Several new studies have implicated chlorinated chemicals in human disease, including breast cancer and tooth decay. Chlorine chemistry is clearly the premier example of humans adopting a new technology without thinking about the consequences.

**BREAST CANCER**

A recent study in Denmark reveals a relationship between breast cancer and the chlorinated pesticide dieldrin.[1] The prospective study examined blood taken in 1976 from 7712 women enrolled in the Copenhagen City Heart Study. In the following 17 years, 268 of the women developed breast cancer.

The blood samples drawn in 1976 were analyzed in 1993 for 46 chlorinated chemicals, including 28 individual PCBs [polychlorinated biphenyls], and 18 other chlorinated compounds such as DDT, mirex, aldrin, dieldrin and others.[2] Of the compounds studied, only dieldrin was significantly elevated in the blood of women who developed breast cancer. Beta-hexachlorocyclohexane (beta-HCH) was also elevated in women with breast cancer, compared to those without breast cancer, but the finding was not statistically significant.

In Denmark, about 14% of all women (one in seven) develop breast cancer, and the incidence of the disease has more than doubled in the past 30 years.

Most of the identified "risk factors" for breast cancer indicate that estrogen (female sex hormone) in a woman's blood plays an important role in the disease. The major known "risk factors" for breast cancer are early menarche (early age when the period begins), late menopause, not having any children, late conception of the first child, and hormone-replacement treatment after menopause. All of these factors tend to increase a woman's lifetime exposure to estrogens circulating in the blood.

The Copenhagen study found that the risk of breast cancer was twice as high in women with the highest concentrations of dieldrin in their blood serum, compared to women with the lowest concentrations. Furthermore, a significant dose-response relationship was evident -- the more dieldrin in the blood, the greater the chance that breast cancer would develop.

Some previous studies have implicated certain organochlorines in breast cancer, while other studies have shown no such relationship. (See REHW #571, #572, #573, #574, #575.)

The authors of the Copenhagen study say theirs is the first to properly compare blood levels of organochlorine compounds because they adjusted completely for varying levels of serum in the blood of each individual. They conclude that, "These findings support the hypothesis that exposure to xeno-oestrogens may increase the risk of breast cancer." Xeno-oestrogens are industrial chemicals (such as pesticides) that can mimic estrogen in the human body.

The use of dieldrin in Denmark and in the U.S. was banned about 20 years ago but, in the industrialized world, nearly everyone's body still contains small amounts of stored dieldrin, along with several hundred other industrial poisons, many of them chlorinated.

**DIOXIN**

For several years, U.S. and European health authorities have been hinting that the general public is being exposed to levels of dioxin that are probably causing harm in sensitive people. (See REHW #390, #391, #636.) Now the federal Agency for Toxic Substances and Disease Registry (ATSDR) has confirmed the bad news.

The term "dioxin" encompasses a family of 219 different toxic chlorinated chemicals, all with similar characteristics but different potencies. Because some dioxins are more toxic than others, scientists have established a way of comparing the toxicities and the quantities of various mixtures of dioxins. The technique is called TEQ, or toxic equivalents. The TEQ system takes into account the variations in toxicity, expressing toxicity in terms of the most toxic dioxin, which is TCDD, or 2,3,7,8-tetrachlorodibenzo-p- dioxin.[3]

Dioxin is a highly toxic, unwanted byproduct of many industrial processes, including incineration of municipal, medical and hazardous wastes; metal smelting; the burning of fossil fuels; the manufacture of many pesticides and other chemicals. (See REHW #636.) We are all exposed to dioxin through our diets, mainly by eating fish, meat, and milk products. Vegetarians get much less than the average, but they do not get zero because dioxin falls out of the air onto vegetation.

Last December, the federal Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta published the long-awaited final report, TOXICOLOGICAL PROFILE FOR CHLORINATED DIBENZO-P-DIOXINS.[4] The report had been circulating in draft form since 1991. In the final report, ATSDR establishes a Minimum Risk Level (MRL) for chronic (long-term) exposure to dioxin. An MRL is the amount of total dioxins (expressed as TEQs) that ATSDR believes people can take in day after day without suffering adverse health effects.

ATSDR's official MRL for chronic (long-term) exposure to dioxin is one picogram of dioxin TEQ per kilogram of body weight per day.[4,pg.264] The new ATSDR report says that the average exposure of U.S. citizens is currently three to six times as high as this "safe" level.[4,pg.253] (A picogram is one trillionth of a gram, and there are 28 grams in one ounce.)

Thus ATSDR gives us reason to wonder whether people are being harmed at current background levels of dioxin.

Shortly after ATSDR released its final dioxin report, a new study was published showing that some people have defective teeth as a result of exposure to current background levels of dioxin.[5] The new study was conducted by dentists in Finland who have been studying dioxin for a decade. In the early 1980s, they noticed that many children had poorly developed molars -- discolored and soft. The normal hard enamel coating was partially missing, making the teeth subject to decay.

The researchers hypothesized that the children were being exposed to some toxin early in life and this was interfering with normal growth and development of their teeth.

Chinese children born to mothers who were accidentally exposed to high levels of dioxins showed tooth problems similar to those in Finnish children.[6] Taking this as a clue, the Finnish dentists began exposing rats to low levels of dioxin. They found that they could produce the same kind of tooth defects in the rats that had been seen in the Chinese and Finnish children.[7]

Next they studied 102 Finnish children, ages 6 to 7, whose mother's breast milk had been tested for dioxins when the children were four weeks old. Seventeen of the 102 children (16.6%) had soft, mottled molars, with insufficient enamel to protect the teeth from decay. If a tooth fails to develop a proper enamel coating, the tooth is subject to decay for the rest of the person's life because enamel never develops later.

The Finnish study found that children with the worst teeth were born to mothers with the highest levels of dioxin in their breast milk, thus establishing a dose-response relationship.

The researchers examined PCBs separately from the other dioxins and dioxin-like compounds and they found that the PCBs did not contribute to the children's tooth problems.
The Finnish researchers' new findings "are very exciting in a scientific sense--and very concerning in a public-health sense--because they demonstrate effects from [dioxin] exposures at background levels," says Linda Birnbaum, a well-known dioxin researcher with the U.S. Environmental Protection Agency (EPA).[8]

According to ATSDR, many people in the U.S. and elsewhere have dioxin exposures that exceed the average. These include:[4, pgs. 485-497]

** People who are exposed at work, or through environmental contamination, such as people living in Times Beach, Missouri;

** People living near incinerators that are burning municipal, medical or hazardous wastes, or people living downwind from coal-burning power plants;

** People living near any of the 110 Superfund sites where dioxins have been identified. (Superfund sites are chemically-contaminated places that the federal government has identified as dangerous to human health.)

** Sport fishers in the Great Lakes regions are very likely to have high exposure to dioxin, with Lake Huron the highest, Lake Michigan next highest, and Lake Erie the lowest.

** Currently 66 fish advisories have been issued by 21 states because of dioxin-contaminated fish. Three states -- New York, New Jersey, and Maine -- have statewide fish advisories in effect for all of their marine coastal waters, warning people to limit the amount of fish they eat because of dioxin contamination.

** Many indigenous people eat far more fish than the average. Under these circumstances, even low levels of dioxin contamination in fish can add up to a hazard.

** Subsistence farmers who consume their own farm-reared meat and dairy products may be highly exposed if they live downwind from an incinerator or a metal refinery or other source of dioxins.

** People eating food grown on soil treated with sewage sludge may be in danger. ATSDR says, "Exposure to [dioxin] from land application of municipal sewage sludge or paper mill sludge also can occur through the dietary pathway if people consume food grown or animals grazed on sludge-amended lands."[4, pgs. 497] And, "Most recently, MacLachlan... reported that the prolonged use of sewage sludge as a soil amendment on English farms under some conditions can lead to an increase in the concentrations of [dioxins] in both the soil and in cow's milk."[4, pgs. 497]

The question is, can humans do things differently in the future, or are we doomed to stumble from one uninformed decision to another? Are there social mechanisms (such as environmental impact analysis) that could help us avoid massive mistakes like chlorine chemistry?

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


[2] The 18 organochlorines are: mirex; dieldrin; aldrin; endrin; alpha-chlordane; gamma-chlordane; heptachlor; heptachlor epoxide; oxychlordane; transnonachlor; gamma-hexachlorocyclo-hexane; beta-hexachlorocyclohexane (beta-HCH); hexachlorobenzene (HCB); p,p'-DDT; o,p'-DDE; p,p'-DDT; p,p'-DDE; p,p'-DDD.


Descriptor terms: dioxin; chlorine chemistry; pesticides; breast cancer; dieldrin; studies; fish; meat; milk; food safety; incineration;