

=====Electronic Edition=====

RACHEL'S ENVIRONMENT & HEALTH WEEKLY #463

---October 12, 1995---

News and resources for environmental justice.

=====

[Environmental Research Foundation](#)

P.O. Box 5036, Annapolis, MD 21403

Fax (410) 263-8944; Internet: erf@rachel.clark.net

=====

[Back Issues](#) | [Index](#) | [Search All Issues](#) | [Official Gopher Archive](#)**To subscribe**, send E-mail to rachel-weekly-request@world.std.com

with the single word SUBSCRIBE in the message. It's free.

=====[Previous Issue](#)=====Next Issue=====**DIOXIN AND HEALTH**

The word "dioxin" stands for a group of chemicals that occurs rarely, if ever, in nature. A very large proportion of dioxin comes from human sources. Dioxin began accumulating in the environment around 1900 when the founder of Dow Chemical (in Midland, Michigan) invented a way to split table salt into sodium atoms and chlorine atoms, thus making large quantities of "free chlorine" available for the first time. [1](Dow's chlorine is "free" in the sense of "chemically unattached," not free in the sense of "without cost.") Initially, Dow considered free chlorine a useless and dangerous waste. But soon a way was found to turn this waste into a useful product, attaching chlorine atoms onto petroleum hydrocarbons and thus creating, during the 1930s and 1940s, a vast array of "chlorinated hydrocarbons." These new chemicals, in turn, gave rise to many of today's pesticides, solvents, plastics, and so forth. Unfortunately, when these chlorinated hydrocarbons are processed in a chemical plant, or are burned in an incinerator, they release an unwanted byproduct --dioxin --the most toxic family of chemicals ever studied.

Dioxin is released by paper mills, by metal smelters, by many chemical plants, by many pesticide factories, and by all incinerators. According to Greenpeace chemist Pat Costner, the biggest source of dioxin discharges into the environment is factories that make the popular plastic, PVC (polyvinyl chloride). [2] Industry and EPA (U.S. Environmental Protection Agency) have known much of the bad news about dioxin since at least the late 1970s, but have done little or nothing about it. In 1991, the paper industry and the Chlorine Council (a trade group) pressured EPA to relax the few dioxin standards that EPA had set at the time; in response, EPA has spent the last 4 years re-examining the toxicity of dioxin, in preparation for deciding what to do about it. (See [RHWN #269](#), [#270](#), [#275](#).) EPA released a draft of its 9-volume "dioxin reassessment" last year (see [RHWN #390](#) and [#391](#)). Yesterday, EPA's Science Advisory Board released its own critique of the 9-volume "dioxin reassessment." [3]

So-called "conservatives" in Congress have attacked Chapter 9 of EPA's dioxin reassessment --the

chapter that contains most of the chillingly bad news about dioxin. We reported in [REHW #457](#) that Congress was preparing to pillory EPA scientists in a public hearing; that hearing has been delayed, and perhaps has been scrapped completely. "Conservatives" in Congress complain that Chapter 9 has not been adequately "peer reviewed."

Last month the main authors of EPA's Chapter 9 published --in a peer-reviewed journal --their own conclusions about the toxicity of dioxin. [\[4\]](#)

The basic message from these senior EPA scientists is that dioxin is toxic to humans in surprisingly many ways, and that the general public is not adequately protected from ill effects by a traditional "margin of safety." Public health policy usually aims to keep the public's exposure to poisons at least 100 times below levels known to harm humans or animals. As we will see, this new report from EPA shows that U.S. adults are already carrying around an average dioxin burden in their bodies that is remarkably close to the levels known to cause illness in humans or animals.

We want to note at the outset that all of the results reported here were taken from peer-reviewed literature and were statistically significant. All of the following information is taken from the new EPA study. [\[4\]](#)

EPA'S LATEST FINDINGS: EPA says the average U.S. citizen has no particular exposure to dioxin besides what is routinely eaten in food --mainly in red meat, fish, and dairy products. This routine dietary exposure has produced an average body burden that is estimated to be 13 nanograms of dioxin per kilogram of body weight (ng/kg). (A nanogram is a billionth of a gram; a gram is 1/28th of an ounce. A kilogram is about 2.2 pounds.) Ng/kg is equivalent to parts per trillion. So 13 ng/kg seems tiny --and as an absolute quantity it is. But compared to the amount that causes havoc in dioxin-exposed animals and humans, 13 ng/kg qualifies as a major public health problem, in our opinion. (EPA estimates that 5% of Americans --some 12.5 million people --have body burdens twice the average.) Here are some effects of dioxin, as reported by EPA: [\[4\]](#)

CHLORACNE: Chloracne was the first disease associated with exposure to dioxin, first described in 1897. Chloracne appeared as an occupational problem in the 1930s among pesticide workers, and among workers who manufactured industrial chemicals called PCBs [polychlorinated biphenyls]. However, dioxin was not identified as the cause of chloracne until about 1960. (Dioxin was an unwanted contaminant of the pesticides and PCBs.) Chloracne produces skin eruptions, cysts and 'pustules' --like a very bad case of teenage acne, except that the sores can occur all over the body and in serious cases can last for many years. To grasp the nature of a bad case of chloracne, we can recall Dr. Raymond Suskind's description of one of his patients, a white man who got chloracne from dioxin exposure in a Monsanto chemical plant in West Virginia in 1949: "... he has given up all social and athletic functions and remained in his house, according to his own description, for months on end. Several times he has been mistaken for a Negro and forced to conform with the racial segregation customs of the area. This has happened on buses or in the theatres [sic]," Suskind wrote. [\[5\]](#)

In laboratory animals, chloracne occurs at body burdens as low as 23 ng/kg and as high as 13,900 ng/kg; in humans, chloracne has occurred at body burdens as low as 96 ng/kg and as high as 3000 ng/kg. This means that some humans get chloracne when their dioxin body burden is only 7 times as high as the body burden of the average person in the U.S. today. In other words, there is not even a factor of 10 separating the average person from the possibility of chloracne. In fact, the EPA study cites examples of humans getting chloracne with body burdens only 3 times as high as the U.S. average.

CANCER: There have been 5 peer-reviewed studies showing cancer in humans exposed to dioxin. The exposures occurred through accidents or through routine activities at work. These studies of humans show that, for some human populations, the danger of cancer begins to rise noticeably when the dioxin body burden reaches 109 ng/kg. This means that a cancer effect in humans is evident when the dioxin body burden reaches a point 8 times as high as the average dioxin body burden in the U.S. public. Again, there is not a factor of even 10 separating the average American from the possibility of cancer from dioxin.

BEHAVIORAL EFFECTS & LEARNING DISORDERS: Laboratory experiments on monkeys (marmosets) reveal learning disabilities in young monkeys with a dioxin body burden as low as 42 ng/kg. [6] Thus learning disorders are evident in monkeys who have a dioxin body burden only 3.2 times as high as that of the average American. Again, there is not a factor of even 10 separating the average U.S. resident from the possibility of a dioxin effect on the central nervous system.

DECREASED MALE SEX HORMONE: Researchers at the National Institute of Occupational Safety and Health (NIOSH) found reduced levels of testosterone --male sex hormone --circulating in the blood of dioxin-exposed male workers. [7] Other sex hormone levels in these men were affected as well. If we can assume that dioxin exposure caused the diminished testosterone levels, then some humans are 280 times as sensitive as rats are, from the viewpoint of testosterone. What seems most important is that these dioxin-exposed workers had body burdens only 1.3 times the dioxin body burden of the U.S. population. Thus there is not even close to a factor of 10 separating the average U.S. male from the testosterone effects seen in dioxin-exposed workers. The reduction in testosterone levels was statistically significant, but the reduction was small and the measured levels still remained within the range that is considered normal.

DIABETES: In two studies, an increased incidence of diabetes has been reported in dioxin-exposed Vietnam veterans; a third study that reaches similar conclusions was reportedly released last week by the U.S. Air Force. [8] The body burdens that seem to produce an increase in diabetes range from 99 to 140 ng/kg. Thus the average American, with a body burden of 13 ng/kg, is a factor of 8 below the lowest level thought to create a diabetes hazard. Once again, there is not even a factor of 10 separating the general public from the levels thought to cause health problems in dioxin-exposed people.

IMMUNE SYSTEM TOXICITY: In monkeys (marmosets), changes in white blood cells associated with the immune system can be measured at dioxin levels of 10 ng/kg --25% below the level already found in average Americans. Mice with body burdens of 10 ng/kg --25% below the amount already found in you

and me --display an increased susceptibility to infections by viruses, presumably because their immune system has been damaged.

SPERM LOSS AND ENDOMETRIOSIS. Female rhesus monkeys with body burdens only 5 times as high as the U.S. average have a measurable increase in the painful, debilitating disease of the uterus, called endometriosis. Endometriosis is increasing in U.S. women. ([RHWN #364](#), [#377](#).) Male offspring of rats with a body burden only 5 times as high as the U.S. average have diminished sperm production. During the last 50 years, sperm production of men through the industrialized world has dropped 50%. ([RHWN #343](#), [#432](#).)

CONCLUSION: We have only scratched the surface of the bad news that has accumulated about dioxin. It is an astonishingly versatile and potent poison. EPA, and the corporations that release dioxin into the environment, have waffled and fudged for 20 years or more. The answer to this burgeoning public health problem is clear, if not easy: over the next 20 years, we must ban chlorine as an industrial feed stock and thus cut off the source of all dioxins. What other choice do we have?

--Peter Montague

=====

[1] Jack Weinberg, editor, **DOW BRAND DIOXIN** (Washington, D.C.: Greenpeace, September, 1995); 34 pages, \$15.00, from Sanjay Mishra at Greenpeace: (202) 319-2444.

[2] Pat Costner, **PVC: A PRIMARY CONTRIBUTOR TO THE U.S. DIOXIN BURDEN** (Washington, D.C.: Greenpeace, February, 1995); \$15.00; available from Sanjay Mishra at Greenpeace: (202) 319-2444.

[3] Copies of the Science Advisory Board's dioxin critique are available, while supplies last, by phoning (202) 260-8414.

[4] Michael J. DeVito and others, "Comparisons of Estimated Human Body Burdens of Dioxinlike Chemicals and TCDD Body Burdens in Experimentally Exposed Animals," **ENVIRONMENTAL HEALTH PERSPECTIVES** Vol. 103, No. 9 (September, 1995), pgs. 820-831.

[5] Raymond R. Suskind, **PROGRESS REPORT -PATIENTS FROM MONSANTO CHEMICAL COMPANY, NITRO, WEST VIRGINIA, APRIL, 1950** (Cincinnati, Ohio: Kettering Laboratory, April, 1950), pg. 9.

[6] S.L. Schantz and others, "Learning in monkeys exposed perinatally to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)." **NEUROTOXICOLOGY AND TERATOLOGY** Vol. 11 (1989), pgs. 13-19. And see: R. Bowman and others, "Behavioral Effects in Monkeys Exposed to 2,3,7,8-TCDD Transmitted Maternally During Gestation and During Four Months of Nursing." **CHEMOSPHERE** Vol. 18 (1989), pgs. 235-242.

[7] Grace M. Egeland and others, "Total Serum Testosterone and Gonadotropins in Workers Exposed to

Dioxin," AMERICAN JOURNAL OF EPIDEMIOLOGY Vol. 139 (1994), pgs. 272-281.

[8] Reuters reported October 6 on a new 20-year study of Air Force veterans exposed to Agent Orange. Reuters said the new study shows that dioxin-exposed vets have an increased incidence of diabetes and heart disease. We believe the new study is available from Donna Tinsley at the Air Force; phone (202) 767-4587. Thanks to Pat Costner of Greenpeace for this intelligence.

Descriptor terms: dioxin; chlorine; dow chemical; epa; studies; pesticides; solvents; metal smelters; paper mills; pulp mills; pvc; polyvinyl chloride; pcbs; science advisory board; sab; food safety; diet; meat; milk; dairy products; fish; chloracne; cancer; learning disorders; central nervous system; testosterone; male sex hormones; occupational safety and health; diabetes; ranch hand study; vietnam veterans; immune system toxicity; viruses; sperm loss; endometriosis; greenpeace; pat costner;

[Next issue](#)