function of recent maternal exposure. For some egg-laying species, the body-burden of the females just prior to ovulation [egg production] is the most critical period. For mammals, exposure to endocrine disruptors occurs during all of prenatal and early postnatal development because they are stored in the mother.

** The developing brain exhibits specific and often narrow windows during which exposure to endocrine disruptors can produce permanent changes in its structure and function. The timing of exposure is crucial during early developmental stages, particularly during fetal development when a fixed sequence of structural change is occurring and before protective mechanisms have developed. A variety of chemical challenges [exposures] in humans and animals early in life can lead to profound and irreversible abnormalities in brain development at exposure levels that do not produce permanent effects in adults.

** Thyroid hormones are essential for normal brain functions throughout life. Interference with thyroid hormone function during development leads to abnormalities in brain and behavioral development. The eventual results of moderate to severe alterations of thyroid hormone concentrations, particularly during fetal life, are motor dysfunction of varying severity including cerebral palsy, mental retardation, learning disability, attention deficit hyperactivity disorder, hydrocephalus, seizures and other permanent neurological abnormalities. Similarly, exposure to man-made chemicals during early development can impair motor function [ability to move], spatial perception, learning, memory, auditory development, fine motor coordination [for example, coordinating movement of the hands and eyes], balance, and attentional processes; in severe cases, mental retardation may result.

** Sexual development of the brain is under the influence of estrogenic (female) and androgenic (male) hormones. Not all endocrine disruptors are estrogenic or anti-estrogenic. For example, new data reveal that DDE, a breakdown product of DDT, found in almost all living tissue, is an anti-androgen in mammals. Man-made chemicals that interfere with sex hormones have the potential to disturb normal brain sexual development. Wildlife studies of gulls, terns, fishes, whales, porpoises, alligators and turtles link environmental contaminants with disturbances in sex hormone production and/or action. These effects have been associated with exposure to sewage and industrial effluents, pesticides, ambient ocean and freshwater contamination, and the aquatic food web.

** Commonalities across species in the hormonal mechanisms controlling brain development and function mean that adverse effects observed in wildlife and in laboratory animals may also
occur in humans, although specific effects may differ from species to species. Most important, the same man-made chemicals that have shown these effects in mechanistic studies in laboratory animals also have a high exposure potential for humans.

**The full range of substances interfering with natural endocrine modulation of neural and behavioral development cannot be entirely defined at present. However, compounds shown to have endocrine effects include dioxins, PCBs, phenolics, phthalates, and many pesticides. Any compounds mimicking or antagonizing actions of, or altering levels of, neurotransmitters, hormones, and growth factors in the developing brain are potentially in this group.**

[The Erice Statement continues; we will present the remainder in a future issue of REHW.]

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)

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Descriptor terms: hormones; endocrine disrupters; brain; central nervous system; erice statement; wildlife; human health; thyroid; cerebral palsy; mental retardation; learning disability; attention deficit hyperactivity disorder; hydrocephalus; seizures; sexual development; estrogen; androgen; sewage; pesticides; PCBs; phenolics; phthalates;