



Health Risks and Environmental Issues

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Dioxin: A Universal Toxin – Part 2

Dioxin is considered by some scientists to be the most toxic substance known to man, possibly equal to plutonium. Dioxin refers to a

family of chemicals that are the unwanted byproducts of the modern industrial age. They are created in metal smelting, cement kilns, solid and medical waste incineration, chlorine paper bleaching, the manufacture of pesticides and plastics, as well as the burning of polyvinyl chloride (PVC) plastics.

Dioxin – Part I discussed the toxicity, persistence, global coverage, EPA assessment, and food contamination of dioxins. Part 2 offers a brief overview of some of the many health risks associated with dioxins.

Dioxin and DNA Damage

One of the worst members of the dioxin family is 2,3,7,8-tetrachlorodibenzo-p-dioxin, TCDD for short. This molecule binds very strongly to intracellular receptors in human and animal cell nuclei. The danger is in dioxin's ability to enter the nucleus where the cell's DNA is located, and wreak havoc. Damage to the DNA can lead to cancer, or birth defects, or any number of diseases caused by alterations in DNA's instructions for producing a normal balance of enzymes, hormones, and other proteins.¹

Dioxin and the Immune System

Based on studies of rats, mice, guinea pigs, rabbits, cattle, monkeys, and humans, EPA concludes that even low doses of dioxin impair the immune system by directly reducing the number of B cells (formed in the bone marrow), and T cells (formed in the thymus). EPA scientists believe the human embryo may be very susceptible to long-term impairment of immune function from in utero exposure to dioxins at even the lowest levels of exposure.²

As an immune suppressant, dioxin interferes with the body's ability to fight disease. It is also capable of upregulating (exciting) the immune system to become hypersensitive, leading to autoimmunity and allergies. The past few decades have seen a marked increase in the numbers of people suffering with allergies and a variety of autoimmune diseases.

EPA scientist, Linda Birnbaum, who headed the dioxin reassessment team, believes there is no threshold for immunotoxic response to dioxins. Simply put – there is no level of dioxin below which the immune system is not affected.³

The pharmaceutical industry, often with the government's blessing and the taxpayer's dollar, continues to patent drugs designed to treat the "walking ill." If only our government would use our money to search out and reduce the *cause* of illness, the individual and societal rewards would be enormous.

Dioxin and Cancer

In 1997 The International Agency for Research on Cancer (IARC), a division of the World Health Organization, formally concluded that dioxin causes cancer in humans. A large study by the US National Institute for Occupational Safety and Health (NIOSH) involving 5,132 workers exposed to dioxin at 12 US industrial plants was published in the May 5, 2000 issue of *The Journal of the National Cancer Institute*. A 60% higher incidence of cancer deaths among workers who received the most exposure was observed.⁴ Still, not all scientists agree. Industry employs large numbers of scientists to dispute that dioxins pose a danger to humans, or the environment.

Endometriosis

Low dose exposure to dioxin in the diet of female rhesus monkeys resulted in the development of endometriosis. The more dioxin, the worse the endometriosis, according to studies from the University of Wisconsin.⁵

Heart Disease

A study involving 1,189 German workers in a pesticide factory found a dose-dependent relationship to deaths from heart disease, as well as cancer, among workers exposed to dioxin. Exposed workers showed an increase in death due to ischemic heart disease, a narrowing of the arteries, causing a reduction of blood flow resulting in heart attack.⁶

The study, published in the *American Journal of Epidemiology*, Vol. 142, No. 11, Dec. 1, 1995, found the incidence of death from ischemic heart disease in exposed workers to be 2.5 times greater than among workers in a control group. The amount of dioxin in the blood was measured, as opposed to estimated.⁷

Following the 1976 accident at a chemical plant in Seveso, Italy, excessive numbers of heart attack deaths were noted, but were attributed to "stress from the accident." It now raises the possibility that the Seveso heart attack deaths may have resulted from exposure to dioxin released during the explosion.

Vietnam Vets

Vietnam vets exposed to Agent Orange and their subsequent offspring have been disproportionately afflicted with numerous health problems including non-Hodgkin's lymphoma and soft tissue sarcomas, serious skin disorders (chloracne), and liver disorders. Agent Orange, a chlorinated phenoxy herbicide is made up of two common weed killers, 2,4,5-T and 2,4-D, both of which are routinely contaminated with dioxins during the manufacturing process.⁸

Additional health effects associated with phenoxy herbicides are Hodgkin's disease (a cancerous enlargement of the lymph nodes, spleen, and general lymphoid tissues),

neurological effects, reproductive and developmental disorders. The latter includes low sperm count, increased incidence of spontaneous abortion among wives of Vietnam vets, increased incidence of birth defects in children of Vietnam vets (defects of the skin, nerve, heart, kidney, cleft lip and cleft palate).⁹

Diabetes

A recent announcement by the Veteran's Administration to compensate Vietnam vets with diabetes, officially links this disease to the growing list of disorders associated with Agent Orange and dioxin exposure.¹⁰

This decision did not come easily. Not only did thousands of veterans give several years of their lives fighting for what they believed were just causes, but years later as they began to succumb to numerous illnesses, they had to wage additional battles fighting their own government for just compensation for personal and family health problems.

Spokesman James Benson said the Veteran's Administration had to undertake exhaustive medical research to finally prove the case for a link between diabetes and Agent Orange. "Now, a veteran doesn't have to prove he was exposed to Agent Orange. It's enough that he served in Vietnam."¹¹

Dioxin alters glucose tolerance and interferes with the hormone, insulin. A ten-year follow-up study of 55 exposed workers found half to be diabetic or with abnormal glucose tolerance tests, an early sign of diabetes. The risk of diabetes appears to rise 12% for every 100 picogram dioxin/gram (pg/g) of lipid in the blood.¹²

Thyroid

PCBs and dioxin are structurally similar to the thyroid hormone. Some of their toxic effects resemble hypothyroidism, a reduced functioning of the thyroid gland. Most studies have been done on animals but one human study of breast fed infants showed reduced thyroid function in those whose mothers had the highest levels of dioxin in their breast milk.¹³

Deficiencies of thyroid hormone during fetal life or early infancy can lead to mental impairment, hearing loss, and speech problems. Even when IQs measure in the normal range, thyroid deficiency can result in language comprehension problems, impaired learning and memory, and hyperactive behavior.¹⁴

Dioxins and Children

Children are the most vulnerable population when it comes to suffering negative impacts from toxic exposures. Numerous incidents around the world make this very clear.

In one example Taiwanese children exposed to dioxin-like chemicals had frequent respiratory infections and ear infections (otitis). Halfway around the world, children of the Inuit community in Quebec, Canada, have also been found to suffer from very high incidences of respiratory infections and otitis. It appears the Inuit people have elevated levels of dioxin in their bodies from eating the fat of marine mammals which have become contaminated from dioxin sources hundreds of miles away. Seals are a primary food source for the Inuit

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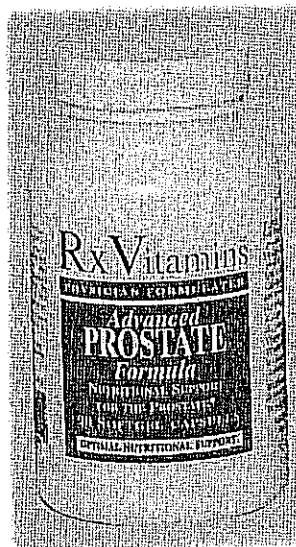
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OPTIMAL NUTRITIONAL SUPPORT

Dioxin

population. It has also been determined that vaccinations do not take well among the Inuit children, possibly because their immune systems have been damaged.¹⁶

A study from the Netherlands showed that children exposed to higher levels of dioxins and PCBs suffered more neurological, developmental, reproductive, and immune effects than children exposed to lower levels. The Dutch PCB/Dioxin Study began in 1989 in response to high levels of dioxins and PCBs in breast milk. The study found most effects in children exposed to dioxins before birth included reduced birth weight, delays in psychomotor development, alterations in thyroid hormones, and alterations in immune system function.¹⁸

A study of Japanese children in the general Japanese population, of exposure to "background" levels of dioxins and dioxin-like compounds in breast milk showed adverse immune effects and altered thyroid function, including low levels of normal brain development. Low thyroid hormone during the first weeks of life for pre-term and low weight babies can result in neurological disorders requiring special education by age nine.¹⁷

A similar study from Finland testing children's exposure to "background" levels of dioxin in breast milk showed effects on tooth development. The study found a relationship between the concentration of dioxin in breast milk and severity of tooth defects. This correlates with the timing of tooth mineralization which occurs during the first two years of life.¹⁸

Babies exposed to rice oil poisoning in Yushko, Japan and Yu-Cheng, Taiwan developed yellowish-brown tooth discoloration, teeth at birth, altered eruption of permanent teeth, and abnormally shaped tooth roots. The rice oil used for cooking had been contaminated with PCBs that were not discovered until after the oil had been widely distributed and consumed. Chloracne, a skin disorder associated with exposure to high levels of dioxin, was present in nearly all of the mothers of the affected babies.¹⁹

More dental abnormalities were observed in children born near the infamous dioxin-contaminated hazardous waste site at Love Canal, near Niagara, New York. These children had double sets of teeth at birth.²⁰

In an article written for the citizen action group, Center for Health and Environmental Justice, Stephen Lester summarizes the growing body of evidence linking dioxin exposure in the general population to developmental and reproductive effects in children. Pre-natal exposure affects development of the nervous system. Whereas, dental effects are associated with dioxin in breast milk. These, combined with slight alterations in thyroid levels and cognitive ability, may be just the beginning of our understanding of how dioxins and similar chemicals can have long range negative impacts on our health.²¹

Dioxin and Birth Defects

Children born to Vietnam vets exposed to Agent Orange appear to have a higher incidence of spina bifida (failure of the neural tube to close in the first six weeks of gestation). The evidence is strong enough that compensation is now made to Vietnam vets if their children are born with this birth defect.²²

The teratogenic effects are even greater in animal studies, where it causes cleft palate in mice, malformed kidneys in rats, and extra ribs in rabbits.²³

Dioxin and Reproduction

Dioxins are capable of interfering with normal development of the human reproductive system. Hypospadias, a birth defect in which the urethra opens on the underside of the penis, has been associated with dioxin exposure.²⁴

Following the 1976 chemical plant explosion in Seveso, Italy, a drop in male births has been reported. The average ratio is 51% male births to 49% female births, but after the accident male births in this area dropped to 44%. The ratio drops to 38% of male births born to fathers who were younger than 19 at the time of the accident.²⁵

How dioxin damages the male reproductive system is not fully understood. Animal studies show decreased testicular size and decreased sperm production in adult rats exposed to dioxins before birth. Dioxin also appears to lower testosterone levels in men.²⁶

Public Activism

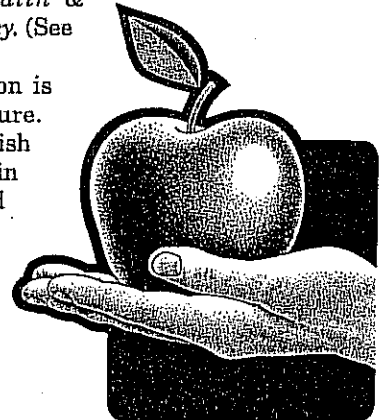
Polluting industries may court a community with the promise of jobs and prosperity, or simply muscle their way in, relying on political clout to facilitate the process. After this, the scenario follows a predictable course.

Workers, their families, and the community at large are not informed about health risks associated with whatever pollutants are characteristic of a particular industry. Years go by; workers get sick; children's illnesses increase; the environment degrades; people become suspicious, then angry, and finally demand answers. Industry denies any wrong doing. Government regulatory agencies and health departments are seldom useful, often relying on information provided by industry.

Most often the burden of proof and the realization of change falls squarely on the shoulders of the public, whose resources are limited and whose health has been compromised. Change generally comes about only as a result of persistent, determined and organized community action.

Lois Marie Gibbs, whose family was in the midst of the Love Canal crisis, is the founder and executive director of the Center for Health and Environmental Justice (CHEJ). Not only does her organization provide guidance to families and communities who are experiencing similar problems, but the CHEJ has launched a nationwide campaign to raise awareness and eliminate use of PVC plastic products. The CHEJ published its own study, *Dying from Dioxin: A Citizen's Guide to Reclaiming Our Health & Rebuilding Our Democracy*. (See resources below).

An ounce of prevention is still worth a pound of cure. Health proponents who wish to take a more active role in eliminating dioxin and dioxin-like chemicals from our world can learn more about the issues from the health and environmental organizations listed on the next page.



Sources for more information about dioxin:

- Center for Health and Environmental Justice, Inc., (CHEJ)
P.O. Box 6806
Falls Church, Virginia 22040 USA
703-237-2249
www.chej.org
info@chej.org
- Endometriosis Assn.
8585 N. 76th Place
Milwaukee, Wisconsin 53223 USA
800-992-3636
- GREENPEACE
1436 U. St., NW
Washington, DC 20009 USA
800-326-0959
www.greenpeaceusa.org/campaigns/toxics/pvc_dist.html
- Rachel's Environment and Health News /
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P.O. Box 5036
Annapolis, Maryland 21403-7036 USA
410-263-1584
erf@rachel.org
- Sierra Club
85 Second St.,
San Francisco, California 94105 USA
415-977-5500
www.sierraclub.org

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